

ORIGINAL ARTICLE

The biopsychosocial treatment approach for chronic neck and back pain: A systematic review of randomized controlled trials.**Anastasios Tzenalis RN, MSc^{1,2}, Anastasia Beneka PhD³, Paraskevi Malliou PhD⁴, Georgios Godolias MD, PhD⁵, Nektarios Staurou PhD⁶**

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Abstract

Purpose of the present study was to determine whether biopsychosocial therapy is more effective than reference treatments for chronic back and neck pain. Literature searches were conducted according to the research strategy recommended by the Editorial Board of the Cochrane Back review Group, using MEDLINE-Biomed, EMBASE-Elsevier. 7% of the 276 quality assessment were scored unclear. 21 studies (91%) had six or more positive scores which was the preset threshold for high quality. There is strong evidence that cognitive behavioral treatment of patients with CBNP has a positive effect on pain intensity, generic functional status and behavioral outcomes, when compared with booklets of healthy information, standardized exercise programs, active management, best practice advice and standardized active physical treatment.

Key Words: biopsychosocial chronic neck pain, rehabilitation, neck pain.

Chronic musculoskeletal pain is a highly prevalent disorder and a challenge to the health care system. This major health problem is most common in industrialized countries with a prevalence around 35% in the general population (Bergman, 2008). Back and neck pain (BNP) is the largest diagnostic group underlying sick-listing (Lindel et al., 2008). Chronic back pain, with its associated disabilities, is the most common cause of long term disability in the working population with a lifetime prevalence of 40% to 80% with 2% to 7% of cases developing chronic persistent problems (Moradi et al., 2012; Kohlmann, 2013). Chronic neck pain is the second common musculoskeletal disorder. The point prevalence of neck pain in the general population varies between 9.5% and 22% (Pool et al., 2010). Each year approximately one-third of all adults will

experience neck pain and some 5-10% of all neck complaints will develop into chronic pain (Croft et al., 2001; Pool et al., 2010).

The traditional pathoanatomical-biomedical approach to the diagnosis of (BNP) disorders is widely known during the past decades. However, it is well recognized that for the vast majority of the patients no pathology can be imaged which can reliably account for symptoms (Jull & Sterling, 2009). In our days, there is no agreement about the multidimensional nature of chronic back and neck pain, because chronic pain by its own is so complex. A modern approach to chronic pain includes a combination of therapies: drug therapies, psychological therapies, rehabilitative therapies, anesthesiological therapies, neurostimulatory therapies, surgical therapies and lifestyle changes, as well as complementary and alternative medicine (Dureja, 2006).

Researchers described a conceptualization of illness, in which symptoms were considered to be the result of a dynamic interaction between psychological, social and pathophysiological variables (Engel, 1997). Biopsychological pain disorders are, by definition, those disorders having three dimensions: biological, psychological and social (Disorbio et al., 2006). The biopsychosocial model was introduced as a diagnostic and management paradigm to recognize correctly the multidimensional nature of pain (Jull & Sterling, 2009). Evaluating a chronic pain condition such as (NBP) from one-dimensional perspective is limiting and often fails to explain the patients' symptoms.

Medical

In the treatment of chronic (BNP) the medical team traditionally focuses on assessment of a physical base for the pain which composed from clinical examination, diagnosis, treatment and evaluation of the treatment. However, even when medications and invasive procedures effectively reduce pain, they often do not produce concomitant improvements in physical and emotional functioning (Turk et al., 2008). After patients receive appropriate treatment, because chronic pain is incurable, they are left to manage their residual symptoms on their own (Osborne et al., 2006).

Psychological

Psychological factors in chronic (BNP) include the affective components of pain: depression, anxiety and anger. The above symptoms can lead to decreased energy and no motivation to participate in rehabilitative process (Adams et al., 2006). Physiologically, anxiety and distress may maintain autonomic arousal with consequent physical symptoms than arising (Osborne et al., 2006).

Social

The social variables are influence the pain experience at the individual level, because there is evidence that classical and operant conditioning processes can lead to pain behaviors and experiences being learned through interactions with the environment (Nicholas, 2008). Social factors include social learning factors, sources of inadvertent reinforcement of pain, current or resent stressors and compensation or litigation issues (Victor & Richeimer, 2003).

There are four components that comprise pain management treatment from a psychosocial perspective. These interrelated components are: a) Patient education (Victor & Richeimer, 2003; Disorbio et al., 2006; Turk et al., 2008) The goal of patient education is to reestablish a sense of self-efficacy in a demoralized patient. b) Cognitive-behavioral therapy (Turner et al., 1982; Moorey et al., 1996; Linton et al., 2005; Merlijn et al., 2005; Kroner-Herwing, 2009). This therapy combines cognitive techniques such as cognitive restricting and thought stopping, with behavioral techniques such as role playing and homework assignments. c) Relaxation training and biofeedback (Kelly, 1994; Victor & Richeimer, 2003; Dureja, 2006; Turk et al., 2008). The goals of relaxation training include reduction of maladaptive neuromuscular behaviors. Whereas, biofeedback refers to the instrumentation that can be used in conjunction with relaxation training. d) Active adaptation focuses on aspects of the patients' environment or lifestyle, that have the potential to support or not rehabilitative process (Victor &Reicheimer, 2003; Bergman, 2008; Nicholas, 2008; Albaladejo et al., 2010). The objective of this systematic review was to determine whether biopsychosocial therapy is more effective than reference treatments for chronic back and neck pain and to determine which types of interventions are most effective.

