MINDFULNESS-BASED INTERVENTIONS IN THE MANAGEMENT OF CHRONIC PAIN

FEEDBACK FOLLOWING PRELIMINARY SEARCH

QUERY: REF P-006

Received: 23rd July 2010 Feedback to CSG: 15th September 2010 (due/sent)

SEARCH METHODOLOGY

The content of this feedback report refers only to the most relevant material located under each of the evidence headings and is drawn predominantly from author abstracts or research recommendations within Guidelines. The question is posed in the context of controlled and uncontrolled trials exploring the effectiveness and underlying mechanisms of mindfulness-based interventions in the context of chronic (musculoskeletal) pain, and non-experimental studies and reviews defining the theoretical framework around mindfulness-based interventions. This report therefore focuses on material that makes a clear connection between mindfulness-based interventions and chronic (musculoskeletal) pain. Studies are restricted to those published during or after 2000 to date (August 2010). Further details of all the studies included in this report are shown in the appendix, sorted by report section and author name.

Criteria used (PICO):

Who? (population)
Patients with chronic (musculoskeletal) pain

What? (intervention/exposure/measure)
Studies involving individuals with an established mindfulness meditation practice and mindfulness-based interventions including:
- Mindfulness-based stress reduction (MBSR);
- Mindfulness-based cognitive therapy (MBCT);
- Breathworks;
- Acceptance-based interventions employing mindfulness training e.g. Acceptance and Commitment Therapy (ACT);
- Other interventions but must include mindfulness as a key element.

Comparison
Mindfulness-based interventions versus treatment as usual, placebo or other interventions.

What is measured? What are the outcomes?
Pain, functioning (disability), emotional well-being, depression, anxiety and general health. With particular focus on underlying psychological processes: present-moment attention, acceptance, cognitive defusion/decentring, experiencing self-as-context, values and committed action and self-compassion.
**Location and setting**
No specific requirements

**Exclusion Criteria**
No specific criteria

Non-English language guidelines, recommendations, systematic reviews, overviews and clinical opinions. However, non-English language primary research articles with English abstracts were included, see Section D: Primary Research.

**Databases Searched**
NHS Evidence: Health Information Resources (Bandolier, UK Database of Uncertainties about the Effects of Treatments [DUETS], National Library of Guidelines including NICE Guidance, International Guidelines, Clinical Knowledge Summaries, NHS Evidence Specialist Collections [Musculoskeletal]); TRIP database; Centre for Reviews and Dissemination (DARE, NHS EED and HTA); Cochrane Database of Systematic Reviews; EMBASE; MEDLINE; PsycINFO; CINAHL; Cochrane Central Register of Controlled Studies; ISRCTN Register; Medical Research Centre: Clinical Trials Unit; UK Clinical Research Network Study Portfolio; NIH records on ClinicalTrials.gov; Nederlands Trial Register; German Clinical Trials Register; Australian New Zealand Clinical Trials Registry.

Citation tracking and mindfulness-focused websites (www.mindfulexperience.org and www.mindfulnet.org) were also used to locate relevant articles.

**Types of Study**
Head-to-head, controlled or outcome trials, and conceptual papers.

**Keywords searched**
Mindfulness; Mindful; Acceptance[-based]; Acceptance and Commitment; [Chronic] Pain

Keywords and phrases were used separately or in combination; truncation was used where possible/applicable. MESH terms were also included.

**Date limits**
2000 to date.

**Summary of available evidence**

<table>
<thead>
<tr>
<th>EVIDENCE TYPE</th>
<th>INCLUDED IN FEEDBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Evidence Summaries</td>
<td>1</td>
</tr>
<tr>
<td>B Systematic Reviews (and non-systematic reviews)</td>
<td>14</td>
</tr>
<tr>
<td>C Clinical Trial Registries (Current and Closed)</td>
<td>16</td>
</tr>
<tr>
<td>D Primary Research</td>
<td>59¹</td>
</tr>
<tr>
<td>E Overviews and expert opinions</td>
<td>N/A</td>
</tr>
<tr>
<td>F Intellectual Property Office</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ 60 articles describing 59 studies
RESULTS

A: Good Quality Evidence Summaries (including guidelines)

No evidence summaries specifically address mindfulness-based interventions in the context of chronic pain, however, one report focused on meditation practices for health. This identified mindfulness meditation as one of five broad categories of meditation but highlighted a lack of consensus regarding definitions, components and processes of mindfulness mediation and the need for future research to include systematic reviews of meditation for chronic pain and fibromyalgia (Ospina et al., 2007).

B: Systematic Reviews

This section includes meta-analyses, systematic reviews and reviews where no specific detail of the review methodology is given.

Two reviews, both non-systematic, focus specifically on mindfulness interventions and (chronic) pain: mindfulness meditation to manage low back pain (Patil, 2009) and mindfulness and relaxation in the treatment of acute and chronic pain (Dunford & Thompson, 2010). Both identify a limited evidence-base, which suggests mindfulness is beneficial in the context of (chronic) pain.

Other reviews have broader focus. Some of these cover complementary and alternative therapies (CAM) as a whole, including mindfulness-based interventions, in the context of chronic pain conditions: three systematic reviews address fibromyalgia (Baranowsky et al., 2009), fibromyalgia and myalgic encephalomyelitis (Porter, Jason, Boulton, Bothne & Coleman, 2010) and chronic non-malignant pain (Morone & Greco, 2007), whilst a single non-systematic review focuses on CAM for chronic pain (Tan et al., 2007). Other reviews target mindfulness-based interventions across a range of physical (and mental) pathologies including chronic pain conditions: three meta-analyses focus on Mindfulness-Based Stress Reduction (MBSR) (Grossman, Niemann, Schmidt, & Walach, 2004), MBSR and Mindfulness-Based Cognitive Therapy (MBCT) (Baer, 2003) and Acceptance and Commitment Therapy (ACT) (Powers, Vörding, & Emmelkamp, 2009); two systematic reviews address mindfulness meditation (Mars & Abbey, 2010) and MBSR, specifically in cancer care (Smith, Richardson, Hoffman, & Pilkington, 2005); and three non-systematic reviews on MBSR (Koerbel & Zucker, 2007) and ACT (Pull, 2009; Ruiz, 2010).

In general, these reviews identify a limited evidence base that suggests a beneficial effect of mindfulness-based interventions across a range of conditions including chronic pain, and call for further research to be undertaken. Furthermore, two reviews also provide a conceptual review of mindfulness training (Baer, 2003) and ACT (Ruiz, 2010); one review also suggests that the high attrition rates observed in many studies may reflect the requirement for individuals to self-engage and commit to MBSR (Koerbel & Zucker, 2007), another that whilst ACT appears effective it has no greater benefit than established therapies (Powers et al., 2009), whilst one paper calls for studies to examine the individual core elements of MBSR (Smith et al., 2005).
**C: Clinical Trial Registries**

Includes details from: ISRCTN Register; Medical Research Centre: Clinical Trials Unit; UK Clinical Research Network Study Portfolio; NIH records on ClinicalTrials.gov; Nederlands Trial Register; German Clinical Trials Register; Australian New Zealand Clinical Trials Registry.

Fifteen clinical trials were identified for this report, of which 12 are RCTs, 1 controlled trial and 2 cohort studies.

- Seven trials, all RCTs, focus on MBSR in the context of: chronic low back pain (C11, C12, C14, C15), rheumatoid arthritis (C3), fibromyalgia (C13) and brain mechanisms and peripheral biological correlates (C2);
- Two RCTs on ACT for chronic pain (C1, C11);
- Single RCTs address MBCT for medically unexplained symptoms (C4); Mindfulness meditation for chronic pain (C5); and Amygdala Retraining Program (including mindfulness) for chronic fatigue (syndrome) and fibromyalgia (C7);
- A controlled trial focuses on the effects of mindfulness and concentration meditation on multiple sclerosis and peripheral neuropathy (C9);
- Two cohort studies investigate a mindfulness-based interventions for chronic pain (C7, C8).

(Trial end dates were used to sort the following table.)

<table>
<thead>
<tr>
<th>Ref</th>
<th>Trial Details</th>
</tr>
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</table>
| C1  | Telehealth Therapy for Chronic Pain  
*Department of Veterans Affairs*
http://ClinicalTrials.gov/show/NCT01055639 |
|     | 2010-2013 |
| C2  | The Effects of Well-being Interventions on Affect, Attention, Sleep, Social Stress and Pain Regulation  
*University of Wisconsin, Madison; National Center for Complementary and Alternative Medicine (NCCAM)*
http://ClinicalTrials.gov/show/NCT01057368 |
|     | 2009-2012 |
| C3  | The effect of Mindfulness-Based Stress Reduction on pain and disease activity with people who have Rheumatoid Arthritis: Mechanisms of action  
*University of Auckland*
|     | 2010-2012? |
| C4  | Mindful Body Trial: Mindfulness training for medically unexplained symptoms.  
*University Medical Center St. Radboud*
http://www.trialregister.nl/trialreg/admin/rctview.asp?TC=2222 |
|     | 2009-2011 |
| C5  | Effectiveness of mindfulness meditation for low back pain: a randomized controlled trial  
*Charité Berlin*
http://drks-neu.uniklinik-freiburg.de/drks_web/navigate.do?navigationId=trial.HTML&TRIAL_ID=DRKS00000373 |
|     | 2009-2010 |
| C6  | A Pilot Study of Amygdala Retraining Program in Patients With Chronic Fatigue Syndrome, Chronic Fatigue and Fibromyalgia  
*Mayo Clinic*
http://ClinicalTrials.gov/show/NCT01046370 |
|     | 2009-2010 |
| C7  | Impact of a Course on Stress Reduction  
*Hamilton Health Sciences*
http://ClinicalTrials.gov/show/NCT00902863 |
|     | 2009-2010 |
### C8 Evaluating a Chronic Pain Treatment Program

*Wayne State University; Blue Cross Blue Shield*

http://ClinicalTrials.gov/show/NCT00861302

2008-2010

### C9 Effects of Meditation on Multiple Sclerosis and Peripheral Neuropathy

*The Cleveland Clinic*

http://ClinicalTrials.gov/show/NCT00981643

2009-2009

### C10 Behavioral Treatments for Chronic Pain

*Department of Veterans Affairs*

http://ClinicalTrials.gov/show/NCT00371865

2006-2009

### C11 Effectiveness of Cognitive Behavioral Treatment and Mindfulness Based Stress Reduction (MBSR) for Chronic Low Back Pain

*Kovacs Foundation; Spanish Back Pain Research Network (REIDE); Fondo de Investigacion Sanitaria; Universitat Autonoma de Barcelona*

http://ClinicalTrials.gov/show/NCT00360802

2006-2009

### C12 Mindfulness Meditation for Chronic Low Back Pain in Older Adults

*University of Pittsburgh; National Center for Research Resources (NCRR)*

http://ClinicalTrials.gov/show/NCT00494845

2007-2008

### C13 Mindfulness-Based Stress Reduction Program as an Intervention in Patients With Fibromyalgia

*University Hospital Freiburg; Samueli Institute for Information Biology*

http://ClinicalTrials.gov/show/NCT00106275

2003-2006

### C14 Feasibility of Mindfulness Meditation for Adults 65+ With Chronic Low Back Pain

*University of Pittsburgh*

http://ClinicalTrials.gov/show/NCT00594243

2004-2005

### C15 Massage, Meditation, and Tai Chi for Chronic Lower Back Pain

*National Center for Complementary and Alternative Medicine (NCCAM)*

http://ClinicalTrials.gov/show/NCT00070915

2000-2003

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**D: Primary Research**

Primary research has been sub-divided according to presenting condition: healthy individuals subjected to acute pain; chronic pain; chronic low back pain; fibromyalgia and miscellaneous. Further classification is made with reference to the experimental design and hence level of evidence provided.

**D.1 Health individuals exposed to acute pain**

**Randomized controlled trials**

*Large studies (n≥50)*

- ACT with and without a values component (Branstetter-Rost, Cushing, & Douleh, 2009);

*Small studies (n<50)*

- Acceptance-based versus
  - cognitive based brief protocols (Gutierrez, Luciano, Rodriguez & Fink, 2004);
  - control-based interventions (Roche, Forsyth, & Maher, 2007);

- Mindfulness practice (Kingston, Chadwick, Meron, & Skinner, 2007);
Controlled trials

- Meditation (including mindfulness-based meditation) experience versus no experience (Brown & Jones, *in press*);
- Zen meditators versus non-meditators (Grant & Rainville, 2009; Grant, Courtemanche, Duerden, Duncan, & Rainville, 2010).

