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# Effectiveness of psychological interventions for chronic pain on health care use and work absence: systematic review and meta-analysis

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| **Abstract:** | Psychological interventions for chronic pain and its consequences have been shown to improve mood, disability, pain, and catastrophic thinking, but there has been no systematic review specifically of their effects on health care use or time lost from work as treatment outcomes in mixed chronic pain. We conducted a systematic review and meta-analysis to evaluate the effectiveness of psychological therapies for chronic pain (excluding headache) in adults for these outcomes. We used searches from two previous systematic reviews and updated them. Eighteen randomized controlled trials were found that reported health care use (15 studies) and work loss (nine studies) as outcomes. Fourteen studies provided data for meta-analysis. There were moderate effects for psychological interventions compared to active, treatment as usual and waiting list controls in reducing health care use, with confidence in the findings. No benefits were found for medication reduction, but with less confidence in this result. Analysis of work loss showed no significant effects of psychological interventions over comparisons, but the use of many different metrics necessitated fragmenting the planned analyses, making summary difficult. The results are encouraging for the potential of routine psychological intervention to reduce post-treatment health care use, with associated cost savings, but it is likely that the range and complexity of problems affecting work necessitate additional intervention over standard group psychological intervention. |

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# Effectiveness of psychological interventions for chronic pain on health care use and work absence: systematic review and meta-analysis

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**Abstract**

Psychological interventions for chronic pain and its consequences have been shown to improve mood, disability, pain, and catastrophic thinking, but there has been no systematic review specifically of their effects on health care use or time lost from work as treatment outcomes in mixed chronic pain. We conducted a systematic review and meta-analysis to evaluate the effectiveness of psychological therapies for chronic pain (excluding headache) in adults for these outcomes. We used searches from two previous systematic reviews and updated them. Eighteen randomized controlled trials were found that reported health care use (15 studies) and work loss (nine studies) as outcomes. Fourteen studies provided data for meta-analysis. There were moderate effects for psychological interventions compared to active, treatment as usual and waiting list controls in reducing health care use, with confidence in the findings. No benefits were found for medication reduction, but with less confidence in this result. Analysis of work loss showed no significant effects of psychological interventions over comparisons, but the use of many different metrics necessitated fragmenting the planned analyses, making summary difficult. The results are encouraging for the potential of routine psychological intervention to reduce post-treatment health care use, with associated cost savings, but it is likely that the range and complexity of problems affecting work necessitate additional intervention over standard group psychological intervention.

**Keywords:** rehabilitation**;** CBT; medication; hospital visits; work loss.

## 1. Introduction

Systematic review and meta-analysis of cognitive and behavioral (CBT) methods for chronic pain (excluding headache) in adults found "small to moderate benefits, more for disability, mood and catastrophic thinking than for pain … in trials which compared CBT with no treatment".[41,65] The 2012 review found too few studies that assessed health care use or work loss to include them. Since these are commonly invoked as ultimate goals of improving function and self-management,[30,58] and of increasingly interest to third party funders,[13,17] we believed that a systematic review was due to summarise the current evidence.

In Europe,[9] the US[17] and elsewhere,[7] people with chronic pain are frequent healthcare users. In the UK, primary care appointments for chronic pain cost £69 million[56] and analgesic prescriptions cost £500 million annually.[13] Health care use may be evaluated in terms of numbers or extent of consultations, investigations and treatments, ideally from independent records rather than patient self-report, or as costs. Seeking and receiving health care are consistently predicted by psychological variables, such as anxiety, depression (e.g.[3,31]), and increased attention to pain,[38] as well as by increased pain, so psychological interventions appropriately aim to reduce use of medical resources. Reduced health care use and costs following psychologically-based pain management have been reported in the USA[58] and in the UK,[11] but fall short of continued unnecessary and even harmful expenditure on further treatments for chronic pain.[17] We therefore sought to investigate to what extent health care use reduced as a result of standard psychologically-based pain management.

Chronic pain is also a major cause of loss of work days and of underperformance in the workplace,[6,9] and thus of welfare payments to those unable to work.[13] Although it has been proposed that the same psychological factors affect work absence and performance in chronic pain as affect other activities, in particular fear of pain or injury and avoidance of activities associated with those fears,[54,63] a systematic review of work loss in people with chronic low back pain could find no clear predictors.[32] The 2001 systematic review by Guzmán et al.[21] found little evidence that pain management reduced workdays lost

in working participants, although 'work readiness' was reported to be improved in those not at work. On the other hand, return to work or starting work is a common goal during pain rehabilitation for many of working age. We hoped that more recent attention to work outcomes would provide sufficient data for meta-analysis.

We therefore aimed to include in a systematic review and meta-analysis of psychological interventions for chronic pain any indicators of health care use and work loss. We drew from the studies in the 2012 review by Williams et al.[65] psychological treatments for chronic pain (excluding headache) in adults, compared with treatment as usual, waiting list control, or active treatment control); we updated searches using the same search terms and selection criteria, while relaxing the requirement for at least 20 participants in any arm at the end of treatment to 10 (as in the 2009 systematic review[15]).

## 2. Methods

### *2.1. Search strategy*

First, we searched the Eccleston et al.[15] and Williams et al.[65] reviews for any trials reporting health care use, work absence, or both, as outcomes. We then extended the searches for the 2012 review (which searched to September 2011) of the Cochrane Central Register of Controlled Trials (CENTRAL 2013), MEDLINE, EMBASE and PsychInfo, from January 2011[65] to January 2015. We made minor adjustments to search terms where required by changes in search systems. An example search strategy is given in online Appendix 1. No language restrictions were applied. We also updated our search of clinical trials registers and, as in the Williams et al. review, [65] we also searched the reference lists of retrieved papers.