Comparisons that were investigated were:

- Biopsychosocial interventions versus other kinds of treatments
- Biopsychosocial interventions in addition to another treatment
- Comparisons among different types of biopsychosocial interventions

Method

Types of studies

Only randomized controlled trials (RCTs) were included.

Types of participants

Subjects with chronic back or neck pain (BNP) between 18 and 75 years of age were included.

Chronic BNP pain was defined as symptoms persisting 12 weeks or more. The RCTs that include subjects with specific BNP caused by pathologic entries (infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis or fractures) were excluded.

Types of interventions

The RCTs in which one or more biopsychosocial treatments were used were included in this systematic review. That is treatments based on medical, educational, cognitive behavioral, relaxation, biofeedback and social therapy principals.

Types of outcome measures

Included were RCTs in which at least one of the outcome measures that the reviewers considered to be important was used: overall improvement, BNP specific functional status, generic functional status, return to work and pain intensity.

Search strategy

All relevant RCTs meeting the inclusion criteria were identified by a computer aided research. Literature searches were conducted monthly between May 2013 and October 2013, according to the research strategy recommended by the Editorial Board of the Cochrane Back review Group (Bernaards et al., 2007; Albaladejo et al., 2010), using MEDLINE-Biomed (2000-October 2013), EMBASE-Elsevier (2000-October 2013). The following search terms were used: BIOPSYCHOSOCIAL/COGNITIVE BEHAVIOURAL/ PSYCHOLOGICAL/ EDUCATION/ BIOFEEDBACK/ RELAXATION/ LIFESTYLE/ BACK NECK CHRONIC PAIN. The reference lists of all included trials were searched for further relevant studies that may not have been identified by the databases above (citations tracking). Supplementary hand-searches of relevant journals, review articles were also performed by the researchers.

Study selection

Two independent reviewers conducted study selection using pre-piloted standardized forms. Consensus was used to resolve disagreements concerning inclusion of RCTs and a third reviewer was consulted if disagreements persisted.

MQ assessment of included articles

The Cochrane Back Review Group Guidelines represent the current “state of the art” of review methods in neck and back chronic pain research (Albaladejo et al., 2010). (Table1).

Table 1. Methodologic Criteria

Internal validity criteria			
1a) Method of randomization	+	-	?
1b) Concealment of treatment allocation	+	-	?
2a) Dropout rate during the intervention period	+	-	?
2b) Withdrawals during follow up	+	-	?
3) Co interventions avoided or equal	+	-	?
4) Blinding of patients	+	-	?
5) Blinding of outcome assessment	+	-	?
6) Blinding of care providers	+	-	?
7) Intention to treat analyses	+	-	?
8) Compliance	+	-	?
9) Similarity of baseline characteristics	+	-	?
10) Adequate length of follow up	+	-	?

The methodological quality of RCTs was independently assessed by two reviewers and the RCTs were included or excluded based on their MQ (Table 2).

Table 2. Criteria for the categorization of trial quality

Criteria for the categorization of trial quality	
Quality of RCT	
High	At least 70% of the methodological criteria met plus internal validity of ? 6/10
Medium	At least 50% of the methodological criteria met plus internal validity of ? 5/10
Low	At least 50% of the methodological criteria met plus internal validity of <5/10
Very low	Less than 50% of the methodological criteria met plus internal validity of <5/10

Data extraction

Two independent reviewers conducted data extraction for key study characteristics noted in table

3.

Table 3. Quality assessment of RCTs

Reference	1a	1b	2a	2b	3	4	5	6	7	8	9	10	Total
Albaladejo et al., 2010	+	+	+	+	-	+	-	+	+	+	+	+	10
Bernaards et al., 2007	+	-	+	+	+	-	-	-	?	+	+	+	6
Chao et al., 2011	+	-	+	+	+	-	?	-	-	+	+	+	7
Dufour et al., 2010	+	+	+	+	?	+	+	+	+	?	+	+	10
Gustavson et al., 2010	+	+	+	+	+	-	?	-	+	+	+	+	9
Hansen et al., 2011	+	+	-	-	?	+	+	+	+	-	+	+	8
Henchoz et al., 2010	+	+	+	+	+	-	+	-	+	-	?	+	8
Jensen et al., 2005	+	+	+	+	-	-	?	-	+	-	+	+	7
Jonshon et al., 2007	+	+	+	+	-	-	-	-	+	+	+	+	8
Lamb et al., 2010	+	+	+	+	?	?	+	+	+	+	+	+	10
Lamb et al., 2012	+	+	+	+	+	+	?	+	+	+	+	+	11
Lang et al., 2003	+	-	-	-	+	-	-	-	?	+	+	+	5
Lauche et al., 2013	+	+	+	+	+	?	-	+	+	+	+	+	10
Lindell et al., 2008	+	-	+	+	+	-	-	-	+	?	+	+	7
Linton et al., 2000	+	+	+	+	+	-	-	-	-	?	+	+	7
Linton et al., 2006	+	+	+	+	+	+	-	-	-	-	+	+	8
Michalsen et al., 2012	+	+	+	+	+	-	?	-	+	-	+	+	8
Monticone et al., 2012	+	+	+	+	+	+	?	-	-	+	+	+	9
Moore et al., 2000	+	+	+	+	+	-	-	-	+	-	+	+	8
O' Sullivan et al., 2013	+	-	-	-	+	?	-	-	-	?	+	+	4
Smeets et al., 2008	+	-	+	+	+	-	-	+	+	+	+	+	9
Vonk et al., 2004	+	+	-	-	+	+	+	+	+	-	+	+	9
Vong et al., 2011	+	+	+	+	+	+	?	+	+	+	+	+	11