Cohort studies

- Long-term meditators (Perlman, Salomons, Davidson, & Lutz, 2010);
- Brief 3-day Mindfulness meditation, math distraction and relaxation (3 experiments) (Zeidan, Gordon, Merchant, & Goolkasian, 2010)

D.2 Chronic pain

Randomized controlled trials

Large studies (n≥50)

- MBSR versus multidisciplinary education programme (Wong, 2009)

Small studies (n<50)

- ACT self-help (Johnston, Foster, Shennan, Starkey, & Johnson, 2010);
- ACT for chronic pain and whiplash associated disorders (Wicksell, Ahlqvist, Bring, Melin, & Olsson, 2008);
- MBSR (Plews-Ogan, Owens, Goodman, Wolfe, & Schorling, 2005);
- Body-oriented therapy (including mindfulness) for female veterans with chronic pain and post-traumatic stress disorder (Price, McBride, Hyerle, & Kivlahan, 2007)

Controlled trials

- Breathworks (2 studies) (Cusens, Duggan, Thorne, & Burch, 2010);
- 8-week mindfulness training (Sagula D. & Rice K.G., 2004);
- Mindfulness-Based Meditation (face-to-face or video-conferencing) (Gardner-Nix, Backman, Barbati, & Grummitt, 2008).

Cohort studies

- ACT-based (multidisciplinary) protocols (McCracken, Vowles, & Eccleston, 2005; Vowles & McCracken L., 2009; Vowles, Wetherell, & Sorrell, 2009; Vowles & McCracken, 2008; 2010);
- CBT attention management including mindfulness exercises (Elomaa, Williams, & Kalso, 2009);
- MBSR (Rosenzweig *et al.*, 2010);
- Relationship between persistent pain and mindfulness (Schutze, Rees, Preece, & Schutze, 2010);
- Role of pain-related anxiety on mindfulness (Cho, Lee, McCracken, Moon & Heiby, 2009);
- Behavioural and cognitive processes underlying mindfulness (McCracken & Thompson, 2009);
- Role of mindfulness (McCracken, Gauntlett-Gilbert, & Vowles, 2007) acceptance and values-based action *i.e.* psychological flexibility (McCracken & Vowles, 2007, 2008; McCracken & Keogh, 2009; McCracken & Velleman, 2010).

Case studies

- ACT and CBT older adult (Lunde & Nordhus, 2009).
D.3 Chronic low back pain

*Randomized controlled trials*
Small studies (*n*≤50)
- Mindfulness meditation in older adults (Morone, Greco, & Weiner, 2008; Morone, Rollman, Moore, Li, & Weiner, 2009).

*Cohort studies*

*Case studies*
- ACT (Kleen & Jaspers, 2007).

D.4 Fibromyalgia
These studies almost exclusively include women only.

*Randomized controlled trials*
Large studies (*n*≥50)
- Mindfulness mediation and Qigong (Astin *et al.*, 2003).
- MBSR (Sephton *et al.*, 2007; Weissbecker *et al.*, 2002).

*Controlled trials*
- MBSR (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007) for women with multiple chemical sensitivity, CFS and fibromyalgia (Sampalli, Berlasso, Fox, & Petter, 2009);
- Breathing rate on acute pain (experimental) (Zautra, Fasman, Davis, & Craig, 2010).

*Cohort studies*
- Mindfulness meditation (Lush *et al.*, 2009)
- Explore meaning and process of pain acceptance in women fibromyalgia and arthritis (Lachapelle, Lavoie, & Boudreau, 2008)

D.5 Miscellaneous

*Randomized controlled trials*
Large studies (*n*≥50)
- Rheumatoid arthritis
  - CBT for pain, Mindfulness meditation and emotional regulation therapy, or education (Zautra *et al.*, 2008);
  - MBSR (Pradhan *et al.*, 2007).
Small studies (*n*<50)

*Controlled trials*
- MBSR for range of conditions, in community dwelling (Smith *et al.*, 2008) and nursing home residents (Ernst *et al.*, 2008).


**Cohort studies**
- MBSR for range of conditions including chronic pain (Carmody & Baer, 2008; Chang et al., 2004; Reibel, Greeson, Brainard, & Rosenzweig, 2001) for nursing home residents (McBee, Westreich, & Likourezos, 2004);
- Mindfulness meditation for cancer (Ando et al., 2009)

**Case studies**
- Mindfulness meditation for headaches due to intense concentration (Sun, Kuo & Chiu, 2002)

The majority of primary studies included in this report focus on physical and psychological outcomes of mindfulness-based interventions. However, some studies focus on identifying the potential psychological factors that underlie mindfulness and its effects: psychological flexibility identified in the research of McCracken and colleagues (McCracken L.M. & Thompson M., 2009; McCracken & Vowles, 2007, 2008; McCracken et al., 2007; McCracken & Keogh, 2009; McCracken & Velleman, 2010); Sense of coherence (Weissbecker et al., 2002); self-efficacy and positive states of mind (Chang et al., 2004) and pain-related anxiety (Cho et al., 2009).

Two further categories of studies were identified, which are not detailed in the Appendix, but may be pertinent for future research:

**Questionnaires**
- Beliefs about Emotions Scale (Rimes & Chalder, 2010)
- Cognitive and Affective Mindfulness Scale (CAMS) (Baer, Smith, Hopkins, Kriemtemeyer, & Toney, 2006; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007)
- Coping Strategies Questionnaire (CSQ) and the Chronic Pain Acceptance Questionnaire (CPAQ) (McCracken & Eccleston, 2006)
- Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2006; Van Dam, Earleywine, & Danoff-Burg, 2009)
- Freiburg Mindfulness Inventory (FMI) (Baer et al., 2006; Buchheld, Grossman, & Walach, 2001; Kohls, Sauer, & Walach, 2009; Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006)
- Kentucky Inventory of Mindfulness Skills (KIMS) (Baer et al., 2006; Dekeyser, Raes, Leijssen, Leysen, & Dewulf, 2008; Hansen, Lundh, Homman, & Wångby-Lundh, 2009; Nicastro, Jermann, Bondolfi, & McQuillan, 2010)
- Mindful Attention Awareness Scale (MAAS) (Baer et al., 2006; Brown & Ryan, 2003; Carlson & Brown, 2005; Cordon & Finney, 2008; Hansen et al., 2009; MacKillop & Anderson, 2007; Cordon & Finney, 2008; Hansen et al., 2009)
- Mindfulness-Based Relapse Prevention Adherence and Competence Scale (MBRP-AC) (Chawla et al., 2010)
- Mindfulness Questionnaire (MQ) (Baer et al., 2006)
- Philadelphia Mindfulness Scale (PHLMS) (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008)
- Pictorial Representation of Illness and Self Measure (PRISM) (Gardner-Nix & Kassardjian, 2009; Kassardjian, Gardner-Nix, Dupak, Barbati, & Lam-McCulloch, 2008)
- Psychological Inflexibility in Pain Scale (PIPS) (Wicksell, Renofalt, Olsson, Bond, & Melin, 2008)
- Self-Compassion Scale (Neff, 2003)
• Self-Other Four Immeasurables (SOFI) (Kraus & Sears, 2009)
• Toronto Mindfulness Scale (TMS) (Baer, Smith, & Allen, 2004; Lau et al., 2006)

**PhD Dissertation research**
Mindfulness-meditation in the context of:
• Cancer (Bonadonna, 2000);
• Chronic fatigue syndrome (Pauzano-Slamm, 2005);
• Chronic headache pain (Nash-Mc Feron, 2006) and tension headaches and secretory immunoglobulin A in saliva (Rosdahl, 2003);
• Chronic pain (Sagula, 2000), with focus on power and pain perception (Wijesinghe, 2007);
• Fibromyalgia (Moriconi, 2004), and MBSR for fibromyalgia (Lynch, 2004) in older women (Prewitt, 2000);
• Psychological processes underlying the health benefits of MBSR (Malcoun, 2008);
• Rumination as a mediator of effects of MBSR on community experiencing anxiety, depression and/or chronic pain (McKim, 2007);
and ACT specifically, in the context of:
• Chronic non-malignant pain (Meyer, 2009)

**E: Overviews and Expert Opinions**

These are not detailed in the appendix, as higher-level evidence is available, however, a reference list of peer-reviewed articles, book sections and books is provided in Section E of the Appendix.

**F: Intellectual Property Office**

Not relevant to this report

**CONCLUSION**

Primary research studies comprise a majority of the articles included in this report (59/74) with a further 15 clinical trials ongoing or recently completed and unpublished. The largest minority of studies (24/59) are uncontrolled study designs that rate as low-level evidence, and whilst 19 RCTs and 30 controlled-trials are identified, 12 RCTs and 5 controlled-trials have low sample sizes (<50) and thus may be considered low-quality studies. These findings are consistent with the conclusions in the evidence review, meta-analyses, systematic and non-systematic reviews identified in the report: that is, that there is a lack of reliable evidence regarding the effectiveness of mindfulness-based interventions for chronic pain conditions.

Furthermore, a large majority of the studies in this report are concerned with the physical and psychological outcomes of mindfulness-based interventions (in the context of chronic pain), whilst only a minority focus on identifying the underlying psychological processes.

In summary, this report identifies the lack of high quality clinical trial evidence as a necessary research direction in establishing the effectiveness and underlying psychological processes of mindfulness-based interventions in the context of chronic musculoskeletal pain.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ACT</td>
<td>Acceptance and Commitment Therapy</td>
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<tr>
<td>CAM</td>
<td>Complementary and Alternative Medicine</td>
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<td>CBSR</td>
<td>Cognitive behavioural stress reduction</td>
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<td>CFS</td>
<td>Chronic Fatigue Syndrome</td>
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<td>COPM</td>
<td>Canadian Occupational Performance Measure</td>
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<td>CPAQ</td>
<td>Chronic Pain Acceptance Questionnaire</td>
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<td>CPT</td>
<td>Continuous Performance Task</td>
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<td>DAPOS</td>
<td>Depression, Anxiety and Positive Outlook Scale</td>
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<td>DAS28-CRP</td>
<td>Disease Activity Score in 28 Joints</td>
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<td>DDPRQ-9</td>
<td>Difficult Doctor Patient Relationship-9</td>
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<tr>
<td>EEG</td>
<td>Electroencephalography</td>
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<td>EQ-5D</td>
<td>EuroQual-5D Health Survey</td>
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<td>ERP</td>
<td>Event-related potential</td>
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<tr>
<td>ESS</td>
<td>Epworth Sleep Scale</td>
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<tr>
<td>FACIT-Sp</td>
<td>Functional Assessment of Chronic Illness Therapy - Spiritual Well-Being</td>
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<tr>
<td>FFMQ</td>
<td>Five Facet Mindfulness Questionnaire</td>
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<tr>
<td>FIQ</td>
<td>Fibromyalgia Impact Questionnaire</td>
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<tr>
<td>FMI</td>
<td>Freiburg Mindfulness Inventory</td>
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<tr>
<td>GDS-12R</td>
<td>The Geriatric Depression Scale (Residential)</td>
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<tr>
<td>HADS</td>
<td>Hospital Anxiety and Depression Scale</td>
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<tr>
<td>IAT</td>
<td>Implicit Association Task</td>
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<tr>
<td>MAAS</td>
<td>Mindfulness Attention Awareness Scale</td>
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<tr>
<td>MBCT</td>
<td>Mindfulness Based Cognitive Therapy</td>
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<tr>
<td>MBSR</td>
<td>Mindfulness Based Stress Reduction</td>
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</tbody>
</table>
MDFI  Multidimensional Fatigue Inventory
ME    Myalgic Encephalomyelitis
MMST  Mini Mental State Test
MRI BOLD  Magnetic Resonance Imaging: Blood oxygen level dependent
MYMOP-2 Measure Your Medical Outcome Profile
PCS   Pain Catastrophising Scale
PHQ   Patient Health Questionnaire
PLC   Profile of Quality of Life in the Chronically Ill
POMS  Profile of Mood States
PSEQ  Pain Self-Efficacy Questionnaire
PTSD  Post-Traumatic Stress Disorder
RA    Rheumatoid Arthritis
RRS   Ruminative Response Style
SES   Arthritis Self-Efficacy
SF-12 Satisfaction with Life - 12
SF-36 Satisfaction with Life - 36
SF-B  Schlaffragebogen B (Quality of Sleep)
SoC-13 Sense of Coherence-13
STAI-G State-Trait Anxiety Inventory – German Form
SWLS  Satisfaction with Life Scale
VAS   Visual Analogue Scale
WLQ   Work Limitation Questionnaire
References


C1. Meditation practices for health: state of the research (Ospina, Bond, Karkhaneh, Tjosvold, Vandermeer, Liang, Bial, Hooton, Buscemi, Dryden & Klassen, 2007). The focus of this evidence report is to provide a state of research on a variety of meditation practices. A comprehensive literature search was undertaken; relevant evidence/studies were identified, assessed and graded. Delphi methodology was used to develop a set of parameters to describe meditative practices and resulted in five broad categories of meditation being identified: Mantra meditation, Mindfulness meditation, Yoga, Tai chi and Qi gong. With regards to Mindfulness meditation four separate types were recognized: Vipassana meditation, Zen-Buddhist meditation, MBSR and MBCT. The report highlights inconsistencies between investigators on general descriptions of mindfulness and thus, no consensus on defining components or processes. On examination of the evidence, the three most studied conditions (across meditation as a whole) were hypertension, cardiovascular disorders and substance abuse: and the evidence for these three were summarised for the different types of meditation — although studies addressing meditation interventions for chronic pain and fibromyalgia were mentioned and the need for future research to include systematic reviews of these pathologies and meditation was highlighted.