### *2.2. Inclusion and exclusion criteria*

As in the previous review, studies were included if they:

- were available as a full publication or report of a randomized controlled trial;
- had a design that placed a psychological treatment as an active treatment of primary interest. As in the Williams et al. [65] review, psychological treatment was deemed credible if it was based on an existing psychological model or framework, and its delivery was by, or was supervised by, a healthcare professional qualified in psychology;
- had a psychological treatment with definable psychotherapeutic content, that is, based on an existing psychological model or framework, and delivered and/or supervised by a healthcare professional qualified in psychology;
- had at least one trial arm consisting of a psychological intervention, with at least one comparator arm of an attention control, other active treatment, treatment as usual or waiting list control;
- were published (or electronically pre-published) in a peer-reviewed scientific journal;

- were with participants (aged 18 years or older) reporting chronic pain (of at least three months' duration) in any body site;
- were not concerned with headache or associated with a malignant life-threatening disease;
- had 10 or more participants in each treatment arm at the end of treatment (returning to previous criteria in Eccleston et al.[15] to include previously excluded studies).

In addition, we required that they measured health care use or costs, work absence or costs of work absence post-treatment, or a combination, as an outcome or outcomes.

Given the diversity of possible indicators of health care use, any data were included that assessed post-treatment use of health service resources, whether by self-referral, medical referral, or as part of a medical insurance package. Thus any visits or consultations by patients to or of doctors, physical therapists, nurse or other healthcare professionals were eligible, as were outpatient visits, hospital stays, or procedures, whether assessed by patient report or by independent records. In the latter case, it was not always clear that pain-related visits were distinguished from non-pain related visits but, since post-treatment data were compared across treatment and control groups, the assumption was made that any reduction in health care use after pain treatment would at least in part be related to a lesser use of health care for pain. We also collected data on medication use as an indicator of change in health status. We did not include use of complementary or alternative treatments, the costs of which were often borne by patients themselves.

Work loss data included any measurement of sick leave or work absence, whether recorded as days or as episodes over a set time, and either from patient report or from insurance or work records. As with health care use, if these were expressed in terms of cost, they were included.

Trials included in the previous systematic review and meta-analysis[15, 65] were automatically included in this review if they reported health care use or work loss data. Studies in process at the time of the Williams et al.[65] review were followed up for publications and, where data were missing, authors were

contacted. Of the 16 authors contacted, seven did not respond, five clarified that they had not measured either outcome, and four provided data.[35,39,50,52]

### *2.3. Data extraction and management*

The authors independently extracted data and risk of bias from this final set of papers and achieved consensus where there was disagreement. Descriptive characteristics of participants and treatments, including setting and mode of delivery, and treatment data were collected.

### *2.4. Risk of bias and quality rating*

Risk of bias was assessed according to Cochrane principles.[23] Of the five suggested 'Risk of bias' categories, random sequence generation (selection bias), allocation concealment (selection bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), and selective reporting (reporting bias) were included. The option of 'blinding participants and personnel' was excluded because neither therapists nor patients can be blinded to whether they deliver or receive treatment. As in the previous reviews,[15,65] we used a quality rating scale specifically designed for psychological interventions in pain.[68] This provided an overall total score (0 to 35) from two sub-scales: a treatment sub-scale (0 to 9), covering the stated rationale for treatment, manualization, therapist training and patient engagement; and a design and methods sub-scale (0 to 26), covering inclusion/exclusion criteria, attrition, sample description, minimization of bias (randomization method, allocation bias, blinding of assessment, equality of treatment expectations), selection of outcomes, length of follow-up, analyses and choice of control.

The first four 'Risk of bias' items from the Cochrane Handbook for Systematic Reviews of Interventions[23] are represented in the design section of the Yates et al. scale,[68] accounting for up to five of the nine points available. Two authors (AP, AW) scored all studies and reached a consensus after initial comparisons or ratings.

### *2.5. Meta-analysis of treatment effect*

All data were analyzed using RevMan5.3,[48] the tool designed for the Cochrane Collaboration that calculates effect sizes and other indices in meta-analyses.[12,23] Where continuous data were reported, treatment effects were estimated using standardized mean differences by extracting means, standard deviations and sample size, and using random (rather than fixed) effects, given the likely heterogeneity.[23] Where data were dichotomous, treatment effects were estimated using odds ratios by extracting events data and sample sizes, again with random effects for the same reason, likely heterogeneity.

Where a trial had more than one treatment arm, the arm designated as active treatment was either the most psychologically comprehensive or best matched the description of a psychological intervention. We aimed, if there were sufficient data, to carry out sub-analyses by treatment (cognitive behavioral versus behavioral) and by control group (active treatment versus waiting list or treatment as usual), as in Williams et al.[65] We also planned to analyze post-treatment data separately from follow-up of three months or more, choosing the longer where there was more than one, up to 24 months.