Results

Study Selection

This search collected 42 references from Medline and Embase. The first selection was based on article, key words and abstracts, rejecting 178. being uncertain about inclusion of 25 and disagreeing about 5. Studies. Another review was consulted for 2 studies. The final selection was based on the full papers and resulted in inclusion of two additional trials. Another 3 additional trials were identified through reference cheking.

Methodologic quality

Table 3 shows the final results of the quality assessment. After consensus 20 (7%) of the 276 quality assessment (23 studies, 12 criteria) were scored unclear. Five authors responded to 9 requests and provided additional information on five studies. As a request 10 unclear scores were changed to negative and 4 scores to positive. In general the methodologic quality of the RCTs included this review was high. 21 studies (91%) had six or more positive scores which was the preset threshold for high quality. Only seven (30%) of the studies was the care providers blinded. Study characteristics are presented in table 4.

Table 4. Study Characteristics

Study Characteristics			
Study	Participants	Interventions	Outcomes
Albaladejo et al., 2010	330 participants with LBP (low back pain), 110 patients per group. Median age 52,5 years old.	Control Group (I): were given a booklet of healthy nutrition habits and 15-minute group talk. Education Group (II): were given a "back book" and 15-minute talk. Education Physiotherapy Group (III): received the same educational program as those in the educational group and a booklet on postural hygiene and a second 15-minute group talk in manipulation.	During the 6-month follow-up period, improvement in the "control" group was negligible. Improvement in the "education" and "education _ physiotherapy" groups was found for disability (2.0 and 2.2. Roland Morris Questionnaire points, respectively), LBP (1.8 and 2.10 Visual Analogue Scale points), referred pain (1.3 and 1.6 Visual Analogue Scale points), catastrophizing (1.6 and 1.8 Coping Strategies Questionnaire points), physical quality of life (2.9 and 2.9 SF-12 points), and mental quality of life (3.7 and 5.1 SF-12 points).
Bernaards et al., 2007	466 computer workers with frequent or long term neck and upper limb symptoms were randomized into: 1) work style (WS) group (n=152), 2) work style and physical activity group (WSPA) (n=156), 3) usual care group (UC) (n=158).	The WS and WSPA group attended six interactive group meetings in a six month period, focused on behavioral change with regard to body posture, workplace adjustment brakes and coping with high work demand and physical activity. Pain, disability at work, days with symptoms, months without symptoms were measured at baseline and after 6 (T1) and 12month (T2).	The single work style intervention was effective in reducing all pain outcomes, whereas the combined work style and physical activity intervention was not. The work style intervention was only effective on the long-term (i.e. after 12 months of follow-up) and not on the short-term (i.e. after 6 months of followup). Although changes in recovery and disability at work after 12 months of follow-up were more favourable in the intervention groups than in the usual care group, none of these effects were statistically significant.
Chao et al., 2011	60 participants with neck and back pain completed the randomized controlled trial separated in 4 groups: a biofeedback, an active exercise, a passive treatment and a control group.	The 3 interventions were applied for 6 weeks. In the biofeedback group, participants were instructed to use a biofeedback machine on the bilateral upper trapezius (UT) muscles daily while performing computer work. Participants in the exercise group performed a standardized exercise program daily on their own. In the passive treatment group, interferential therapy and hot packs were applied to the participants' necks and shoulders. The control group was given an education booklet on office ergonomics.	Postintervention, average pain and NDI scores were reduced significantly more in the biofeedback group than in the other 3 groups, and this was maintained at 6 months. Cervical erector spinae muscle activity showed significant reductions postintervention in the biofeedback group, and there were consistent trends of reductions in the UT muscle activity. Six weeks of biofeedback training produced more favorable outcomes in reducing pain and improving muscle activation of neck muscles in patients with work-related neck and shoulder pain.
Dufour et al., 2010	286 participants with chronic low back pain, 18-60 years old separated in 2 groups: A) a group-based multidisciplinary biopsycosocial rehabilitation program or B) intensive individually therapist-	12-week program comprising 73 hours of therapist exposure (approximately 12 h/patient): 35 hours of hard physical exercise, 22 hours of light exercise/occupational therapy, and 16 hours of education (group A) or a 12-week program comprising 1 hour of personal training twice a week, i.e., therapist exposure 24 h/patient (group B). At	After treatment, significant improvements were observed with regard to pain, disability, and most of the quality of life dimensions. These effects were sustained over the 24-month follow-up period. There were some statistically significant differences between the 2 groups relating to secondary end points, Roland-Morris disability questionnaire, and in the MOS 36-Item Short-Form Health Survey the "physical functioning" dimension and the "physical