<table>
<thead>
<tr>
<th>Title</th>
<th>Sample</th>
<th>Methodology/Comments</th>
<th>Summary</th>
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<tbody>
<tr>
<td>Baer (2003) Mindfulness training as a clinical intervention: A conceptual and empirical review</td>
<td>Conceptual and empirical review (meta-analysis) of mindfulness training as a clinical intervention. Note: Exclusion of studies of mindfulness as defined by Lange.</td>
<td>Computerised search of Psychnfo and Medline, for articles and chapters. Restricted to English language articles only. Citation tracking also employed.</td>
<td>The article outlines interventions based on (MBSR and MBCT) and incorporating (dialectical behaviour therapy, ACT and relapse prevention) mindfulness training. Then proceeds to present a number of postulated mechanisms involved in symptom reduction and behavioural change: exposure, cognitive change, self-management, relaxation and acceptance. The relationship between CBT and mindfulness training is also discussed. Twenty one studies included in meta-analysis covering a range on: conditions including chronic pain (n = 4), fibromyalgia (n = 2), psoriasis (n = 1) and cancer (n = 1); mixed clinical populations; and non-clinical populations. These suggest that mindfulness based interventions may be beneficial across a range of disorders. However, it was noted that the current evidence based was methodologically flawed and that further good quality studies were required.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Methodology</td>
<td>Database Search</td>
<td>Findings</td>
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<td>--------------------------------</td>
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<tr>
<td>Baranowsky, Klose, Musial, Haeuser, Dobos &amp; Langhorst (2009) Qualitative systemic review of randomized controlled trials on complementary and alternative medicine treatments in fibromyalgia</td>
<td>Systematic review of RCTs of CAM therapies for fibromyalgia.</td>
<td>Computerised search of databases from 1990 to July 2007: Embase, Medline, Pubmed, PsychInfo, Cochrane Central Register of Controlled Trials; Cambase. Restricted to articles written in English or German.</td>
<td>Twenty four RCTs were included in the review. Two trials were relevant to this report i.e. reported on mindfulness interventions. Both studies involve the use of MBSR, the first on depressive symptoms and the second, in combination with Qigong, on a broader range of outcomes (including FIQ, myalgic score, pain and depression). It is concluded that due to methodologies it is unclear whether the observed positive effects are attributable solely to MBSR, and that further investigation in this area is warranted.</td>
</tr>
<tr>
<td>Dunford &amp; Thompson (2010). Relaxation and mindfulness in pain: a review.</td>
<td>Review of the use of relaxation and mindfulness in acute and chronic pain.</td>
<td>Computerised search of Web of Science and PsycINFO from 1958 to August 2008. Restricted to English language articles only.</td>
<td>With regards to mindfulness and pain the review identified 114 articles of which 13 met inclusion criteria. Studies suggest that mindfulness can lead to improvements in both physical functioning and psychological measures in individuals with pain (including chronic pain, arthritis and fibromyalgia) and that these benefits are maintained at follow up. The need for further research was highlighted.</td>
</tr>
<tr>
<td>Grossman, Niemann, Schmidt &amp; Walach (2004). Mindfulness-based stress reduction and health benefits. A meta-analysis</td>
<td>Meta-analysis of published and unpublished controlled and uncontrolled studies regarding the use of MBSR in the context of health with physical or mental well-being outcomes.</td>
<td>Computerised search of databases up to December 2002: Medline; PsychInfo including Digital Dissertations; Psyndex Plus; Web of Science including Science Citation Index; Cochrane Library.</td>
<td>Sixty four empirical studies were indentified of which 20 met inclusion criteria for quality and/or relevance. Included studies covered a range of clinical populations including pain, heart disease, depression, anxiety and heart disease, and nonclinical populations. Outcomes used in analysis were physical and mental well being variables, with an overall effect size of about 0.5 (P&lt;0.0001). Concludes that the current evidence base whilst small suggests that MBSR may be beneficial in a wide range of clinical and nonclinical conditions.</td>
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<td>Koerbel &amp; Zucker (2007). The suitability of mindfulness-based stress reduction for chronic hepatitis C</td>
<td>Systematic review of primary research articles only examining the use of MBSR in the context of chronic conditions including fibromyalgia, HIV, TB Hepatitis C and heart disease. Nb: transcendental meditation excluded.</td>
<td>Computerised search of databases from 1995-2004: CINAHL; PsychInfo; PubMed; Psychological Articles, SSCI; Sociological Abstracts; ERIC and Social Science Abstracts.</td>
<td>Five studies met the inclusion criteria; in general the results show a positive effect of MBSR across a variety of chronic illnesses. It is therefore suggested that further investigation is warranted. The high attrition rates in studies are highlighted and it is suggested that this reflects the fact that MBSR requires self-engagement and commitment which may not appeal to everyone.</td>
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<td>Study</td>
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<tr>
<td>Mars &amp; Abbey (2010). Mindfulness</td>
<td>Systematic review of RCTs and evaluation studies assessing the effectiveness of</td>
<td>Twenty two studies met the inclusion criteria for the systematic review. Overall studies consistently show significant improvements in positive health measures and spirituality, and decreases in pain, depressive recurrence and relapse, and psychological distress. A lack of specific, reliable and validated mindfulness measures was noted. The need for future large scale, long-term studies encompassing a wider demographic and including specific mindfulness outcome measures was highlighted.</td>
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<td>meditation practice as a healthcare</td>
<td>meditation interventions in healthcare. <em>Nb: Transcendental meditation excluded.</em></td>
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<td>intervention: A systematic review</td>
<td>Computerised search of databases to July 2006 including: AMED; ASSIA; BNI; Cochrane</td>
<td>Twenty two studies met the inclusion criteria for the systematic review. Overall studies consistently show significant improvements in positive health measures and spirituality, and decreases in pain, depressive recurrence and relapse, and psychological distress. A lack of specific, reliable and validated mindfulness measures was noted. The need for future large scale, long-term studies encompassing a wider demographic and including specific mindfulness outcome measures was highlighted.</td>
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<td>Central Register of Controlled Trials; CINAHL; Cochrane Controlled Trials Register;</td>
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<td>DARE; Ingenta Connect; National Health Service Technology Assessment Database Programme;</td>
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<td>PsychInfo; PubMed; Science Direct; Scopus. Hand-searches were also conducted.</td>
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<td>Restricted to peer-reviewed articles written in English.</td>
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<tr>
<td>Morone &amp; Greco (2007). Mind-body</td>
<td>Systematic review of RCTs and uncontrolled clinical trials of mind-body interventions</td>
<td>Twenty articles fulfilled the inclusion criteria of the systematic review: 14 of which were controlled trials.</td>
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<td>interventions for chronic pain in</td>
<td>(specifically: biofeedback, progressive muscle relaxation, meditation, guided imagery,</td>
<td>Two studies involved MBSR (these only studies presented for the meditation category). Therefore, with regards to meditation the review found limited evidence to suggest its efficacy for in improving function or coping in older adults with OA or lower back pain. Overall, it concludes that there is currently insufficient evidence for the effectiveness of any interventions in reducing chronic non-malignant pain in older adults. The need for further large scale, good quality clinical trials of mind-body interventions was highlighted.</td>
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<td>older adults: a structured review</td>
<td>hypnosis, Tai Chi, Qi gong, and yoga) in older adults with chronic non-malignant pain.</td>
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<td>Computerised search of databases to March 2006 including: Medline; PsychINFO; AMED and</td>
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<td>CINAHL. Citation tracking of relevant articles was also employed.</td>
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<td>Restricted to articles published in English.</td>
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<td>Patil (2009). Effectiveness of</td>
<td>Review (systematic?) to examine the current evidence-base for the effectiveness of</td>
<td>Concludes that there is no Grade I evidence for the effectiveness of mindfulness-based meditation in the treatment of chronic lower back pain, although the current evidence-base suggests that there is merit in its use. The need for further high quality RCTs focusing on pure mindfulness-based meditation interventions is highlighted.</td>
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<td>mindfulness meditation (Vipassana)</td>
<td>mindfulness meditation in the management of chronic lower back pain.</td>
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<td>in the management of chronic low</td>
<td>No search methodology was presented.</td>
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<td>back pain</td>
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<td>Porter, Jason, Boulton, Bothne &amp; Coleman (2010).</td>
<td>Alternative medical interventions used in the treatment and management of myalgic encephalomyelitis/chronic fatigue syndrome and fibromyalgia</td>
<td>Systematic review and evaluation of RCTs and non-randomized controlled trials of alternative therapies and non-pharmacological supplements used for ME/CFS and fibromyalgia.</td>
<td>PubMed, MEDLINE and PsychInfo. Two leading sub-speciality journals were hand-searched. Included studies were quality assessed (Jadad scale) and data extracted.</td>
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<tr>
<td>Powers, Vörding, Emmelkamp (2009).</td>
<td>Acceptance and commitment therapy: a meta-analytic review</td>
<td>Meta-analysis of controlled trials examining efficacy of ACT compared to waiting lists, psychological placebos, treatment as usual, and established therapies for physical and mental health conditions. Nb: A wide range of conditions were included in the study including pain.</td>
<td>PsycINFO; Medline; Cochrane Central Register of Controlled Trials. Citation tracking and electronic citation maps were also used. Included studies were quality assessed (Jadad scale) and data extracted. Studies were restricted to those published in English.</td>
</tr>
<tr>
<td>Pull (2009).</td>
<td>Current empirical status of acceptance and commitment therapy</td>
<td>Editorial review of previous reviews, meta-analysis and new studies published between January 2006 and August 2008.</td>
<td>N/K</td>
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<tr>
<td>Ruiz (2010).</td>
<td>A review of acceptance and commitment therapy (ACT) empirical evidence: correlation, experimental psychopathology, component and outcome studies.</td>
<td>Review of reviews and evidence addressing ACT in the context of physical and mental health.</td>
<td>N/K</td>
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<td>Study</td>
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<td>Smith, Richardson, Hoffman &amp; Pilkington (2005). Mindfulness-based stress reduction as supportive therapy in cancer care: systematic review</td>
<td>Systematic review of effectiveness of MBSR (including modified MBSR and mindfulness meditation studies) in supporting care for patients with a primary diagnosis of cancer. Computerised database search to May 2004 including: MEDLINE; EMBASE; AMED; CISCOM; CINAHL; PsychINFO; British Nursing Index; Cochrane Library. Also employed citation tracking. Ongoing and unpublished research searched online: National Research Register (UK) and Clinicaltrials.gov (USA); and by contacting experts in the field.</td>
<td>Outcome measures included subjective well-being, QoL, physical functioning (pain and mobility) psychological measures (coping, anxiety, stress) and physical measures (blood and saliva tests). Three RCTs and 8 uncontrolled trials met inclusion criteria. One unpublished, uncontrolled study investigated pain, reporting a significant improvement in pain levels in patients undertaking a mindfulness meditation programme. Review concludes that MBSR studies to date have focused on the psychological outcomes and QoL, reporting positive effect. It was highlighted that no assessment of whether individual attitudes or characteristics affected outcomes and that further investigation is required. The current evidence base is limited: few studies, small sample sizes and methodological limitations. The need to examine the effectiveness of individual core elements of MBSR (body scan, meditation, yoga stretches) and qualitative data on patient expectations, commitment to practice and experience were also highlighted.</td>
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<td>Tan, Craine, Bair, Garcia, Giordano, Jensen, McDonald, Patterson, Sherman, Williams &amp; Tsao (2007). Efficacy of selected complementary and alternative medicine interventions for chronic pain</td>
<td>Review of controlled trials, review articles and meta-analyses examining the effectiveness of CAM therapies in the treatment of chronic pain. Computerised database search from 1966-July 2006 including: MEDLINE; PsychINFO, CINAHL; Cochrane Library. Restricted to articles published in English. Excluded acute pain and disease-associated pain.</td>
<td>This review covers therapies that fall into 4 domains: biologically based medicine, energy medicine, manipulative and body-based medicine, and mind-body medicine, in addition to homeopathy and acupuncture. With regards to mindfulness based therapies these were classified under mind-body medicine and specifically meditation (which included both mindfulness and concentrative meditation). It was concluded that the current evidence-base was limited and not strong enough to support the routine use of meditation for the managing pain; however, there was support for its use as an adjunct to other forms of care. Possible mechanisms underlying meditation’s effects are presented including that of change in awareness of pain enabling a shift in cognitive and emotional reaction to pain; increased self-efficacy, coping capacity and attenuation to stress; relaxation; release of nitric oxide stimulating vasodilation, anti-inflammatory, morphinergic and endocannabinoid activity.</td>
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<td><strong>C1</strong> Telehealth Therapy for Chronic Pain</td>
<td><em>Department of Veterans Affairs</em> &lt;br&gt;2010-2013 &lt;br&gt;Ongoing</td>
<td>RCT (active control, ( n = 196 )) to determine the effect of individual psychosocial in-person ACT or telehealth ACT, in reducing the interference of pain with daily life, pain intensity and emotional distress, and improve quality of life and activity levels. Patients (18 years and older) with chronic pain (&gt; 6 months). Outcomes include: Brief pain inventory; West Haven-Yale Multidimensional pain inventory; SF-12; Pain Anxiety Symptom Scale – 20; Pittsburgh Sleep Quality Index; Actigraphy; Patient Health Questionnaire-9; Valued Living Questionnaire; Client Satisfaction Questionnaire; Patient Global Impression of Change Scale; National Health Interview Survey. Timepoints: baseline, 4 weeks, 8 weeks, 3-month and 6-month</td>
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<td><strong>C2</strong> The Effects of Well-being Interventions on Affect, Attention, Sleep, Social Stress and Pain Regulation</td>
<td><em>University of Wisconsin, Madison; National Center for Complementary and Alternative Medicine (NCCAM)</em> &lt;br&gt;2009-2012 &lt;br&gt;Ongoing</td>
<td>RCT (factorial assignment, ( n = 150 )) to examine the brain mechanisms and peripheral biological correlates of mindfulness-based and compassion/loving-kindness meditation. Comparisons between 8-week MBSR, day of intensive meditation practice, 8-week health enhancement program and waiting list controls. Patients (25-65 years old): nb exclusion criteria include individuals with chronic pain conditions. Outcomes: MRI BOLD; EEG; Salivary Cortisol; Behavioural; Self-report Timepoints: Pre, post and follow up?</td>
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<td><strong>C3</strong> The effect of Mindfulness-Based Stress Reduction on pain and disease activity with people who have Rheumatoid Arthritis: Mechanisms of action</td>
<td><em>University of Auckland</em> &lt;br&gt;2010-2012? &lt;br&gt;Not yet recruiting</td>
<td>RCT (active control, ( n = 100 )) to examine the effect of Mindfulness-Based Stress Reduction on pain and disease activity in patients with RA. Eight-week MBSR intervention vs treatment as usual. Patients (over 18 years) with RA. Outcomes include: Pain, Pain-related acceptance (Chronic Pain Disease Activity Score); Disease activity (DAS28-CRP); Depression &amp; anxiety (HADS). Time points: baseline, immediately post-intervention, and 1, 3, 6 and 12 months follow up.</td>
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<td><strong>C4</strong> Mindful Body Trial: Mindfulness training for medically unexplained symptoms</td>
<td><em>University Medical Center St. Radboud</em> &lt;br&gt;2009-2011</td>
<td>Multicentre RCT (active control, ( n = 100 )) to determine effectiveness of mindfulness training for patients with medically unexplained symptoms (<em>including pain</em>). Eight-week mindfulness training (MBCT) vs. care as usual. Patients (18-70 years old) with medically unexplained symptoms for &gt;6 months affecting quality of life. Outcomes include: EQ-5D; SF-36; PHQ; Whately Index; FFMQ; RRS; Medical Consumption (cost); WLO; DDPRQ-9; SoC-13 Timepoints: Medical consumption and WLO – monthly; DDPRQ-9 – baseline and 1 year; all others at baseline, 3 and 12 months post-baseline.</td>
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<td>C5</td>
<td>Effectiveness of mindfulness meditation for low back pain: a randomized controlled trial</td>
<td>Charité Berlin</td>
<td>2009-2010</td>
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<td>C6</td>
<td>A Pilot Study of Amygdala Retraining Program in Patients With Chronic Fatigue Syndrome, Chronic Fatigue and Fibromyalgia</td>
<td>Mayo Clinic</td>
<td>2009-2010</td>
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<td>C7</td>
<td>Impact of a Course on Stress Reduction</td>
<td>Hamilton Health Sciences</td>
<td>2009-2010</td>
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<tr>
<td>C8</td>
<td>Evaluating a Chronic Pain Treatment Program</td>
<td>Wayne State University; Blue Cross Blue Shield</td>
<td>2008-2010</td>
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<td>C9</td>
<td>Effects of Meditation on Multiple Sclerosis and Peripheral Neuropathy</td>
<td>The Cleveland Clinic</td>
<td>2009-2009</td>
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<td>ID</td>
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<td>C10</td>
<td>Behavioral Treatments for Chronic Pain</td>
<td>Department of Veterans Affairs</td>
<td>RCT (active, n = 114) to determine the effectiveness of a brief (8 sessions), group-based psychosocial intervention (acceptance-based therapy model including mindfulness) in reducing the interference of pain with daily life, pain intensity and emotional distress, and improve quality of life and activity levels. Compared with 8-sessions of group CBT. Both arms undergo an initial 6 weeks of treatment as usual. Patients (18 years and older) diagnosed with 2° chronic benign pain associated with 1° impairment due to trauma, congenital or acquired disorder. Outcomes: physical activity, actigraphy. Time-points: Baseline, 6- and 12-weeks, and 6-month follow up.</td>
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<tr>
<td>C11</td>
<td>Effectiveness of Cognitive Behavioral Treatment and Mindfulness Based Stress Reduction (MBSR) for Chronic Low Back Pain</td>
<td>Kovacs Foundation; Spanish Back Pain Research Network (REIDE); Fondo de Investigacion Sanitaria; Universitat Autonoma de Barcelona</td>
<td>Multicentre RCT (active, n = 330) to determine the effectiveness of two psychological interventions: MBSR and CBT, in patients with chronic low back pain. Patients (18-70 years old) attending pain clinics. Outcomes: anxiety; QoL; pain; disability; catastrophizing; depression; anger; analgesic medication; satisfaction with care. Time-points: immediately after therapy, 2 and 12 months follow up.</td>
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<td>C12</td>
<td>Mindfulness Meditation for Chronic Low Back Pain in Older Adults</td>
<td>University of Pittsburgh; National Center for Research Resources (NCRR)</td>
<td>RCT (active, n = 40) to determine impact of an 8-week MBSR intervention on pain and physical function in older adults with chronic low back pain. Compared to an 8-week Health Education Class. Older adults (65 years and older) living in the community with pain for at least 3 months. Outcomes: pain severity; disability/physical function; physical performance; psychosocial function (including mindfulness &amp; QoL); sleep; pain-related appetite reduction; medication use. Time-points: prior to starting and immediately after completion of program; and at 6 months follow up.</td>
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<td>C13</td>
<td>Mindfulness-Based Stress Reduction Program as an Intervention in Patients With Fibromyalgia</td>
<td>University Hospital Freiburg; Samuelle Institute for Information Biology</td>
<td>RCT (active, n = 180) to determine the efficacy of MBSR for women with fibromyalgia. Compared to an active control and wait-list control. Women (18-70 years old) diagnosed with fibromyalgia. Outcomes: FIQ; Biobehavioral Fibromyalgia Index; QoL (PLC); Pain sensation (SES); Depression (ADS); Anxiety (STAI-G); Quality of Sleep (SF-B); Mindfulness (FMI); Concomitant therapies; Compliance; Autonomic regulation; Physical activity measures; Sleep related measures. Time-points: start and end of training, 4- and 12-months post-treatment.</td>
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<tr>
<td>C14</td>
<td>Feasibility of Mindfulness Meditation for Adults 65+ With Chronic Low Back Pain</td>
<td>University of Pittsburgh</td>
<td>Pilot RCT (active, n = 37) to determine the feasibility of an 8-week Mindfulness based stress reduction program (involving mindfulness meditation) for patients with chronic low back pain. Compared to wait-list control. Older adults (65 years and older) attending a chronic pain clinic with pain lasting at least 3 months. Outcomes: Pain; Mood; Physical function; Attention; QoL. Time-points: not stated</td>
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C15 Massage, Meditation, and Tai Chi for Chronic Lower Back Pain