Between-trial heterogeneity is automatically calculated in RevMan and expressed using the $I^2$ statistic. $I^2$ values above 50% indicate high heterogeneity, between 25% and 50% medium heterogeneity, and below 25% low heterogeneity. Heterogeneity, which can be substantial despite using random effects models, should be regarded as an approximate estimate, rather than a point estimate, and although random effects allow for heterogeneity attributable to random error, but between-study heterogeneity assessed by $I^2$ can indicate non-random sources.[23]

## 3. Results

### *3.1. Search*

The search of previous systematic reviews identified 13 papers describing randomized controlled trials, nine from the 2012 Cochrane review[2,19,26,27,29,34,50,66] and four from the earlier 2009 review (which permitted 10 ≤ N <20).[16,28,37,40] The updated search found four new trials,[35,39,52,60] and one follow-up of an earlier trial ([10] follow-up[26]). One further trial[59] was obtained from reference lists of other studies. This made 18 trials altogether (see Figure 1, study flow diagram), half of which were published in the last 10 years.

*Figure 1 about here*

The excluded studies from the current search were rejected for the following reasons. Two were insufficiently psychological;[20,62] two did not provide outcome data on health care use or work;[36,45] one was not chronic pain;[49] and one was an internet study.[8] Details of studies excluded from the two previous reviews,[15,65] with reasons for exclusion, are published in those reviews.

### *3.2. Participants*

Studies were predominantly from Europe, with only two from the US.[40,59] The 18 included trials comprising 2253 participants (74% female) at the start of treatment and 1932 at the end (means 125 and 107 per study respectively): the mean completion rate was 86%. Table 1 shows the numbers of studies and participants in each analysis.

*Table 1 about here*

Most participants were between 35 and 60, with a mean of 46 years. Participants in four studies were all women (N = 373) and in the other 14 studies women usually outnumbered men, at a mean 69% (range 2% - 98%). They were recruited from pain or other specialist clinics (10 studies), primary care (4 studies), community or volunteer sources (3 studies) and one from a work-related insurance register. Where

duration of pain was reported, the mean was around 4 years but with a long upper tail to the distribution, including a report of 50-year pain duration.[39] Seven studies recruited patients with mixed chronic pain, usually with a predominance of low back pain, and four recruited patients with low back and/or neck pain. One study was of patients with shoulder pain, one of temporomandibular disorder (TMD), and one with mixed low back pain and TMD. Four studies were of people with fibromyalgia.

Fourteen studies tested cognitive and behavioral treatments (including Acceptance and Commitment Therapy (ACT) and Mindfulness-Based Stress Reduction (MBSR)) within a smaller or larger package of treatments, often including physical therapy; two tested behavioral therapies (one operant;[16] one graded exposure;[18] and one tested cognitive methods.[35] Twelve studies had two arms, using as controls two non-enriched CBT interventions, four physical therapy interventions, five treatment as usual, and one waiting list. Five studies had three arms; three used a non-enriched CBT and waiting list as comparisons,[40,50,66] one used a behavioral treatment and usual care,[16] and one used physical therapy and usual care.[60] The study with four arms used physical therapy, behavioral therapy, and usual care as comparisons. Whereas patients in the active control arm all received the same treatment, patients assigned to treatment as usual or waiting list (which usually does not preclude receiving treatment as usual) could experience anything from no healthcare contact to regular consultations or treatment sessions, and were rarely asked to report it.

### *3.3. Health care use*

Fifteen studies assessed health care use at the end of treatment or at follow-up of various lengths. Where there was a choice, we used the latest endpoint for which data were provided for intervention and control groups. Table 1 shows the 13 studies that provided data either on health care consultations or resource use and/or on medication consumption or abstinence. The three Figures 2-4 comprise two concerning health care resource use other than medication, one with continuous data and the other with event-related data, and one concerning medication use, with event-related data.

*Table 2 about here*

### *3.3.1. Consultations and resource use*

Nine studies provided means and standard deviations for standard mean differences in Figure 2, and four studies provided event-related data for Figure 3. Table 2 provides details for each study. Ways of assessing health care use varied from recording physician visits only to direct costs of health care, one of only two studies that provided data not collected by self-report. The direct costs included medication, which was also used alone in the medication analysis since the data could not be disaggregated. However, medication represented a similar proportion of total direct health care costs: 26% for the intervention group and 31% for the control group. Figure 2 summarises these nine studies. The overall effect showed moderate superiority of intervention over control in reduction of health care use: SMD = -0.38 (95% CI -0.73 to -0.02); z = 2.09, p = 0.04. Heterogeneity was high, at 83%.

*Figures 2 and 3 about here*

Figure 3 summarises four studies that assessed health care use variously, from physician visits to any further treatment for pain. The odds ratio showed no significant difference between intervention and control groups: OR = 0.53 (95% CI 0.18 to 1.54), and z = 1.17, p = 0.24, with moderately high heterogeneity of 67%.

Two studies assessed health care use but did not provide analysable data. Alaranta et al.[2] reported similar percentage changes in treatment and control groups for doctor and outpatient visits at 1 year follow-up, but no test was reported. Lindell et al.[34] reported no significant difference in decrease in healthcare practitioner visits at 18 month follow-up between intervention and control groups.

### *3.3.2. Medication use*

Seven studies reported medication change, of which five produced analysable data, three as events, Figure 4, and two as means and standard deviations (no figure): see Table 2 for details of studies. Medication was variously measured, from numbers of analgesics or any medication taken to costs of medication, and at different post-treatment points.