	assisted back muscle strengthening exercises.	baseline and at 3, 6, 12, and 24 months, patients filled out questionnaires on pain (visual analogue scale [VAS]-pain average, which was the primary outcome measure), Roland-Morris disability questionnaire, global perceived outcome, and 36-Item Short-Form General Health Survey.	component summary." Both groups showed long-term improvements in pain and disability scores, with only minor statistically significant differences between the 2 groups..
Gustavson et al., 2010	156 patients 18-65 years old with neck pain randomly assigned to either the experiment treatment PASS, or to the control treatment APT.	The PASS treatment consisted of an information and training program carried out with groups of patients, including both participants in the study and other patients with musculoskeletal pain referred to the PHC centres. It consisted of seven 1.5-h sessions, over a period of 7-weeks, and an additional booster session at 20-weeks after the initial session. Each session consisted of applied relaxation training, body awareness exercises, lectures and group discussions. APT entailed individual physical therapy sessions according to current practice and was not a standardized treatment procedure.	On average participants receiving PASS attended seven treatment sessions and participants receiving IAPT 11 sessions over the 20-week follow-up period. Repeated measures ANCOVA showed significant time group interaction effects for ability to control pain $\delta p < 0:001p$, self-efficacy regarding pain-interfering activities $\delta p \frac{1}{4} 0:005p$, disability due to neck pain ($p = 0.001$) and levels of catastrophic thinking $\delta p < 0:001p$ in favour of PASS. PASS had a better effect than IAPT in the treatment of persistent musculoskeletal tension-type neck pain regarding coping with pain, in terms of patients' self-reported pain control, self-efficacy, disability and catastrophizing, over the 20-week follow-up.
Hansen et al., 2011	200 adults with a minimum age of 18 years old with CNP (chronic neck pain) have been recruited. Patients randomized to either the Pain management Group (control) or the Pain management and Training Group (intervention).	The Pain Management (control) group will receive education in pain management strategies. There will be 4 sessions of 1 1/2 hours, covering topics regarding pain mechanisms, acceptance of pain, coping strategies, and goal-setting, based upon pain management and cognitive therapy concepts. The Pain Management plus Training (intervention) group will receive the same education in pain management as those in the control group plus 8 treatment sessions with the same period of 4 months length.	The primary outcome measures will be Medical Outcomes Study Short Form 36 (SF36), Physical Component Summary (PCS). Secondary outcomes will be Global Perceived Effect (-5 to +5), Neck Disability Index (0-50), Patient Specific Functioning Scale (0-10), numeric rating scale for pain bothersomeness (0-10), SF-36 Mental Component Summary (MCS), TAMPA scale of Kinesiophobia (17-68), Impact of Event Scale (0-45), EuroQol (0-1), craniocervical flexion test (22 mmHg - 30 mmHg), joint position error test and cervical range of movement. The SF36 scales are scored using norm-based methods with PCS and MCS having a mean score of 50 with a standard deviation of 10.
Henchoz et al., 2010	109 patients with LBP between 18-60 years old from a rheumatologic outpatient clinic.	Patients were randomised to either a 3-week functional multidisciplinary rehabilitation programme, including physical and ergonomic training, psychological pain management, back school and information, or 18 sessions of active outpatient physiotherapy over 9 weeks.	Oswestry disability index was improved to a significantly greater extent after functional multidisciplinary rehabilitation compared to outpatient physiotherapy at follow-up of 9 weeks ($P = 0.012$), 9 months ($P = 0.023$) and 12 months ($P = 0.011$). Work status was significantly improved after functional multidisciplinary rehabilitation only ($P = 0.012$), resulting in a significant difference compared to outpatient physiotherapy at 12 months' follow-up ($P = 0.012$). Secondary outcome results were more contrasted. Functional multidisciplinary rehabilitation was better than outpatient physiotherapy in improving functional and work status. From an economic