http://ClinicalTrials.gov/show/NCT0070915

National Center for Complementary and Alternative Medicine (NCCAM) 2000-2003

Pilot RCT (active, n = 120) to examine the effectiveness of Tai Chi, meditation (MBSR program) and therapeutic massage for adults with chronic low back pain, compared to usual care.

Adults (20 years and older?) with chronic low back pain.

Outcomes: not stated.

Time-points: not stated.

SECTION D – PRIMARY RESEARCH

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<th>Title</th>
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<th>Methodology/Comments</th>
<th>Summary</th>
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<tr>
<td>Ando, Morita, Akechi, Ito, Tanaka, Ifuku &amp; Nakayama (2009). The efficacy of mindfulness-based meditation therapy on anxiety, depression, and spirituality in Japanese patients with cancer.</td>
<td>Cohort study. 28 Japanese patients receiving anti-cancer treatment who underwent mindfulness-based meditation therapy.</td>
<td>To assess the efficacy of mindfulness-based meditation therapy (modified MBSSR intervention) on depression, anxiety, spiritual well-being, appreciation, growth, pain and symptoms. Outcomes: HADS and FACIT-Sp (Japanese versions), Caregiving Consequence Inventory, Benefit Finding Scale, and VAS (0-10) for pain and various symptoms (including nausea, constipation, fatigue and sleep disturbance). Time-points: pre- and post-intervention.</td>
<td>There were significant decreases in HADS scores post-intervention, but no significant change in spiritual well-being. Furthermore spiritual well-being correlated negatively with HADS ($r = -0.78, p&lt;0.001$), growth ($r = -0.35, p = 0.04$) and pain ($r = -0.41, p = 0.02$), and positively with growth and appreciation ($r = 0.45, p = 0.009$). Concludes that mindfulness-based meditation therapy may be effective for Japanese cancer patients to aid with depression and anxiety, additionally, that spiritual well-being is associated with pain, growth, anxiety and depression. The negative correlation between spiritual well-being and growth contradicts previous studies and further studies to investigate the underlying mechanism is suggested.</td>
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<td>Astin, Berman, Bausell, Lee, Hochberg &amp; Forsy (2003). The efficacy of mindfulness meditation plus Qigong movement therapy in the treatment of fibromyalgia: a randomized controlled trial.</td>
<td>RCT. 128 individuals with diagnosis of fibromyalgia randomly assigned to an 8-week mindfulness and Qigong intervention for individuals with fibromyalgia.</td>
<td>To evaluate the short- and long-term effects of an 8-week mindfulness and Qigong intervention for individuals with fibromyalgia. Outcomes: disability (FIQ), pain, depression, Total Myalgic Score, 6-minute walk test and coping strategies. Time-points: baseline, 8, 16 and 24 weeks.</td>
<td>Both groups showed significant improvements with time for FIQ, Total Myalgic Score, pain and depression, but no change in distance traversed in 6-minutes. No significant differences between groups were observed. Concludes that an 8-week mindfulness meditation with Qigong movement intervention for fibromyalgia was not superior to education and support. Thus, further RCTs required before such interventions may be recommended for treatment of fibromyalgia.</td>
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<td>Branstetter-Rost, Cushing &amp; Douleh (2009). Personal values and pain tolerance: does a values intervention add to acceptance?</td>
<td>RCT. 99 health individuals (students) randomised to receive ACT intervention with (n = 34) and without a values component (n = 30), or control condition (n = 35).</td>
<td>To compare ACT-based acceptance interventions with and without the values component in individuals undergoing cold-pressor task. Outcomes: pain tolerance, severity and threshold; COPE; White Bear Suppression Inventory; Acceptance and Action Questionnaire; Valued Living Questionnaire.</td>
<td>Both ACT groups exhibited greater pain tolerance than controls; however, pain severity was lower for the control group, whilst the remaining variables including pain thresholds were similar across the 3 groups. Concludes that the study supports the importance of values in acceptance based interventions e.g. ACT, which may be of benefit for directing interventions for chronic pain conditions.</td>
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<td>Brown &amp; Jones (in press). Meditation experience predicts less negative appraisal of pain: Electrophysiological evidence for the involvement of anticipatory neural responses.</td>
<td>Controlled study. 27 healthy, right-handed participants. 12 had experience of meditation (6 female, 6 male; mean age 37±13 years) of which 5 practiced mindfulness meditation; the remaining 15 had no meditation experience (8 female, 7 male; mean age 32±14 years).</td>
<td>To explore affective appraisal of pain in experienced meditators and controls subjected to laser stimuli (of matched subjective intensity between groups). Outcomes: anticipatory and pain-evoked event-related potentials (ERP), and pain unpleasantness.</td>
<td>No significant differences in the laser energies used to induce pain were revealed between the two groups. Experienced meditators perceived pain as less unpleasant compared to controls, with experience correlating inversely with unpleasantness rating. They exhibited lower midcingulate cortex activity compared to controls which was associated to lower unpleasantness rating and was predicted by lifetime meditative experience. Additionally meditators show a reversal in the normal positive correlation between medial pre-frontal cortical activity and pain unpleasantness during anticipation; and lower S2 and insular activity during the pain evoked response. Concludes these findings are consistent with the hypothesis that meditation reduces anticipation and negative appraisal of pain, but the effect on pain-evoked activity remains unclear. The need for studies to directly examine the relationship between meditation, pain anticipation and experience are highlighted.</td>
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<td>Carmody &amp; Baer (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program.</td>
<td>Cohort study. 174 adults on an 8-session MBSR program for stress-related problems, illness, anxiety and chronic pain.</td>
<td>To explore the relationship between home practice of mindfulness meditation exercises and mindfulness, medical &amp; symptoms (medical and psychological), perceived stress, and psychological well-being. Outcomes: mindfulness, perceived stress, symptoms, well-being and home-practice monitoring. Time-points: pre- and post-MBSR</td>
<td>There were significant increases in mindfulness and well-being, and decreases in stress and symptoms post-MBSR compared to pre-MBSR measures. Moreover, extent of improvement in most components of mindfulness, several symptom measures and well-being were significantly associated with time spent engaging in formal meditative practice at home. Formal mindfulness practice and it relationship to improvement in psychological functioning were mediated by increases in mindfulness. Thus, it is suggested that mindfulness meditation elicits an increase in mindfulness which consequently leads to a reduction in symptoms and improvement in well-being.</td>
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<td>Chang, Palesh, Caldwell, Glasgow, Abramson, Luskin, Gill, Burke &amp; Koopman (2004)</td>
<td>Cohort study. 8-week MBSR intervention.</td>
<td>To determine the effect of an MBSR intervention on pain, mindfulness self-efficacy, positive states of mind and stress. Time-points: pre- and post-MBSR intervention.</td>
<td>Following the MBSR intervention mindfulness self-efficacy and positive states of mind were significantly increased, whereas stress levels were significantly lower. Concludes that MBSR has a potential in stress management, attention and awareness training and for encouraging positive states of mind. Nb: Full article could not be accessed to retrieve more detailed information.</td>
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<td>Cho, Heiby, McCracken, Lee &amp; Moon (2010)</td>
<td>Retrospective cross-sectional study.</td>
<td>To explore the mediating role of pain-related anxiety between mindfulness and physical/psychosocial functioning in adults with chronic pain. Outcomes: Korean versions of the Pain Anxiety Symptoms Scale-20, MAAS and SF-36.</td>
<td>Structural equation analysis, chi-squared tests and bootstrapping procedures were used to explore partial and full-meditation models. The findings suggest that mindfulness might indirectly lead to decreased disabling influences of pain-related anxiety, thus enabling better physical and psychosocial functioning, rather than having a direct influence on functioning. Concludes benefits from mindfulness may derive from processes of mindfulness interacting with processes of avoidance and cognitive effects on emotional suffering.</td>
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<td>Cusens, Duggan, Thorne &amp; Burch (2010)</td>
<td>Controlled study. Study 1: Pilot.33 patients attending a Breathworks (mindfulness-based) Pain Management Programme, 20 patients undergoing treatment as usual in an outpatient pain clinic. Study 2: 12 patients from the Breathworks programme, 18 patients undergoing treatment as usual. All participants in Study 2 had participated in Study 1.</td>
<td>To investigate effect of Breathworks pain management programme on well-being. Outcomes: DAPOS, CPAQ, PSEQ, PCS, SF-35, pain intensity. Time-points: pre- and post-intervention (mean interval 10 weeks). Study 2: To determine the impact of Breathworks programme on mindfulness. Outcomes: MAAS, CPT, IAT effect, Explicit affect (pleasant-unpleasant). Time-points: as Study 1.</td>
<td>Study 1 Depression, outlook, catastrophizing and pain self-efficacy was significantly improved in the Breathworks group, but no differences were observed in the comparison group. Notably, the effect size for pain acceptance was large. Concludes that this supports the short-term efficacy of Breathworks programme and reinforces the important role of acceptance for positive outcomes in patients with chronic pain. Study 2 Self-reported mindfulness markedly increased following Breathworks but not after usual care. No significant change in sustained attention was seen in either group. It is suggested that implicit measures of affect indicate an increased awareness of positive stimuli following Breathworks intervention only. Concludes that these studies highlight the short-term benefits of Breathworks, however, further studies are needed to assess its long-term efficacy.</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention</td>
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<tr>
<td>Dahl, Wilson &amp; Nilsson (2004).</td>
<td>Pilot RCT</td>
<td>19 participants (17 women, 2 men; mean age 40±13.2[sd] years) randomly assigned to medical treatment as usual without (n=8) or with (n=11) additional brief ACT intervention (1-hour session weekly for 4 weeks)</td>
<td>To investigate the effect of brief ACT intervention for treatment of public health sector workers exhibiting chronic stress/pain considered at risk for high sick leave utilization.</td>
</tr>
<tr>
<td>Elomaa, de C Williams &amp; Kalso (2009).</td>
<td>Pilot cohort study.</td>
<td>Participants undergoing 6 weekly 90-min sessions of CBT attention management (included mindfulness exercises).</td>
<td>To determine the effect of attention management in the treatment of chronic pain.</td>
</tr>
<tr>
<td>Ernst, Welke, Heintze, Gabriel, Zollner, Kiehne, Schwantes &amp; Esch (2008).</td>
<td>Feasibility controlled study.</td>
<td>22 nursing home residents in Germany: 15 attended 8-week MBSR course, 7 untreated.</td>
<td>To investigate an MBSR programme on elderly residents in a nursing home.</td>
</tr>
<tr>
<td>Gardner-Nix, Backman, Barbati &amp; Grummitt (2008).</td>
<td>Controlled study.</td>
<td>Patients with chronic pain undergoing a Mindfulness-based chronic pain management course (2 hours a week over 10 weeks): either face-to-face (n=99), or via video-conferencing (n=57), and waitlist controls (n=59).</td>
<td>To determine the effectiveness of delivering a distance mindfulness-based meditation programme.</td>
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</table>

Controlled study. Experienced Zen meditators ($n = 13$) and age/gender-matched controls ($n = 13$), subjected to thermal stimuli to elicit moderate calf pain.

To investigate pain perception and analgesic effects of mindful states in experienced Zen meditators. Experimental interventions included concentration and mindfulness conditions.

Outcomes: Five Factor Mindfulness Questionnaire, pain intensity and unpleasantness.

Meditators required significantly greater temperatures to elicit pain than controls ($p = 0.01$).

Controls showed increased pain intensity under the concentration condition but no change from baseline when mindful. In contrast, meditators showed no change from baseline under the concentration condition but decreased pain intensity whilst attending mindfully. Generally, parallel changes were seen in pain unpleasantness measures.

Pain modulation correlated significantly with respiratory rate and meditation experience in meditators. Whilst covariance analysis revealed mindfulness-related changes were in part explained by changes respiration rates. Meditators reported greater tendency to observe and be non-reactive to experiences: these correlated to inter-individual variation in respiration.

Concludes Zen meditators show low pain sensitivity and experience analgesic effects during mindful states, this may reflect cognitive/self-regulatory skills related to mindfulness or altered respiratory rates. Highlights the need for studies to investigate effects of meditative training and respiration on pain regulation.

Grant, Courtemanche, Duerden, Duncan & Rainville (2010). Cortical thickness and pain sensitivity in Zen meditators.

Controlled study. 17 Zen meditators and 18 control participants who underwent structural MRI brain scans.

To explore whether differences in brain morphometry are associated with low pain sensitivity of Zen practitioners.

Outcomes: temperature needed to produce moderate pain.

Zen meditators had significantly lower pain sensitivity than controls. Lower pain sensitivity was associated with thicker cortex in affect, pain related regions of the brain including the anterior cingulated cortex, bilateral parahippocampal gyrus and anterior insula. Zen meditators had significantly thicker cortex in the dorsal anterior cingulated and bilaterally in secondary somatosensory cortex. Thicker gray matter in the anterior cingulated was associated with years of meditation experience, whilst amount of gray matter in the lower leg area of the primary somatosensory cortex and hand area in the right hemisphere was predicted by hour of meditation experience.

Concludes results suggest pain sensitivity is related to cortical thickness in pain-related areas of the brain, with lower pain sensitivity of meditators potentially the result of morphometric alterations over long-term practice.


Controlled study. 58 women (mean age 52 ± 8 years) assigned to receive an 8-week MBSR programme or active social support.

To evaluate the effectiveness of MBSR in the treatment of fibromyalgia.

Outcomes (all validated German inventories): Pain (VAS), pain perception, coping with pain, QoL and symptom checklist.

Time-points: pre- and post-intervention; also a 3-year follow up (subgroup $n = 26$).

MBSR provided significantly greater post-intervention improvement in pain, QoL, coping with pain, anxiety, depression and somatic complaints compared to controls (effect size 0.4-1.10). Improvement was sustained at 3-years for MBSR participants.