*Figure 4 about here*

The three studies in Figure 4 included 109 people in intervention groups and 98 in control groups. The odds ratio showed no significant difference between groups: OR = 0.21 (95% CI 0.04 to 1.28); z = 1.69, p = 0.09. Heterogeneity was very high at 85%. The two studies in the second medication analysis included 146 participants in intervention groups and 129 in control groups. The effect size of difference between groups appeared of moderate size but was non-significant: SMD = -0.65 (95% CI -1.56 to 0.26); z = 1.39, p = 0.16, and heterogeneity was high at 88%. Data from both studies, reported as means and standard deviations, appeared to be substantially skewed, and it was not clear that parametric analysis of data in the studies was appropriate or interpretable, so this should be treated with caution. Risk of bias was mostly uncertain or high, casting further doubt on this analysis.

For both medication analyses, risk of bias was on average uncertain, and design quality was only 15/26. One further study[39] reported that few patients reduced medication and there was no significant difference between groups, but data were not available.

### *3.4. Work loss*

Nine studies provided data on work loss, in metrics such as mean or number of hours or days absent from work on health grounds, early retirement on health grounds, and cost of work loss (for which days of work absence were multiplied by the standard minimum wage). Follow-up times also differed: see Table 3.

*Table 3 about here*

Four studies (Figure 5) reported mean days of work lost, at various time points. They produced a nonsignificant SMD of -0.35 (95% CI -1.09 to 0.39); z = 0.92, p > 0.1. Heterogeneity was 94%, largely due to a single study with a substantial SMD. One further study[28] that provided apparently eligible data at one year follow-up was excluded from the analysis because the intervention and controls differed so substantially at baseline that interpretation of follow-up scores was not possible, although the authors reported that the intervention reduced sick leave.

*Figure 5 about here*

Two studies reported non-return to work (Lindell2008) or early retirement (Jensen2005), with no significant difference between the groups: OR = 2.05 (95% CI 0.52 to 8.11); z = 1.02, p > 0.1. Heterogeneity was 84%. Two further studies[2,29] reported the number of participants with work absence of more than 30 days at follow-up. There was no significant difference between groups: OR = 1.11 (95% CI 0.71 to 1.72); z = 0.45, p > 0.5. Heterogeneity was zero, but the risk of bias was mostly high, and design quality was 16/26.

One further study (Jensen1997) assessed work but did not provide analyzable data; it reported improvements in sick leave at six month follow-up in both treatment and control groups (essentially very similar CBT programs). A second paper,[10] a ten-year follow-up of Jensen et al.,[26] also reported significant benefits of full rehabilitation over both controls in reduced sick leave and disability pensions. We decided that this was too long a period compared with other included studies to be combined with them.

## 4. Discussion

The predominance of European studies in this review was not surprising, since insurance-based funding in the US militates against conducting RCTs in this population. We would argue, however, that since the content and process of pain management programmes is largely similar in Western healthcare systems, so are the gains for patients in clinical pain management programs.[41]

Fifteen studies of CBT for chronic pain assessed health care use, as consultations and treatments with a narrower or wider range of healthcare professionals, or as medication intake, or both, mainly by self-report. Treatment aimed to reduce all aspects of health care use, consistent with self-management and overall better function, and there was evidence from continuous data, with a moderate effect size, of successful reduction in health care use; this came from nine of the 15 studies, with nearly 900 participants. We did not analyse cost savings separately.[19,35] There were no major methodological

threats to interpretation. The other analyses, of healthcare events measured categorically and of medication, showed no evidence of benefit of treatment, but were substantially smaller, as was the number of participants in each analysis. There is a small risk of missing studies, although building on previous searches helps to minimise this; we cannot estimate whether there is a serious risk of publication bias, but most of these trials had multiple outcomes, and our sample included several without the hypothesised improvement. Given that costs to health service funders and to patients themselves are often cited as one of the reasons to provide treatment, it is surprising that health care use is not a more universal outcome in studies.

Our review produced more positive findings on reducing health care use than comparable reviews, both of consultations for chronic low back pain: Hoffman et al.[24] and Kamper et al.[30] It may be that including treatments as well as consultations shows a greater effect of treatment, and is certainly an important element of cost. In a large scale community study in Portugal, Azevedo et al.[3] found that nearly half the adults who reported moderately or severely disabling chronic pain, with a median duration of 10 years, had a high rate of diagnostic tests in the last 6 months, while 22% were receiving specialist medical care, and 81% attending family physicians for their pain. Further, 76% were taking pain-related medication. It is just such an extended – or repetitive – sequence of tests and consultations, with no adequate resolution (given that respondents had at least moderately disabling pain) that psychological treatments for pain aim to curtail, with individuals understanding the non-harmful nature of their pains and adopting a more autonomous approach. Given the good evidence of high levels of health care use in people with persistent pain[7] and widespread specific health worries associated with persistent pain[6] of the sort that drive health care use,[55] cognitive and behavioral pain management interventions are well placed to address beliefs and associated emotions and behavior, and thereby reduce the substantial associated costs[33] which produce very little benefit for patients.