Jensen et al., 2005	214 patients 18-60 years old suffering from long term spinal pain. The source population was persons covered by AGS insurance scheme.	The study employed a 4!5 repeated-measures design with four groups and five assessment periods during a 3-year follow-up. The group studied consisted of blue-collar and service/care workers on sick leave, identified in a nationwide health insurance scheme in Sweden. After inclusion, the subjects were randomised to one of the four conditions: behaviour-oriented physiotherapy (PT), cognitive behavioural therapy (CBT), behavioural medicine rehabilitation consisting of PTCCBT (BM) and a 'treatment-as-usual' control group (CG).	point of view, these results should be backed up by a costeffectiveness study.
Jonshon et al., 2007	234 patients 18-65 years old with persistent disabling LBP. 196 subjects (84%) completed follow up 12 months after the completion of the intervention program. Intervention group n=116 and control group n= 118.	The intervention arm received a program of eight 2-hour group exercise session over 6 weeks comprising active exercise and education delivered by physiotherapists using a CBT approach. Both arms received an educational booklet and audio-cassette. The primary outcome measures were pain (0-100 Visual Analogue Scale) and disability (Roland and Morris Disability Scale; score 0-24).	The results showed, consistently, the full-time behavioural medicine programme being superior to the three other conditions. The strongest effect was found on females. Regarding sick leave, the mean difference in the per-protocol analysis between the BM programme and the control group was 201 days, thus reducing sick leave by about two-thirds of a working year. Rehabilitating women has a substantial impact on costs for production losses, whereas rehabilitating men seem to be effortless with no significant effect on either health or costs. A full-time behavioural medicine programme is a cost-effective method for improving health and increasing return to work in women working in blue-collar or service/care occupations and suffering from back/neck pain. A total of 196 subjects (84%) completed follow-up 12 months after the completion of the intervention program. The intervention showed only a small and nonsignificant effect at reducing pain (-3.6 mm; 95% confidence interval, -8.5, 1.2 mm) and disability (-0.6 score; 95% confidence interval, -1.6, 0.4). The cost of the intervention was low with an incremental cost-effectiveness ratio of pound5000 (U.S. \$8650) per quality adjusted life year. In addition, patients allocated to the intervention that had expressed a preference for it had clinically important reductions in pain and disability.
Lamb et al., 2010	701 patients with chronic LBP with mean age 54 years old.	Participants were randomised to receive either AM (active management) and CBA (cognitive behavioura approach) or AM alone.	Benefits were seen across a range of outcome measures in favour of CBA with no evidence of group or therapist effects. CBA resulted in at least twice as much improvement as AM. Mean additional improvement in the CBA arm was 1.1 [95% confidence interval (CI) 0.4 to 1.7], 1.4 (95% CI 0.7 to 2.1) and 1.3 (95% CI 0.6 to 2.1) change points in the RMQ at 3, 6 and 12 months respectively. Additional improvement in MVK pain was 6.8 (95% CI 3.5 to 10.2), 8.0 (95% CI 4.3 to 11.7) and 7.0 (95% CI 3.2 to 10.7) points, and in MVK disability was 4.3 (95% CI 0.4 to 8.2), 8.1 (95% CI 4.1 to 12.0) and 8.4 (95% CI 4.4 to 12.4) points at 3, 6 and 12 months respectively. At 12 months, 60% of the AM+CBA arm and 31% of the AM arm reported some or complete recovery.
Lamb et al., 2012	74 patients with chronic LBP from 56 general practices in 7	All participants received a 10-15 min session of (BPA) best practice advice to remain active provided by a	After 12 months, the improvements in pain and disability observed with CBI were sustained. For disability measures, the treatment

	localities across England. Participants were randomized to the experimental intervention in a ratio 2:1.	trained health professional. The intervention group allocated to BPA+ CBI (cognitive behavioural intervention).	difference in favour of CBI persisted (mean difference 1.3 Roland and Morris Disability Questionnaire points, 95% confidence interval 0.27 to 2.26; 5.5 Modified von Korff Scale disability points, 95% confidence interval 0.27 to 10.64). There was no between-group difference in Modified von Korff Scale pain outcomes. The effects of a group CBI are maintained up to an average of 34 months.
Lang et al., 2003	208 patients with chronic LBP recruited in the community of a selected region. The participants separated in a prospective intervention group versus a prospective observational usual care group.	The control group received usual care by independent physicians group and was treated by usual non multidisciplinary treatments. The MRP multidisciplinary rehabilitating program group participated in a comprehensive MRP with functional restoration of 20 days and 4 hours per day.	Patients of the MRP group improved in the physical and mental health domains of the SF-36 more than patients treated by usual care (p=.05). Days off work were more (p=.05) reduced by the MRP (16.35 days) than by usual care (.2.39 days). Overall appraisal of successful outcome was better (p=.01) after MRP (54% of patients) as compared with usual care (24% of patients). The pain intensity (NRS), the pain-related interference with function (Brief Pain Inventory; BPI) and the depression scores (ADS) did not differ significantly between both groups.
Lauche et al., 2013	61 patients with CNP aged 24-74 years old. Participants were allocated to CM (copping massage) group and to PMR (progressive muscle relaxation) group.	Cupping Massage (CM) group. These participants, and a partner attended a one-hour practical workshop to learn how to use cupping massage. Patients, and those accompanying them, then practiced the cupping massage technique, with staff members providing feedback and suggestions for improvement as needed. Two treatment sessions per week of 10–15 minutes' duration each at comfortable intensity were recommended. Progressive Muscle Relaxation (PMR) group. Participants in this group attended a onehour session led by a psychologist experienced in delivering relaxation training. They then practiced a shortened version of the PMR technique. Patients were asked to practice relaxation at home twice a week for 20 minutes a session and to record their practice in a diary. At the end of the trial, they were also offered a cupping massage workshop	After treatment, both groups showed significantly less pain compared to baseline however without significant group differences. Significant effects in favor of cupping massage were only found for wellbeing and pressure pain thresholds. In conclusion, cupping massage is no more effective than progressive muscle relaxation in reducing chronic non-specific neck pain. Both therapies can be easily used at home and can reduce pain to a minimal clinically relevant extent. Cupping massage may however be better than PMR in improving well-being and decreasing pressure pain sensitivity but more studies with larger samples and longer follow-up periods are needed to confirm these results.
Lindell et al., 2008	After stratification by age ($\leq 44 \geq 45$ years) and sub acute/chronic BNP, 125 Swedish primary-care patients were randomly allocated to cognitive-behavioral rehabilitation	One treatment group was allocated to cognitive-behavioural rehabilitation at the rehabilitation centre (rehabilitation group). The other treatment group was allocated to continued primary care (primary-care group). The centre used a cognitive-behavioural programme with the aim of achieving the	All patients: <i>Return-to-work share</i> and <i>Return-to-work chance</i> were equivalent between the groups. <i>Net days</i> and <i>Visits</i> were equivalent over 18 months but decreased significantly more rapidly for the rehabilitation group over the six-month periods ($p < .05$). Subacute patients: <i>Return-to-work share</i> was equivalent. <i>Return-to-work chance</i> was significantly greater for the rehabilitation group (hazard ratio