Concludes MBSR has potential long-term benefits for women with fibromyalgia.
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention</th>
<th>Outcomes</th>
<th>Findings</th>
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<tr>
<td>Gutierrez, Luciano, Rodriguez &amp; Fink (2004).</td>
<td>RCT</td>
<td>40 participants randomly allocated to receive an acceptance-based or cognitive-based protocol whilst undergoing a nonsense-syllables-matching task involving exposure to increasingly painful shocks.</td>
<td>To compare acceptance-based and cognitive-based interventions for coping with experimentally induced pain.</td>
<td>Participants in the acceptance-based protocol attained significantly greater tolerance to pain, and lower believability of pain experience compared to the cognitive-based (control) protocol.</td>
<td>Nb: Abstract indicates conceptual implications are discussed.</td>
</tr>
<tr>
<td>Johnston, Foster, Shennan, Starkey &amp; Johnson (2010).</td>
<td>RCT</td>
<td>14 participants randomized to ACT-based self-help book (n = 6) or waitlist control (n = 8) for 6 weeks. Subsequently, 5 waitlist controls completed the ACT-based intervention.</td>
<td>To assess the effectiveness of ACT based self-help book for individuals with chronic pain.</td>
<td>Participants completing the self-help book had improved QoL and decreased anxiety compared to controls. When data from all participants who completed the self-help book were pooled statistically significant improvements, with large effect size, were revealed for QoL, acceptance, satisfaction with life and values illness, and medium effect size for improvement in pain ratings was found. Concludes that a self-help book, with minimal therapist intervention, can add value to people’s lives.</td>
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<tr>
<td>Karp, Shega, Morone &amp; Weiner (2008).</td>
<td>Pilot cohort study.</td>
<td>Older adults (65-77 years) with chronic low back pain who underwent mindfulness meditation.</td>
<td>Outcomes: physical function, acceptance of pain, engagement in daily activities.</td>
<td>Results showed mindfulness meditation significantly improved self-reported physical function, acceptance of pain and engagement in daily activities in older adults with chronic low back pain.</td>
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<tr>
<td>Kingston, Chadwick, Meron &amp; Skinner (2007).</td>
<td>Pilot RCT.</td>
<td>42 asymptomatic university students. Participants were randomized into 6 x 1 hour mindfulness sessions or 2 x 1 hour guided visual imagery sessions (control). Both groups provided with CDs and encouraged to practice daily</td>
<td>To explore the effect of mindfulness training on pain tolerance, physiological activity, psychological well-being and acquisition of mindfulness skills.</td>
<td>There was a significant increase in pain tolerance following the mindfulness intervention only. Mindfulness skills increased in the mindfulness intervention (but not statistically significant), but this was not associated with increased pain tolerance. Both groups exhibited a significant decrease in diastolic blood pressure post intervention. Concludes mindfulness training increases pain tolerance, but this is not due acquisition of mindfulness skills.</td>
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<tr>
<td>Reference</td>
<td>Type</td>
<td>Description</td>
<td>Findings/Summary</td>
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<tr>
<td>Kleen &amp; Jaspers (2007).</td>
<td>Case study</td>
<td>40 year old woman with chronic low back pain who underwent ACT.</td>
<td>ACT treatment was beneficial in this case affecting both the psychological and behavioural functioning of the women. Abstract indicates the use of ACT for chronic pain disorders is discussed. Little detail available in the English abstract.</td>
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<tr>
<td>Lachapelle, Lavoie &amp; Boudreau (2008).</td>
<td>Qualitative, focus groups.</td>
<td>11 focus groups comprising of 45 women with fibromyalgia and arthritis.</td>
<td>To explore definitions of acceptance and factors affecting acceptance. On the whole women rejected the term ‘acceptance’ but agreed with recent research identifying key components of current definitions. Acceptance was identified as a process of realizations and acknowledgements including the need to redefine ‘normal’. Factors promoting acceptance included diagnosis, social support, education and self-care, whilst those factors hindering acceptance included trying to maintain pre-pain identity, negative effects on relationship, and non-acceptance by others. These findings have implications for how the process of facilitation can be facilitated.</td>
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<tr>
<td>Lunde &amp; Nordhus (2009).</td>
<td>Case study</td>
<td>Older adult with chronic pain receiving 8-weeks of combined CBT and ACT.</td>
<td>To examine the effectiveness of ACT combined with CBT for the treatment of chronic pain in older adults. The brief intervention resulted in a clinically significant change in pain experience, and increases in pain acceptance, and sleep maintenance and quality. Concludes that mindfulness (a central component of ACT) and a values focus may contribute to efficacy of CBT for chronic pain conditions. Nb: unable to obtain full text for more details.</td>
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<tr>
<td>Lush, Salmon, Floyd, Studts, Weissbecker &amp; Sephton (2009).</td>
<td>Cohort study</td>
<td>24 women with fibromyalgia who underwent MBSR to treat symptoms.</td>
<td>To explore the relationship between MBSR and basal sympathetic activation in women with fibromyalgia. Outcomes: anxiety, depressive symptoms and basal sympathetic activation. Time-points: pre- and post-MBSR. MBSR treatment resulted in significant reductions in basal electrodermal activity and skin conductance level activity during meditation: these are consistent with reduction in basal sympathetic activation. Concludes that MBSR reduced basal sympathetic activation. Further studies are suggested to assess how MBSR may affect negative psychological symptoms and increase SNS activation in fibromyalgia.</td>
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<tr>
<td>McBee, Westreich &amp; Likourezos (2004).</td>
<td>Cohort study</td>
<td>Members (n = ?) of a 514-bed academic nursing home who took part in a psychoeducational group therapy programme (modelled on MBSR) for chronic pain, anxiety and distress.</td>
<td>To assess the effectiveness of a psychoeducational programme for chronic pain, anxiety and distress in nursing home residents. Outcomes: Coop scales for emotional well-being and level of pain. Time-points: pre- and post- Residents attending the programme felt significantly less sad (p&lt;0.001), with a tendency towards feeling less pain (p=0.094). Nb: unable to obtain full text for more details.</td>
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<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Study Design</td>
<td>Participants</td>
<td>Outcome Measures</td>
<td>Findings</td>
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<tr>
<td>McCracken, Gauntlett-Gilbert &amp; Vowles</td>
<td>2007</td>
<td>Cohort study (cross-sectional)</td>
<td>105 patients with chronic pain, attending clinical assessment for treatment.</td>
<td>To examine the relationship between mindfulness and pain, emotional, physical and social functioning in adults with chronic pain. Outcomes: MAAS, CPAQ, Pain Anxiety Symptoms Scale, Sickness Impact Profile.</td>
<td>Correlation analysis showed: no relationship between mindfulness and age, gender, education or chronicity of pain; significant association between mindfulness and multiple measures of patient functioning. Multiple regression analyses, controlling for patient background variables, pain intensity and pain-related acceptance, revealed mindfulness accounted for significant variance in depression, pain-related anxiety, and physical, psychosocial and “other” disability. In all cases greater mindfulness was associated with greater functioning.</td>
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<tr>
<td>McCracken &amp; Keogh</td>
<td>2009</td>
<td>Cohort study (cross-sectional)</td>
<td>125 consecutive adults (64.8% women) seeking speciality pain services.</td>
<td>To investigate the role of anxiety sensitivity in the context of fear/distress and avoidance in individuals with chronic pain. In addition to explore therapeutic processes (i.e. acceptance, mindfulness and values) to reduce emotion avoidance and anxiety sensitivity. Outcomes: Anxiety Sensitivity Index, British Columbia-Major Depression Inventory, CPAQ, Chronic Pain Values Inventory, MAAS, Pain Anxiety Symptoms Scale, Sickness Impact Profile.</td>
<td>Correlation and regression analyses found anxiety sensitivity was associated with increased pain, distress and disability. Furthermore, when acceptance, mindfulness and values were accounted for, anxiety sensitivity alone was weakly associated with patient functioning. It is suggested that anxiety sensitivity amplifies the impact of distress on functioning in chronic pain, and that acceptance, mindfulness and values-based action may ameliorate the effect. Concludes that individuals with chronic pain experience more distress and disability when they exhibit greater fear of anxiety symptoms, however, this may be reduced by behavioural patterns of acceptance and mindfulness.</td>
</tr>
<tr>
<td>McCracken &amp; Thompson</td>
<td>2009</td>
<td>Cohort study (cross-sectional)</td>
<td>150 consecutive patients (64% women) seeking treatment for chronic pain. Mean age of 46.7 ± 13.4 (sd) years.</td>
<td>To examine the behavioural and cognitive processes underlying mindfulness. Outcomes: MAAS, British Columbia-Major Depression Inventory, Pain Anxiety Symptoms Scale, Sickness Impact Profile. (In addition: rating of pain, pain-related distress, estimates of daily uptime and medications taken.)</td>
<td>The reliability and validity of MAAS was supported for patients with chronic pain. Exploratory factory analysis provided a 4-factor structure for the items of MAAS: Acting with awareness; Present focus; Responsiveness; and social awareness. Correlation and regression analysis indicated Acting with awareness and Present focus subscales were significantly associated with measures of physical, emotional and social functioning in patients. Highlights the need for further studies to explore and validate models of mindfulness-based processes.</td>
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<tr>
<td>McCracken &amp; Velleman</td>
<td>2010</td>
<td>Cohort study (cross-sectional)</td>
<td>239 patients with chronic pain surveyed in primary care.</td>
<td>To investigate ‘psychological flexibility’ in patients with chronic pain accessing primary health care. Outcomes: CPAQ, MAAS, Acceptance and Action Questionnaire, Chronic Pain Values Inventory, SF-36, GP visits</td>
<td>Significant correlations were found between psychological flexibility components and measures of health and GP visits. Regression analyses revealed that pain intensity and psychological flexibility as predictors accounted for significant variation in health outcomes, 9.2% and 24.1% of variance respectively. Concludes that psychological flexibility may reduce impact of chronic pain in patients outwith specialist care. It was noted, however, that due to low response rates during recruitment to the study, generalisability remains unclear.</td>
</tr>
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</table>