Neither of the two analyses of trials assessing medication showed significant reduction, though concerns about data quality and trial methodologies urge cautious interpretation of this negative finding. Again, this is a variable better assessed at follow-up than immediately after treatment, although

there are many ways of measuring it (none standard). Medication reduction (medication in the form of opioid analgesics, any analgesics, or any pain-related medication) is variably specified as an aim of treatment, despite widespread concerns in the pain literature about long-term opioid use,[4,53] and despite the presence of well-qualified staff associated with CBT trials, and the suitability of goal-setting methods for medication use.[46]

Nine studies on work loss, at various points of follow-up, contributed to three small meta-analyses with different metrics; none showed significant benefit of treatment over control group. The small number of trials in each analysis and methodological concerns urge cautious interpretation. By contrast with our findings, Kamper et al.[30] in their systematic review of chronic low back pain confidently reported benefits for return to work of multidisciplinary rehabilitation compared with physical treatments in the medium to long term (median 12 months), although there was no such advantage over usual care. An earlier systematic review[34] reported a moderate effect size for long-term return-to-work outcomes after multidisciplinary treatment, while a third found too few trials to analyse.[22]

Return to work is a specific outcome of some CBT for pain management, but help to return may require individual patient intervention and negotiation with potential or actual employers. Studies of return to work[1,31,32,64] suggest that specific beliefs about workplace resources, as well as broader psychological variables, contribute to prediction of return to work. Further, individual and societal factors may make it an inappropriate goal or unlikely outcome: work may not be an immediate or medium-term goal for people with adequate financial resources, or a goal at all for those over retirement age. Where patients are diverse in age and other demographics, they have very variable pathways back to valued activities, with some opting for further education, voluntary work, family care, or other activities. Further, adverse local or national socioeconomic conditions can make the probability of less skilled patients finding paid work very low.

There are recommended methods for improving return to work, based both in evidence and in clinical experience.[42,43,44,51,64,67] Some require substantial workplace commitment to reintegrating the person

with pain, unlikely to be forthcoming in some workplaces and economic conditions. Specific needs to facilitate return to work, as identified in acute low back pain,[47] include workplace support, emotional help, or physical reactivation. If that is the case, generic psychologically-based pain management, involving only the person with pain and not the workplace, would not necessarily resolve the obstacles to return to work. The same points apply to the problem of "presenteeism",[64] presence at work but working at reduced efficiency because of pain.

Some of the implications of this systematic review and meta-analysis are obvious. Despite the lack of standardized or recommended measures, data on health care use (including medication) and return to work are not difficult to collect, albeit more meaningful at follow-up than immediately after treatment. Patient self-report may provide more accurate data on medications used, while automatically-recorded prescription data are valuable but they do not, however, capture variation in adherence to prescribed use, use of over-the-counter medications or use of other non-prescribed medications. Nationally-recorded or insurance data on sick leave appears to differ from patient report, with high specificity for work absence but variable sensitivity;[61] ideally both are used. Both health care use and work return outcomes, where appropriate, can be more easily translated into cost savings than the usual outcomes of pain, mood, and disability, or even quality of life, and there is a need for more economic studies of pain management.[56]

From the viewpoint of improving intervention and long term wellbeing, both reducing health care use, with its risks of over-treatment and undermining of patients' own resources, and improving return to work, given its well-established health benefits,[64] are worthwhile outcomes. We were disappointed not to find more eligible studies, but systematic review is intended to establish the current state of the evidence, whatever the size. From a research viewpoint, despite some good supporting evidence reviewed in this and in other systematic reviews for health care use and for return to work, both outcomes need further study. We endorse the statement by Kamper et al.[30] that both are 'key considerations', while patients also rate work status, though not health care use, as an important outcome[5].

**Conflict of interest statement**

The authors have no conflicts of interest to declare. This study received no external funding.

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**Legends for tables and figures**

Table 1 Data summary for included studies

Table 2 Details of 13 studies that provided data on health care consultations or resource use and/or on medication consumption or abstinence

Table 3 Details of 10 studies that provided data on work loss due to pain.

Figure 1 Study flow: PRISMA diagram

Figure 2 Standard mean differences for health care use: nine studies and overall effect size

Figure 3 Event data on health care use: four studies and overall odds ratio

Figure 4 Event data for medication use: three studies and overall odds ratio

Figure 5 Standard mean differences for work loss: four studies and overall effect size