	(rehabilitation group) or continued primary care (primary-care group).	maximal degree of work ability lasting for at least 30 consecutive days.	3.5 [95%CI1.001 – 12.2]). <i>Net days</i> were equivalent over 18 months but decreased significantly more rapidly for the rehabilitation group over the six-month periods and there were 31 days fewer in the third period. <i>Visits</i> showed similar though non-significant differences and there were half as many in the third period. Chronic patients: <i>Return-to-work share</i> , <i>Return-to-work chance</i> and <i>Net days</i> were equivalent. <i>Visits</i> were equivalent over 18 months but tended to decrease more rapidly for the rehabilitation group and there were half as many in the third period (non-significant).
Linton et al., 2000	272 patients with chronic low back pain aged 18-60 years old. The participants separated in to 3 groups: Pamphlet group, information package group, cognitive behavioral therapy group.	Participants randomized to the pamphlet group received a previously evaluated pamphlet to read concerning back pain. The information package group received a packet of information once a week for 6 weeks. Each package contained advice and illustrations showing how the patient might cope with spinal pain or prevent it by such methods as lifting properly and maintaining good posture. The information was broad and relatively general. Cognitive-Behavior Therapy Intervention. A six-session structured program was offered, in which participants met in groups of 6 to 10 people for 2 hours once a week for 6 weeks. The therapy followed a written manual, and the therapists were certified behavior therapists who had received special training and guidance in administering this group treatment.	The comparison groups reported benefits. However, the risk for a long-term sick absence developing was lowered ninefold for the cognitive-behavior intervention group as compared with the risk for the information groups (relative risk, 9.3). Participants in the cognitive behavior group also reported a significant decrease in perceived risk. The cognitive-behavior group demonstrated a significant decrease in physician and physical therapy use as compared with two groups receiving information, in which such use increased. All three groups tended to improve on the variables of pain, fear-avoidance, and cognitions.
Linton et al., 2006	213 patients with back pain aged 18-75 years old were randomized in to the cognitive behavioral group or to usual care plus information on self care.	This group received standardized, written information. Each person received a pamphlet emphasizing self-help and the need to remain active. A 6-session (2 hours) manual program was offered. Sessions activated participants and promoted coping. Participants developed their own coping program and devised a maintenance program.	The cognitive behavioral group had significantly less pain, was more active, enjoyed better quality of life, and had better general health relative to the information comparison group. There was no difference on health care use. The risk of long-term sick leave was 3 times higher in the information comparison group. The cognitive behavioral group had significantly less lost productivity costs and a lower total cost/y/person compared to the information comparison group.
Michalsen et al., 2012	77 patients with CNP between ages of 18-60 years old were separated to YIG (yoga intervention group) and to CG (control group).	YIG: The yoga group participated in the weekly 90-minute yoga classes according to the Iyengar style in a fully equipped yoga studio. Within the Iyengar yoga style, classical yoga poses are applied and adapted specifically to health problems including neck and back pain. Subjects were requested to practice	Mean pain at rest was reduced from 44.3 ± 20.1 to 13.0 ± 11.6 at week 10 by yoga and from 41.9 ± 21.9 to 34.4 ± 21.1 by self-care/exercise (group difference: -20.1 , 95% confidence interval: $-30.0, -10.1$; $P < .001$). Pain at motion was reduced from 53.4 ± 18.5 to 22.4 ± 18.7 at week 10 by yoga and from 49.4 ± 22.8 to 39.9 ± 21.5 by self-care/exercise (group difference: -18.7 , 95% confidence interval: $-29.3, -8.1$; P