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<p>| McCracken &amp; Vowles (2008). A prospective analysis of acceptance of pain and values-based action in patients with chronic pain. | Prospective cohort study. 115 patients (56.5% women) with chronic pain, attending an assessment and treatment course. | To investigate the effect of pain acceptance and values-based action on physical, emotional and social functioning in individuals with chronic pain. Outcomes: CPAQ, Chronic Pain Values Inventory, Pain Anxiety Symptoms Scale, British Columbia Major Depression Inventory, Sickness Impact Profile. Time-points: baseline &amp; follow-up (average 18.5 weeks later) | Correlations analysis found significant associations between baseline measures of acceptance of pain and values-based action and follow-up measures of pain, pain-related anxiety, distress and avoidance, depression, depression-related interference with functioning and physical and psychosocial disability. Multiple regression analysis, controlling for pain and background patient variables, revealed combined pain acceptance and values-based action accounted for 6.5-27% of the variance of 6 key measures of patient functioning at follow up. Concludes that this study highlights the importance of acceptance and values-based processes in the context of chronic pain. Thus supporting the functional contextual model of psychopathology (that underlies ACT and related approaches such as contextual CBT). |
| McCracken &amp; Vowles (2007). Psychological flexibility and traditional pain management strategies in relation to patient functioning with chronic pain: an examination of a revised instrument. | Cohort study (cross-sectional) 260 consecutive adult patients (64.6% women) seeking treatment for chronic pain. | To explore facets of ‘psychological flexibility’ in patients with chronic pain. Outcomes: Brief Pain Coping Inventory-2, CPAQ, Pain Anxiety Symptoms Scale, MAAS, British Columbia Major Depression Inventory, Sickness Impact Profile. Also general personal characteristics, work status, current pain medications, ratings of pain and pain-related distress (VAS 0-10), number of GP, specialist, and emergency department visits over the past 6 months related to pain, average daily uptime and medication. | Regression analyses, controlling for patient characteristics and pain, revealed psychological flexibility accounted for significant variance in 8 functioning measures, whilst pain management was not a significant predictor of any measure. Concludes that psychological flexibility which consists of mindfulness, acceptance, values-based action and cognitive defusion, significantly effects patient functioning with chronic pain. Thus, it is suggested a shift in focus with regards to approaches to chronic pain is needed. |
| McCracken, Vowles &amp; Eccleston (2005). Acceptance-based treatment for persons with complex, long standing chronic pain: a preliminary analysis of treatment outcome in comparison to a waiting phase. | Cohort study 108 chronic pain (&gt;3 months) patients undergoing an ACT-based 4-week residential (n =86) or 3-week hospital-based (n =32) treatment program (including mindfulness meditation). 64.2% women. Mean age = 44.4±10.7 (sd) years. | To evaluate an acceptance-based approach to chronic pain within a multidisciplinary programme. Outcomes: Beck Depression Index, Pain Anxiety Symptoms Scale, Sickness Impact Profile, CPAQ, Timed 10-minute walk, sit-to-stand, demographic information, pain-related variables, medication, healthcare use. Time-points: initial assessment, pre- and post-treatment, and 3 month follow up. | 84 participants completed 3-month follow up. Significant improvements were observed for physical, emotional and social functioning, and healthcare use following treatment. Furthermore, the improvements were maintained at 3-month follow up in a majority of cases. The improvements seen after treatment were significantly correlated with increased acceptance. |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Research Design</th>
<th>Participants</th>
<th>Intervention</th>
<th>Outcomes</th>
<th>Findings/Implications</th>
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<tbody>
<tr>
<td>Morone, Greco &amp; Weiner (2008)</td>
<td>Pilot RCT</td>
<td>37 community living older adults (≥65 years old, 57% female) with chronic low back pain. Randomized to receive 8-week mindfulness meditation program, or waiting list control. Mean age 74.9 years</td>
<td>To evaluate feasibility of an 8-session mindfulness meditation program in community-living older adults with chronic low back pain. Outcomes: CPAQ, SF-36, attendance. Time-points: pre- and post-intervention</td>
<td>30 participants (81%) completed 8-week assessments. Mean class attendance was 6.7 (of 8), meditating an average of 4.3 days a week, for an average 31.6 minutes a day. The intervention group showed significant improvement in CPAQ total score ($p=0.008$) and activities engagement subscale ($p=0.004$) and SF-36 physical function ($p=0.03$). Concludes an 8-week mindfulness-based meditation program is feasible for older adults with chronic low back pain, living in the community.</td>
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<tr>
<td>Morone, Lynch, Greco, Tindle &amp; Weiner (2008). I felt like a new person. the effects of mindfulness meditation on older adults with chronic pain: qualitative narrative analysis of diary entries.</td>
<td>Qualitative (interviews)</td>
<td>27 community-dwelling older adults (≥65 years old) with chronic low back pain who participated in a 8-week mindfulness meditation program (see above).</td>
<td>To explore the effects of a mindfulness meditation program on older adults with chronic low back pain.</td>
<td>Older adults with chronic low back pain reported numerous benefits from mindfulness meditation including reduced pain, improved attention and sleep (quality and latency), enhanced well-being and quality of life. Highlights the need for future research to determine the mechanisms underlying mindfulness meditation’s effects.</td>
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<tr>
<td>Morone, Rollman, Moore &amp; Weiner (2009). A mind-body program for older adults with chronic low back pain: results of a pilot study.</td>
<td>RCT.</td>
<td>40 community-living older adults with chronic low back pain. Randomized to receive an 8-week mindfulness meditation intervention or 8-week education control programme.</td>
<td>To evaluate the effect of an 8-week mindfulness meditation program on disability, psychological function and pain severity in older adults with chronic low back pain. Outcomes: disability, psychological function, pain severity. Time-points: baseline, post-intervention and 4-month follow up.</td>
<td>16 adults (80%) completed the mindfulness intervention, whereas 19 participants (95%) completed the education program. Both groups showed significant improvements in disability, pain and psychological function immediately following completion of the programmes and at 4-month follow up. No significant differences between the two programmes were identified. At 4 months 88% of participants continued with meditation. Concludes that both the intervention and control programme had beneficial effects on older adults with chronic low back pain. Hence, the control group whilst feasible was not inert: this can inform future clinical trials.</td>
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<tr>
<td>Páez-Blarrina, Luciano, Gutierrez-Martinez, Valdivia, Ortega &amp; Rodriguez-Valverde (2008). The role of values with personal examples in altering the functions of pain: comparison between acceptance-based and cognitive-control-based protocols.</td>
<td>RCT</td>
<td>30 adults (undergraduate students, 21 women) randomly assigned to pain acceptance, pain control or no values conditions. Mean age 22.67 (range 18-31) years.</td>
<td>To compare the effect of providing a motivational context of values on pain: pain acceptance (ACT), pain control (CONT) and no values. Further to isolate the impact of adding coping strategies to ACT (i.e. defusion) and CONT (i.e. suppression) conditions. Outcomes: pain tolerance, self-reported pain, pain believability. Time-points: test 1 (effects of ACT-values, CONT-values and no-values protocol) and test 2 (protocol + coping strategy)</td>
<td>Test 1 revealed ACT-values protocol superior to both CONT-values and no-values with regards to increased tolerance and lower pain believability. Test 2 revealed ACT-values + coping strategy to be superior to both other conditions, however, the CONT protocol also showed decrease in pain.</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Participants</td>
<td>Intervention</td>
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<tr>
<td>Pradhan, Baumgarten, Langenberg, Handwerfer, Gilpin, Magyari, Hochberg &amp; Berman (2007). Effect of Mindfulness-Based Stress Reduction in rheumatoid arthritis patients.</td>
<td>Pilot RCT</td>
<td>63 patients with RA randomized to receive 8-weeks MBSR + 4-month maintenance programme (n=31) or waitlist control (n=32).</td>
<td>To assess the effectiveness of MBSR on depressive symptoms, psychological status and disease activity in patients with RA.</td>
<td>At two months no significant differences in outcomes were observed between the two groups, however, at 6 months the MBSR group showed significantly greater improvement in psychological distress (p&lt;0.04) and well-being (p&lt;0.03), with a greater tendency for improvement in depressive symptoms (p&lt;0.08) and mindfulness (p&lt;0.09). Those treated showed a 35% reduction in psychological distress, but there was impact of the intervention on RA activity. Concludes mindfulness meditation may be beneficial as an adjunct to medical disease management through improving psychological distress and well-being.</td>
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<tr>
<td>Plews-Ogan, Owens, Goodman, Wolfe &amp; Schorling (2005). A pilot study evaluating mindfulness-based stress reduction and massage for the management of chronic pain.</td>
<td>Pilot RCT</td>
<td>30 patients (23 female) with chronic MSK pain randomized to receive MBSR, massage or treatment as usual.</td>
<td>To determine the feasibility of studying MBSR and massage for managing chronic pain, and establish their effect on pain and mood.</td>
<td>76.7% of participants completed the study. At week 8 the massage group showed significantly greater change in pain unpleasantness (p&lt;0.05) and mental health status (p&lt;0.04) compared with the standard care group, but this difference was not apparent at week 12. The MBSR groups showed no significant differences in pain outcomes, although the mean change in mental health status was significantly greater than in the standard care group (p&lt;0.04). Concludes that it is feasible to study massage and MBSR interventions in chronic MSK pain conditions. Furthermore, MBSR may have long-term benefit on mood, whereas massage may have greater benefit for pain reduction.</td>
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<tr>
<td>Perlman, Salomons, Davidson &amp; Lutz (2010). Differential effects on pain intensity and unpleasantness of two meditation practices.</td>
<td>Cohort study. Long-term meditators and novices subjected to noxious thermal stimuli whilst practising focused attention or open monitoring meditation.</td>
<td>To compare the regulatory qualities of two meditative practices during noxious thermal stimuli: Focused attention and Open monitoring.</td>
<td>Outcomes: pain unpleasantness, pain intensity.</td>
<td>Compared to novices, experienced meditators showed significant reduction in unpleasantness of pain during open monitoring, but no difference in pain intensity was found. No significant effects of focused attention were found. Concludes these findings may help indentify the regulatory mechanisms underpinning meditation-based clinical interventions such as MBSR. Nb: unable to access full text for more details</td>
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</tr>
<tr>