Figure 1 Study flow

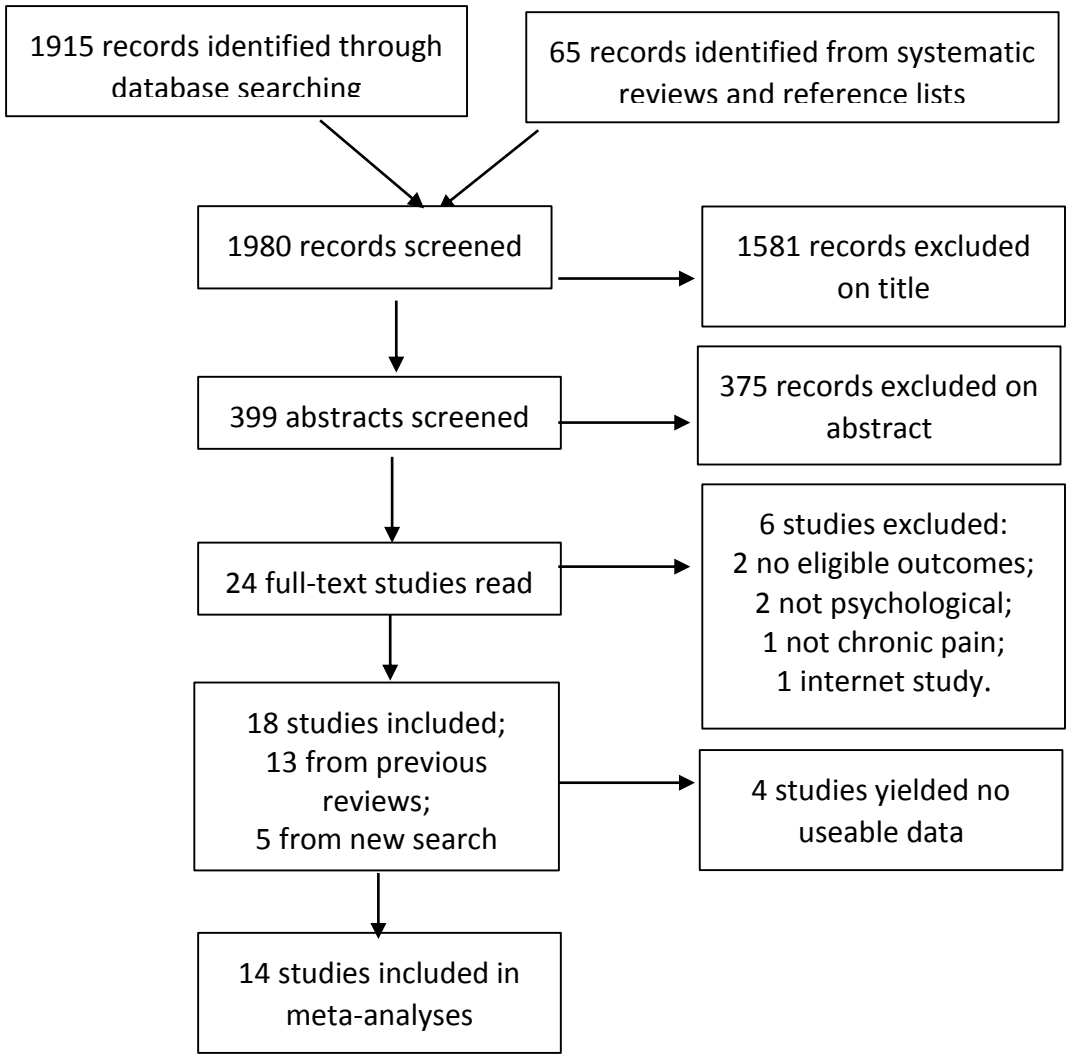


Figure 2

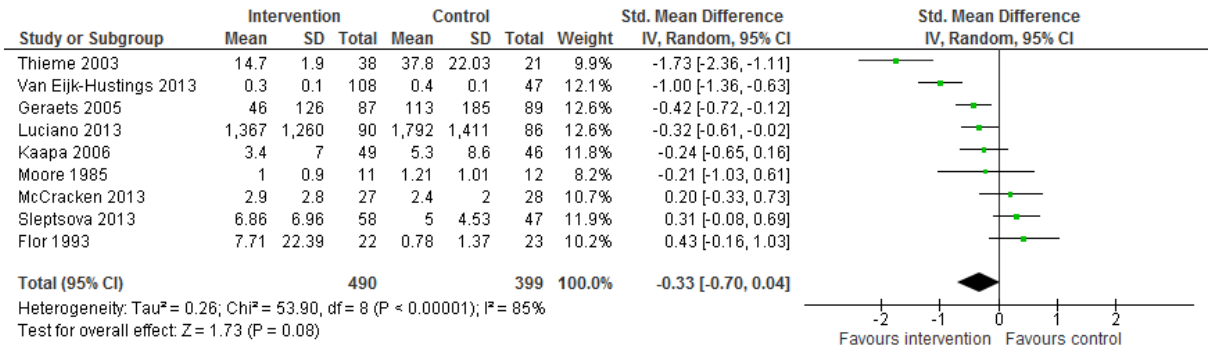

Intervention
Control
Std. Mean Difference
Std. Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
Thieme 2003 14.7 1.9 38 37.8 22.03 21 9.9% -1.73 [-2.36, -1.11]
Van Eijk-Hustings 2013 0.3 0.1 108 0.4 0.1 47 12.1% -1.00 [-1.36, -0.63]
Geraets 2005 46 126 87 113 185 89 12.6% -0.42 [-0.72, -0.12]
Luciano 2013 1,367 1,260 90 1,792 1,411 86 12.6% -0.32 [-0.61, -0.02]
Kaapa 2006 3.4 7 49 5.3 8.6 46 11.8% -0.24 [-0.65, 0.16]
Moore 1985 1 0.9 11 1.21 1.01 12 8.2% -0.21 [-1.03, 0.61]
McCracken 2013 2.9 2.8 27 2.4 2 28 10.7% 0.20 [-0.33, 0.73]
Sleptsova 2013 6.86 6.96 58 5 4.53 47 11.9% 0.31 [-0.08, 0.69]
Flor 1993 7.71 22.39 22 0.78 1.37 23 10.2% 0.43 [-0.16, 1.03]
Total (95% CI) 490 399 100.0% -0.33 [-0.70, 0.04]
Heterogeneity: Tau² = 0.26; Chi² = 53.90, df = 8 (P < 0.00001); I² = 85%
Test for overall effect: Z = 1.73 (P = 0.08)
-2
-1
0
1
2
Favours intervention
Favours control