		selected postures at home for 10 to 15 minutes, 2 to 3 times a week. C.G Participants in the exercise group received a standard self-care manual that specifically addressed exercise and education for chronic neck pain. A total of 12 exercises were described focusing on muscle stretching and strengthening, and joint mobility.	< .001). Significant treatment effects of yoga were also found for pain-related apprehension, disability, QOL, and psychological outcomes. Sensitivity analyses suggested minimal influence of dropout rates
Mondicone et al., 2012	80 patients with CNP age 18-70 of whom 40 were randomized to the PT (physiotherapy) group and 40 to the PTcb (physiotherapy plus cognitive behavioral therapy).	PT group: consisting of a multimodal approach, including passive and active mobilisation of the neck, and exercises aimed at improving postural control, strengthening muscles and stretching PTcb: The physiotherapists concentrated on the subjects' beliefs, negative automatic thoughts and behaviours. Using a process of correct re-learning and cognitive reconditioning, the approach consisted of gradually recovering physical abilities and treating some psychosocial characteristics of patients with chronic pain, such as fear of movement, hypervigilance, catastrophising and the reduction of social relationships.	Disability improved similarly in both groups over time, remaining stable until T3 in the PTcb group and slightly increasing at the same time in the PT group. Pain trends were comparable, with both groups showing an improvement between T1 and T2, and a slight worsening between T2 and T3. There were significant increases in all of the SF-36 domains except for health in general, and vitality in both groups by the end of treatment. SF-36 showed a between-group difference only for the physical activity domain (10.4; 95 % CI 2.4–18.5).
Moore et al., 2000	226 patients with back pain, mean age 49 years, old completed the baseline interview were randomized: 113 to self care group and 113 to usual care group.	The intervention involved a two session Self Care group and an individual meeting and telephone conversation with the group leader, a psychologist experienced in chronic pain management. The intervention was supplemented by educational materials (book and videos) supporting active management of back pain. The control group received usual care supplemented by a book on back pain care.	Participants assigned to the Self Care intervention showed significantly greater reductions in back-related worry and fear-avoidance beliefs than the control group. Modest, but statistically significant, effects on pain ratings and interference with activities were also observed.
O ' Sullivan et al., 2013	24 patients with chronic LBP. Participants' mean age was 24, 7 years old. Subjects categorized in PD (pain developers) and NPD (non pain developers).	A total of 24 participants with non-specific CLBP sat for 2 h while their seated posture and low back discomfort (LBD) were analysed. A total of 16 pain developers (PDs), whose LBD increased by at least two points on the numeric rating scale, repeated the procedure 1 week later, while receiving postural biofeedback.	PDs were older ($p \leq 0.018$), more disabled ($p \leq 0.021$) and demonstrated greater postural variability ($p \leq 0.001$). The ramping up of LBD was reduced ($p \leq 0.002$) on retesting, when sitting posture was less end-range ($p \leq 0.001$), and less variable ($p \leq 0.032$). Seated LBD appears to be related with modifiable characteristics such as sitting behaviour. Among people with sitting-related NSCLBP, the ramping up of LBD was reduced by modifying their sitting behaviour according to their individual clinical presentation. The magnitude of change, while statistically significant, was small and no follow-up of participants was completed.
Smeets et al., 2008	172 patients 18-65 years old with chronic	Each cluster of 4 consecutive patients was assigned one of the three active	During the one-year follow-up, there were no significant differences between each single

	LBP referred for rehabilitation treatment were randomized in clusters of 4 consecutive patients.	treatments or a waiting list. 10 weeks of aerobic training and muscle strengthening of back extensors (active physical treatment; APT), 10 weeks of gradual assumption of patient relevant activities based on operant-behavioral principles and problem solving training (graded activity plus problem solving training; GAP), or APT combined with GAP (combination treatment; CT).	treatment and the combination treatment on the primary outcome, the Roland Disability Questionnaire. Among multiple other comparisons, only one significant difference emerged, with GAP and APT showing higher self-perceived improvement than CT. The combination treatment integrating physical, graded activity with problem solving training is not a better treatment option for patients with chronic low back pain.
Vong et al., 2004	160 patients with chronic neck pain age 18-66 years old, separated in to 2 groups: the graded activity programmed group (GAPG) and the physiotherapy treatment group (PTG).	Treatment is according to a biomedical model, which implies guidance based on the amount and severity of pain that the patient experiences. An operant approach was the basis of the behavioural graded activity programme as used in this study. The treatment is according to a biopsychosocial model, which implies that it is guided by the patients' functional abilities and that time-contingent methods are used to increase the activity level of the patient. The behavioural graded activity programme has three phases; a baseline phase, a treatment phase, and a generalization phase. These phases are not bound to strict time limits but can gradually merge into each other.	Direct and indirect costs will also be assessed. Secondary outcomes include the patient's main complaints, pain intensity, medical consumption, functional status, quality of life, and psychological variables. Recruitment of patients will take place up to the end of the year 2004 and follow-up measurement will continue until end 2005.
Vong et al., 2011	76 patients with chronic low back pain were randomly assigned to receive 10 sessions of either MET plus PT or PT alone treatment. MET included motivational interviewing strategies and motivation-enhancing factors. The PT program consisted of interferential therapy and back exercises	All subjects received ten 30-minute PT sessions in 8 weeks which included 15 minutes of interferential therapy and a tailor-made back exercise program. The patient's exercise performance was monitored during treatment sessions to ensure that these exercises were performed correctly. Exercises also were prescribed as home exercises, and patients were requested to exercise daily. During PT sessions, subjects in the experimental group received MET from their respective physical therapists, who integrated MI skills and several psychosocial components designed to enhance the motivation of subjects to engage in treatment and make appropriate behavioral changes.	The MET-plus-PT group produced significantly greater improvements than the PT group in 3 motivationenhancing factors; proxy efficacy (P..001), working alliance (P..001), and treatment expectancy (P..011). They performed significantly better in lifting capacity (P..015), 36-Item Short Form Health Survey General Health subscale (P..015), and exercise compliance (P..002) than the PT group. A trend of a greater decrease in visual analog scale and Roland-Morris Disability Questionnaire scores also was found in the MET-plus-PT group than the PT group.