<td>Páez-Blarrina, Luciano, Gutierrez-Martinez, Valdivia, Rodriguez-Valverde &amp; Ortega (2008). Coping with pain in the motivational context of values: comparison between an acceptance-based and a cognitive control-based protocol.</td>
<td>RCT 20 participants randomly assigned to acceptance based (ACT) or cognitive control-based (CONT) protocol.</td>
<td>To compare an acceptance based protocol (ACT) and cognitive control-based (CONT) protocol on coping with pain.</td>
<td>Outcomes: pain tolerance, self-report pain and pain believability. Time-points: pre- and post-test</td>
<td>Both protocols resulted in significant increase in pain tolerance and reduction in self-reported pain at post-test. However, participants of the acceptance-based protocol had significantly lower pain believability than the cognitive control-based group. Conceptual implications are discussed Nb: unable to access full text for more details</td>
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<tr>
<td>Study Authors</td>
<td>Design</td>
<td>Participants</td>
<td>Interventions</td>
<td>Outcomes</td>
<td>Results/Conclusion</td>
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<tr>
<td>Price, McBride, Hyerle &amp; Kivlahan</td>
<td>RCT</td>
<td>14 female veterans with PTSD and chronic pain taking prescription analgesics for chronic pain</td>
<td>Mindful awareness in body-oriented therapy for female veterans with post-traumatic stress disorder taking prescription analgesics for chronic pain: a feasibility study.</td>
<td>To explore the feasibility and acceptability of body-orientated therapy for female veterans with PTSD and chronic pain. Outcomes: N/K Time-points: baseline, post-intervention, 3-month follow-up</td>
<td>All participants attended at least 7 of 8 sessions and completed final post-treatment assessments, and 10 of 14 completed the 3-month follow up assessment. Results suggest increased pain relief/relaxation, increased body-mind connection and increased trust/safety. Concludes that such the implementation of such intervention is feasible, however, results indicate the need for longer session and a longer intervention period. Nb: full text could not be access for further details.</td>
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<tr>
<td>Reibel, Greeson, Brainard &amp; Rosenzweig</td>
<td>Cohort</td>
<td>136 patients participating in an 8-week MBSR programme and required to complete 20 minutes meditation daily</td>
<td>Mindfulness-based stress reduction and health-related quality of life in a heterogeneous patient population.</td>
<td>To examine effect of MBSR on a heterogeneous population. Outcomes: SF-36, Medical Symptoms Checklist and Symptom Checklist Time-points: Pre- and post-intervention, 1 year follow-up.</td>
<td>Post-intervention was associated with significant improvements in SF-36 i.e. health-related QoL, including vitality, bodily pain, limitations due to physical health and social functioning (all p&lt;0.01). In addition there were significant decreases in physical symptoms and psychological distress, anxiety and depression (all p&lt;0.0001). For some parameters, this was maintained at 1-year follow-up. Concludes group mindfulness meditation training can improve functional status and well-being, and reduce psychological distress and physical symptoms in a heterogeneous patient population: with the potential for long-term benefit.</td>
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<td>Roche, Forsyth &amp; Maher (2007)</td>
<td>RCT</td>
<td>20 undergraduate students (14 female) randomly assigned: acceptance rationale under high demand; acceptance rationale under low demand; control rationale under high demand, and control rationale under low demand. Mean age = 19.95 ± 2.35 years (sd).</td>
<td>The impact of demand characteristics on brief acceptance- and control-based interventions for pain tolerance.</td>
<td>To explore the effects of nonspecific source of therapeutic change in the context of ACT, by comparing effectiveness of acceptance-based and control-based interventions on pain tolerance (cold pressor task). Outcomes: Spielberger State-Trait Anxiety Inventory Form Y; felt pain, unpleasantness, and sensation (VAS 0-100). Time-points: baseline, immediately after and 10 minutes following one of two interventions.</td>
<td>Results revealed that the main factor affecting ability to withstand the cold pressor task was social pressure. The acceptance-based intervention was more subject to demand than the control-based intervention. Manipulation of demand did not affect pain ratings. Concludes that demand characteristics can have significant positive effects on outcomes of therapeutic protocols.</td>
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<td>Study</td>
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<td>Rosenzweig, Greeson, Reibel, Green, Jasser &amp; Beasley (2010).</td>
<td>Cohort study. 133 patients with chronic pain undergoing MBSR.</td>
<td>To explore the effect of MBSR on patients with chronic pain conditions. Outcomes: bodily pain, Health-related quality of life (SF-36), and psychological symptoms (Symptom Checklist-90-revised).</td>
<td>There was marked variation in magnitude and significance of changes in outcomes across different chronic pain conditions. Patients with arthritis, back/neck pain or two or more comorbid pain conditions exhibited significant improvements in pain intensity and functional limitations after MBSR. Patients with arthritis showed the greatest treatment effects for psychological distress and QoL. The smallest improvement in pain and QoL was seen in patients with chronic headache/migraine, with the smallest improvement in psychological distress observed in patients with fibromyalgia. An association was also established for the amount of home meditation undertaken and psychological distress, somatisation symptoms and self-rated health. Concludes that MBSR’s effect on pain, QoL and psychological well-being varies with chronic pain pathology and compliance with home meditation.</td>
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<td>Sagula &amp; Rice (2004).</td>
<td>Controlled study. 39 patients diagnosed with chronic pain receiving mindfulness training; 18 patients with chronic pain receiving medical assistance or on a waitlist.</td>
<td>To examine the effectiveness of an 8-week mindfulness meditation programme on pain-associated grief. Outcomes: Response to Loss Scale; Beck Depression Inventory, State Trait Anxiety Inventory. Time-points: pre- and post-intervention.</td>
<td>Patients undertaking mindfulness meditation advanced significantly quicker through the initial stages of grieving and showed significant reductions in anxiety and depression compared to the comparison group. However, no significant differences emerged on the final stages of grieving or trait anxiety.</td>
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<td>Sampalli, Berlasso, Fox &amp; Petter (2009).</td>
<td>Controlled study 76 women diagnosed with multiple chemical sensitivity, chronic fatigue syndrome and fibromyalgia which received a 10-week MBSR-based intervention (n=50) or waitlist control (n=26).</td>
<td>To investigate a MBSR programme on women diagnosed with multiple chemical sensitivity, chronic fatigue syndrome and fibromyalgia. Outcomes: Symptoms Checklist Inventory Time-points: pre- and post-intervention, and 3-month follow up.</td>
<td>There was a significant improvement in global scores for symptoms post-intervention which was maintained at follow up in the intervention group: the control group showed no change over time. Furthermore, post-intervention 5 of 9 subscales significantly improved, and at 3-month follow up 8 of 9 subscales were significantly improved over baseline for the intervention group. Concludes that this study highlights the importance of complementary interventions such as MBSR in reducing psychological distress in women with chronic conditions.</td>
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<td>Schutze, Rees, Preece &amp; Schutze (2010).</td>
<td>Cohort study (cross-sectional). 104 outpatients with chronic pain.</td>
<td>To explore the relationship between persistent pain and mindfulness in the context of the fear-avoidance model of chronic pain. Outcomes: MAAS, Five-Factor Mindfulness Questionnaire, pain intensity, negative affect, pain catastrophizing, pain-related fear, pain hypervigilance, functional disability.</td>
<td>Mindfulness significantly negatively predicts all variables investigated i.e. pain intensity, negative affect, pain catastrophizing, pain-related fear, pain hypervigilance, functional disability. Furthermore, hierarchical multiple regression revealed mindfulness predicts pain catastrophizing (when other variables are controlled) and moderates the relationship between pain intensity and catastrophizing. Concludes that this research shows a strong link between mindfulness and pain catastrophizing and consequently suggests the addition on mindfulness to the fear-avoidance model.</td>
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<td>Sephton, Salmon, Weissbecker, Ulmer, Floyd, Hoover and Studts (2007)</td>
<td>Mindfulness meditation alleviates depressive symptoms in women with fibromyalgia: results of a randomized clinical trial.</td>
<td>RCT 91 women with fibromyalgia randomized to receive an 8-week MBSR intervention ($n = 51$) or waitlist control. Mean age of 48 years (range 23-74).</td>
<td>To examine the effects of MBSR on depressive symptoms in women with fibromyalgia. Outcomes: Beck Depression Inventory, Fibromyalgia Impact Questionnaire, Stanford Sleep Questionnaire. Time-points: baseline, immediately post-intervention and 2 month follow up.</td>
<td>Depressive symptoms improved significantly in the treatment group compared to controls across the three time points. Concludes a mindfulness meditation intervention alleviates depressive symptoms in women with fibromyalgia.</td>
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<td>Smith, Shelley, Dalen, Wiggins, Tooley &amp; Bernard (2008)</td>
<td>A pilot study comparing the effects of mindfulness-based and cognitive-behavioral stress reduction.</td>
<td>Pilot controlled study. 50 community dwelling participants who underwent self-selected 8-week MBSR ($n = 36$) or 8-week cognitive behavioural stress reduction (CBSR) ($n = 14$) programmes.</td>
<td>To compare MBSR and CBSR. Outcomes: Binge Eating Scale, Beck Depression Inventory II, Energy level (VAS 0-100), MAAS, neuroticism, Pain level (VAS 0-100), Perceived Stress Scale and, Scales of Psychological Well-Being. Time-points: pre- and post-intervention</td>
<td>Participants who underwent MBSR showed significant improvements across all eight outcomes; those in the CBSR program improved significantly with regards to well-being, perceived stress and depression. Multivariate analysis revealed the MBSR group to have better outcomes across all variables compare to the CBSR group; whilst univariate analysis showed MBSR to have significantly better mindfulness, energy and pain outcomes. Concludes whilst both programs may be effective at reducing perceived stress and depression, MBSR may be more efficacious at improving mindfulness and energy whilst reducing pain. Highlights the need for further research to examine the differential effects of mindfulness-based and cognitive behavioural interventions.</td>
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<td>Sun, Kuo &amp; Chiu (2002)</td>
<td>Mindfulness meditation in the control of severe headache.</td>
<td>Case study Taiwanese male prone to severe headaches associated with activities requiring deep concentration.</td>
<td>N/A</td>
<td>Whilst initially mindfulness meditation induced headaches in this case, the man learnt to control both the pain and discomfort associate with headaches. Concludes that mindfulness meditation may be medically superior and cost-effective as an alternative to pain medication for headaches with no underlying organic cause. Highlights the need for the patient to be highly motivated.</td>
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**Cohort study**