Figure 3

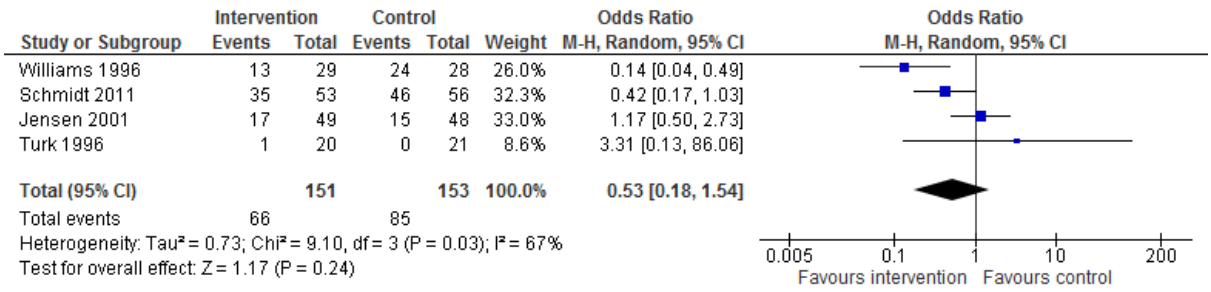

Intervention
Control
Odds Ratio
Odds Ratio
Study or Subgroup
Events
Total
Events
Total
Weight
M-H, Random, 95% CI
M-H, Random, 95% CI
Williams 1996 13 29 24 28 26.0% 0.14 [0.04, 0.49]
Schmidt 2011 35 53 46 56 32.3% 0.42 [0.17, 1.03]
Jensen 2001 17 49 15 48 33.0% 1.17 [0.50, 2.73]
Turk 1996 1 20 0 21 8.6% 3.31 [0.13, 86.06]
Total (95% CI) 151 153 100.0% 0.53 [0.18, 1.54]
Total events 66 85
Heterogeneity: Tau² = 0.73; Chi² = 9.10, df = 3 (P = 0.03); I² = 67%
Test for overall effect: Z = 1.17 (P = 0.24)
0.005
0.1
1
10
200
Favours intervention
Favours control

Figure 4

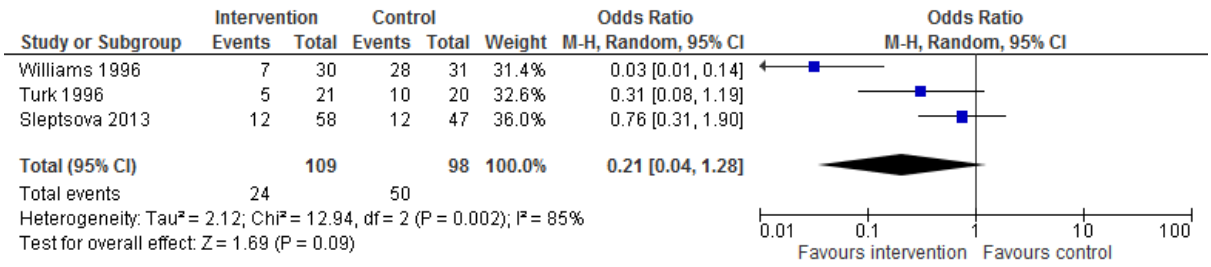
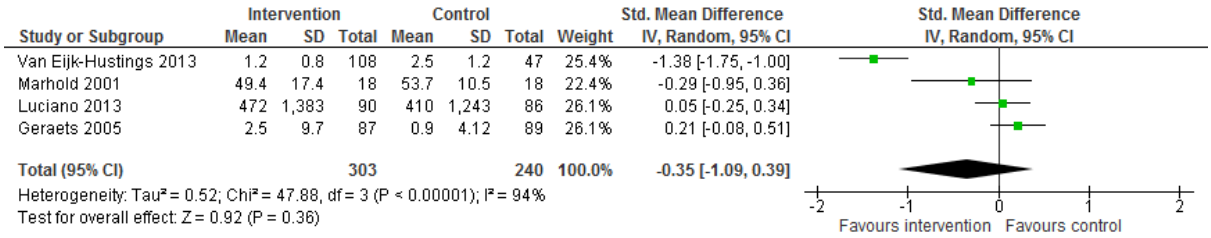

Intervention
Control
Odds Ratio
Odds Ratio
Study or Subgroup
Events
Total
Events
Total
Weight
M-H, Random, 95% CI
M-H, Random, 95% CI
Williams 1996 7 30 28 31 31.4% 0.03 [0.01, 0.14]
Turk 1996 5 21 10 20 32.6% 0.31 [0.08, 1.19]
Sleptsova 2013 12 58 12 47 36.0% 0.76 [0.31, 1.90]
Total (95% CI) 109 98 100.0% 0.21 [0.04, 1.28]
Total events 24 50
Heterogeneity: Tau² = 2.12; Chi² = 12.94, df = 2 (P = 0.002); I² = 85%
Test for overall effect: Z = 1.69 (P = 0.09)
0.01
0.1
1
10
100
Favours intervention
Favours control

Figure 5


Intervention
Control
Std. Mean Difference
Std. Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
Van Eijk-Hustings 2013 1.2 0.8 108 2.5 1.2 47 25.4% -1.38 [-1.75, -1.00]
Marhold 2001 49.4 17.4 18 53.7 10.5 18 22.4% -0.29 [-0.95, 0.36]
Luciano 2013 472 1,383 90 410 1,243 86 26.1% 0.05 [-0.25, 0.34]
Geraets 2005 2.5 9.7 87 0.9 4.12 89 26.1% 0.21 [-0.08, 0.51]
Total (95% CI) 303 240 100.0% -0.35 [-1.09, 0.39]
Heterogeneity: Tau² = 0.52; Chi² = 47.88, df = 3 (P < 0.00001); I² = 94%
Test for overall effect: Z = 0.92 (P = 0.36)
-2
-1
0
1
2
Favours intervention
Favours control

Table

Table 1

| | Studies reporting outcome | Studies providing data for analysis | N in tx groups | N in control groups | Average risk of bias | Average design score (Yates) |
|---|---|---|---|---|---|---|
| Health care use: consultations and resource use | 13 | 9 visits, costs, fig. 2<br>4 visits, treatments, fig. 3 | 490<br>151 | 399<br>153 | Low/ uncertain | 17/26 |
| Health care use: medication | 7 | 3 medication reduction, fig. 4<br>2 medication change | 109<br>146 | 98<br>129 | uncertain | 15/26 |
| Work loss | 9 | 4 work days lost: fig. 5<br>2 non-return to work | 303<br>110 | 240<br>110 | low | 16/26 |

Table 2

| Study | Intervention | Control | Health care use | Figure |
|---|---|---|---|---|
| Flor (1993)[16] | CBT [biofeedback] | Usual care | Doctor visits at 2 year follow-up | 2 |
| Jensen (2001)[26] (Follow-up: Jensen (2005)[25] | CBT | Usual care (BT, physical therapy) | Physician visits at 3 year follow-up | 3 |
| Kaapa (2006)[29] | CBT | Physical therapy | Visits to healthcare professionals at 2 year follow-up | 2 |
| Moore (1985)[40] | CBT (couple and individual) | Waiting list (not followed up) | Outpatient visits at 3-7 month follow-up<br>Medication use: discussed in text | 2 |
| Sleptsova (2014)[52] (data from author) | CBT | Physical therapy | Doctor, hospital and physical therapist visits<br>Medication 3 month follow-up | 2<br>4 |
| Turk (1996)[59] | CBT | Behavioral + counseling | "Use of healthcare resources" at 6 months<br>Any analgesic use at 6 months | 3<br>4 |
| Van Eijk-Hustings (2013)[60] | CBT [exercise] | Usual care | Contacts with medical specialists at 18 month follow-up | 2 |
| Williams (1996)[66] | CBT (inpatient and outpatient) | Waiting list | "Any further treatments…for the pain"<br>Pain-related medication use | 3<br>4 |
| McCracken (2013)[39] (data from author) | ACT | Usual care | Visits to primary care doctors | 2 |
| Schmidt (2011)[50] (data from author) | MBSR | Waiting list (relaxation, support, education) | Ongoing healthcare use and medical visits at short term follow-up | 3 |
| Geraets (2006)[19] | BT | Usual care | Direct health care costs | 2 |
| Thieme (2003)[57] | BT operant | Physical therapy | Doctor visits at 15 month follow-up<br>Medication at 15 month follow-up | 2<br>- |
| Luciano (2013)[35] | CT | Usual care | Direct costs (including medication) at 1 year follow-up<br>Medication at 1 year follow-up | 2<br>- |

Table 3

| Study | Intervention | Control | Work loss | Figure |
|---|---|---|---|---|
| Alaranta (1994)[2] | CBT | Physical therapy | All sick leave > 30 days at 3 month follow-up | - |
| Jensen (2001)[26] | CBT | Usual care [BT, physical therapy] | Early retirement: 3 year follow-up | - |
| Johansson (1998)[28] | CBT | Waiting list | Work absence % at 1 month follow-up | 5 |
| Kääpä (2006)[29] | CBT | Physical therapy | Work absence 2 year follow-up | - |
| Lindell (2008)[34] | CBT | Usual care | Non-return to work at 18 month follow-up | - |
| Marhold (2001)[37] | CBT | Usual care | Work absence 6 month follow-up | 5 |
| Van Eijk-Hustings (2013)[60] | CBT | usual care [exercise] | Hours of work absence per week 18 month follow-up | - |
| Geraets (2006)[19] | BT | Usual care | Sick days at 1 year follow-up | 5 |
| Luciano (2013)[35] | CT | Usual care | Cost of work lost (= days x minimum daily wage) | 5 |
| Jensen (1997)[27] | Woman-specific CBT | Regular CBT | Sick leave in excess of 14 days | No usable data |

## Appendix 1: Sample Search Strategy

(PsycINFO)

1. exp pain/
2. (chronic* adj6 pain*).mp.
3. 1 and 2
4. (chronic* adj6 (discomfort or ache*)).mp.
5. (chronic* adj6 (fibromyalgia or neuralgi* or dysmenorrhea or dysmennorrhoea)).ti,ab.
6. 1 or 2 or 3 or 4 or 5
7. exp Psychotherapy/
8. Cognitive Therapy/
9. exp Behavior Therapy/
10. Biofeedback/
11. ((behaviour* or cognitive) adj (therapy or therapies)).mp.
12. (relax* adj6 (technique* or therapy or therapies)).mp.
13. (meditat* or psychotherap*).mp.
14. ((psychological or group) adj (treatment or therapy or therapies)).mp.
15. (self-regulation adj training).mp.
16. (coping adj skill*).mp.
17. (pain-related adj thought*).mp.
18. (behaviour* adj6 rehabilitat*).mp.
19. ((psychoeducation or psycho-education) adj (group or groups)).mp.
20. (mind and ((body adj relaxation) or (relaxation adj technique))).mp.
21. exp dualism/ or exp relaxation/ or exp relaxation therapy/
22. 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
23. 6 and 22
24. (2007* or 2008* or 2009* or 2010* or 2011* or 2012* or 2013*).up.
25. 23 and 24
26. limit 25 to yr="2011 - 2013"