114 patients with chronic pain (62.4% female) who completed a 3- or 4-week interdisciplinary treatment involving a form of ACT. To explore how changes in traditionally conceived coping strategies compare to changes in psychological flexibility in relation to functioning during an interdisciplinary pain treatment programme.

Outcomes: Brief Pain Coping Inventory-2, British Columbia Major Depression Inventory, Pain Anxiety Symptoms Scale-20, pain intensity, Sickness Impact Profile, pain-related medical visits, 2-minute walking distance, sit-to-stand. Time-points: pre- and post-intervention, and 3-month follow up

The two subscales of the Brief Pain Coping Inventory-2 (BPCI-2) significantly improved over the course of the intervention and follow-up, in addition all other outcomes significantly improved through follow-up. Changes in the Pain Management Strategies of the BPCI-2 were not associated with changes in any other outcome, however the Psychological flexibility subscale was significantly related to improvements at follow up in 7 of 8 outcomes (exception being depression). Concludes that psychological flexibility appears highly relevant to research into chronic pain and to future developments in its treatment.


**Cohort study**

171 patients (64.2% women) with chronic pain who completed a 3- or 4-week interdisciplinary treatment programme involving a form of ACT and mindfulness-based methods. 66.7% of participants completed a 3-month follow-up. Mean age 47.3±11.4 years

To evaluate the effectiveness of ACT for chronic pain and to investigate the processes of acceptance and values-based action.

Outcomes: pain intensity, prescribed medication, pain-related medical visits, work status, CPAQ, Chronic Pain Values Inventory, British Columbia Major Depression Inventory, Pain Anxiety Symptoms Scale-20, Sickness Impact Profile, 2-min walking task and sit-to-stand. Time-points: pre- and post-intervention and 3-month follow-up

Significant improvements were observed for a majority of outcomes, namely pain, depression, pain-related anxiety, disability, medical visits, work status and physical performances. In terms of effect-size these changes were of medium or large effect. Reliable change analysis revealed 75.4% of patients show improvement in at least one key domain. Acceptance of pain and values-based action also showed significant improvement, and were associated with improvements in the primary outcome domains.


**Pilot cohort study**

Study 1: 11 individuals (63.6% female, mean age = 49.5±6.9 [sd] years, average pain duration = 71.3 ± 49.4 [sd] months) receiving an ACT based protocol. Study 2: 11 veterans (18% female, mean age = 50.4±17.8 [sd] years) receiving group ACT (n=6) or group CBT (n=5).

To evaluate the effectiveness of ACT for chronic pain

Outcomes: CPAQ, McGill Pain Questionnaire-Short Form, Center for Epidemiological Studies – Depression Scale, Pain Anxiety Symptoms Scale-Short Form, Pain Disability Index. Time points: initial enrolment (Study 1 only), onset and post-intervention

Study 1: results suggest that significant variation across the three time points for acceptance, pain, depression and pain-related anxiety (all p<0.01). Effect sizes were small for pain-related anxiety, medium for disability and large for pain, acceptance and depression.

Study 2: results showed a significant improvement in acceptance and depression for both ACT and CBT interventions: with greater improvement for participants who underwent ACT. Furthermore, pain-related anxiety was significantly lower post-intervention for ACT compared to CBT. Effect sizes for ACT were large for depression, pain-related anxiety and disability, and medium for acceptance and pain: effect sizes for CBT were smaller than ACT except for acceptance were effect size was large. Concludes these support the feasibility of ACT treatment for chronic pain, with effectiveness comparable to established CBT treatments.
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<td>Weissbecker, Salmon, Studts, Floyd, Dedert &amp; Septon (2002). Mindfulness-based stress reduction and sense of coherence among women with fibromyalgia.</td>
<td>RCT. 91 women with fibromyalgia participating randomized to receive a MBSR programme or waitlist control.</td>
<td>To assess the capacity of Sense of Coherence (SoC) in buffering the effects of illness symptoms on psychological distress in patients with fibromyalgia. Outcomes: symptoms, stress and depression. Time points: baseline (prior to randomization), post-intervention.</td>
<td>At baseline SoC and symptoms were independently correlated to perceived stress and depression. SoC did not significantly moderate symptom effects on psychological distress. However, patients who received MBSR reported a significant increase in SoC compared to waitlist controls. Concludes that this study demonstrates that SoC may be enhanced by an intervention.</td>
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<td>Wicksell, Ahlqvist, Bring, Melin &amp; Olsson (2008). Can exposure and acceptance strategies improve functioning and life satisfaction in people with chronic pain and whiplash-associated disorders (WAD)? A randomized controlled trial.</td>
<td>RCT 21 patients with chronic pain and whiplash-associated disorders randomized to receive an intervention (10 1-hour sessions involving ACT, n=11) or to waitlist control (n=10).</td>
<td>To examine the effectiveness of treatments emphasising exposure and acceptance (e.g. ACT) in patients with chronic pain and whiplash-associated disorders. Outcomes: Pain Disability Index, SWLS, Tampa Scale of Kinesiophobia, Impact of Event Scale, HADS, pain intensity and pain interference. Time-points: baseline (1 week prior to treatment), after treatment, and 4 and 7 months after end of treatment.</td>
<td>One control withdrew from the study. Patients who underwent the intervention showed significant improvement in pain disability, satisfaction with life, fear of movements, depression and psychological inflexibility, compared to controls. No significant change was seen in either group regarding pain intensity. Improvements in the intervention group were maintained at 7-month follow-up. The need for further research was highlighted.</td>
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<td>Wong (2009). Effect of mindfulness-based stress reduction programme on pain and quality of life in chronic pain patients: a randomised controlled clinical trial.</td>
<td>RCT 100 patients with chronic pain (aged 18-65 years) randomized to receive MBSR or a multidisciplinary education intervention.</td>
<td>To compare the effectiveness of MBSR and an educational intervention. Outcomes: pain intensity, Dual visual analogue Sensation of Pain and Distress Scales, Profile of Mood States, Centre for Epidemiological Studies-Depression Scale and the State Trait Anxiety Inventory, SF-12. Time points: baseline, 8 weeks (end of intervention), 3 and 6 months.</td>
<td>Both groups showed significant improvement in pain intensity following treatment which was maintained at 6-month follow-up. Post-treatment improvements in both groups were also observed for SF-12 and anxiety, whilst no difference in depression across time was seen. The only significant difference between groups was observed immediately following the interventions for the Profile of Mood States activity sub-scale (this was not apparent at 3 and 6 months). Concludes that MBSR is effective as an intervention for adults with chronic pain, but is not superior to a multidisciplinary education program.</td>
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<td>Zautra, Davis, Reich, Nicassario, Tennen, Finan, Kratz, Parrish &amp; Irwin (2008).</td>
<td>RCT</td>
<td>144 patients with RA clustered into groups of 6-10 individuals and randomized to receive: CBT for pain, mindfulness meditation and emotion regulation therapy or education only.</td>
<td>To compare the CBT and mindfulness meditation on adaptation to RA for patients with and without recurrent depression. Daily diaries, laboratory assessment of pain, mitogen-stimulated levels of interleukin-6 (IL-6). Time-points: pre- and post-treatment</td>
<td>Patients receiving CBT for pain exhibited greatest improvement in pain control and reduction in IL-6, whilst those receiving CBT for pain or mindfulness meditation showed greater improvement in coping efficacy than those receiving education alone. Furthermore, the relative value of each treatment varied as a function of depression history: in particular, those patients with recurrent depression who underwent mindfulness meditation benefitted most across a number of outcomes including joint tenderness and negative and positive affect. Concludes that the emotional regulation aspects of mindfulness mediation were most beneficial for patients with chronic depressive features.</td>
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<td>Zautra, Fasman, Davis &amp; Craig (2010).</td>
<td>Controlled study.</td>
<td>27 women with fibromyalgia and 25 age-matched healthy control women, exposed to low and moderate thermal pain pulses during paced breathing (at normal rate, or half normal rate).</td>
<td>To explore the effect of breathing rate on pain and emotion following thermal pain stimuli. Outcomes: pain intensity and unpleasantness (post-each trial), and positive and negative affect (post each block of trials).</td>
<td>Slowed breathing resulted in reduced pain intensity and unpleasantness compared to normal breathing: especially so for moderately painful thermal stimuli. However, this effect was less reliable in women with fibromyalgia compared to healthy controls. Slow breathing was associated with decreased negative affect in both groups, however, increased positive affect was only observed in healthy controls with high trait negative affect. Women exhibiting greater trait positive affect prior to the experiment showed greater reduction negative affect due to slow vs normal breathing. Concludes these findings support reports that yogic breathing and mindful Zen meditation is beneficial for pain and depressed affect. Although, in order to gain therapeutic benefit from reduced breathing rates patients with chronic pain may require more guidance.</td>
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<td>Zeidan, Gordon, Merchant &amp; Goolkasian (2010).</td>
<td>3 experiments. Expt 1: n=20 students, 15 male, median age = 19 years (range 18-36) who underwent a 3 day mindfulness meditation. Expt 2: n=20 students, 13 female, median age = 19 (range 18-41) tasked with math distraction and relaxation conditions. Expt 3: n=21 students, 13 female, median age = 19 (range 18-26) tasked with math distraction and relaxation or meditation.</td>
<td>To investigate the analgesic effects of a brief mindfulness meditation training program on ratings of painful electrical stimulation. Outcomes: pain rating, pain sensitivity, State Anxiety Inventory, Freiburg Mindfulness Inventory</td>
<td>Experiment 1, showed participants pain rating and sensitivity to both high and low electrical stimulation significantly decreased after meditation training. Experiment 2, neither math distraction nor relaxation effected pain sensitivity in participants, however, math distraction and not relaxation reduced high pain ratings. Experiment 3, revealed both meditation and math distraction were related to significant decreases in pain intensity, with meditation also being associated with reduced pain sensitivity. Changes in mindfulness and anxiety scores suggest that the analgesic effects of meditation are associated with reduced anxiety and enhanced attention on the present moment. Concludes brief mindfulness meditation is effective at reducing pain ratings and anxiety, and increasing mindfulness skills compared with baseline and other cognitive manipulations.</td>
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SECTION E – OVERVIEWS AND EXPERT OPINIONS

The following reference list include peer-reviewed articles, book sections and books.

**Mindfulness – conceptual and clinical overviews**


**Acceptance and Commitment Therapy**


**Breathworks**


Mindfulness-Based Stress Reduction


Miscellaneous concepts, overviews and mindfulness-based interventions