Dufour and his team in their RCT conducted 12 week program comprising 72 hours of therapist exposure, 22 hours of light exercise and 16 hours of education for the experimental group (Dufour et al., 2010). After treatment significant improvements were observed with regard to pain, disability and most of the quality of life dimensions. Another study compared the control group received usual care with multidisciplinary rehabilitating program group MRP. Patients of the MRP improved in the physical and mental health domains of the SF-36. Overall appraisal of successful outcome was better (Lang et al., 2003).

Cognitive- behavioral approached

A high quality research conducted by Lamb and his partners (Lamb et al., 2010). Participants in this RCT were randomized to receive active management (control group) either active management plus cognitive behavioral approach CBA. Benefits were seen across a range of outcome measures in favor of cognitive behavioral approach. CBA resulted in at least twice as much improvement as active management. Another research focused on behavioral change with regard to body posture, workplace adjustment brakes and coping with high work demand and physical activity (Bernaards et al., 2007). Although changes in recovery and disability were more favorable in the intervention groups than in the usual care group, none of these effects were statistically significant. A high quality research took place in 7 locations across England. All patients received 12-15 sessions of the best practice advice BPA to remain active. The experimental group allocated to BPA + cognitive behavioral intervention CBI. After 12 months the improvements in pain and disability observed were sustained and for disability measures the treatment difference in favor of CBI persisted (Lamb et al., 2012). Six more studies identified to use the cognitive-behavioral therapy approach were significant increases in all of the quality of life aspect in general (Linton et al., 2000; Jensen et al., 2005; Lindel et al., 2008; Smeets et al., 2008; Hansen et al., 2011; Monticone et al., 2012;)

Educational Approach

A research with 330 participants with LBP used an educational program plus 15 minute talk versus a booklet of healthy nutrition's habits and 15 minutes group talk (Albaladejo et al., 2010). During the 6 month follow up period improvement in the control group was negligible, when improvement in the educational group was found for disability, LBP, referred pain,

catastrophizing, physical quality of life and mental quality of life. Another study compared usual care versus an intervention involved in two sessions self care group and an individual meeting with the group leader, plus educational program with books and videos supporting active management of back pain. Participants assigned to the intervention group showed significantly greater reduction in back related worry and fear avoidance beliefs than the control group (Moore et al., 2000).

Relaxation approach

In a recent study a team of researchers compared a standard self care manual with yoga intervention program according to the Iyengar style in a fully equipped yoga studio (Michalsen et al., 2012). Mean pain at rest was reduced at week 10 by yoga. Pain at motion was also reduced. Significant treatment effects of yoga were also found for pain related apprehension, disability, quality of life and psychological outcomes. Another study included a comparison between a coping massage program CM and a progressive muscle relaxation program PMR. After treatment both groups showed significantly less pain compared to baseline, however, without significant differences. CM may be better than PMR in improving well-being and decreasing pressure pain (Lauche et al., 2013).

Biofeedback approach

Chao and his team separated 60 participants in 4 groups: a biofeedback, an active exercise, a passive treatment and a control group (Chao et al., 2011). In the biofeedback group patients were instructed to use a biofeedback machine. Post intervention, average pain scores were reduced significantly more in the biofeedback group rather than in the 3 other groups. Six week of biofeedback training produced more favorable outcomes in reducing pain and improving muscle activation of neck muscles. Another research investigated the effect of real time postural biofeedback on seated discomfort in people with CLBP showing that the magnitude of change, while statistically significant was small and no follow up of participants was complete (O'Sullivan et al., 2013).

Discussion

The educational treatment approach yielded modest, but encouraging benefits in terms of patient worries, attitudes toward self care, pain intensity, fear-avoidance and functional outcomes. These results point to the potential for patients to assume greater responsibility for managing back and

neck pain than is often expected by health care professionals (Moore et al., 2000). LBD was significantly reduced using real-time postural biofeedback which was matched to the individual clinical presentation to facilitate a more neutral, less variable, sitting posture (O'Sullivan et al., 2013).

There are indications that cognitive-behavioral rehabilitation in the longer run might be superior. For chronic BNP, it might be superior in terms of both sick-listing and health-care visits. More conclusive results concerning this possible long-term effect might require a longer follow-up (Lindell et al., 2008). CBT-oriented self-management groups may be helpful in reducing disability and health care use (Linton & Andersson, 2000). A cognitive-behavioral group intervention produces long-term health and economic benefits. Usual medical care might be improved considerably by implementing these psychologic methods (Linton & Nordin, 2006).

The present study underlines the importance of treating all aspects of chronic BNP in a multidisciplinary team following biopsychosocial principles. Outpatient physiotherapy included active exercises, in accordance with current recommendations. Given the high cost of health care, a cost-effectiveness study is needed to determine whether the benefits of functional multidisciplinary rehabilitation, compared to outpatient physiotherapy, are worth the additional costs. The contrasting literature in this area suggests that further research is still needed (Henchoz et al., 2010).

Results from 23 studies included in this systematic review showed that there is strong evidence that cognitive behavioral treatment of patients with CBNP, which is part of the biopsychosocial treatment approach, has a positive effect on pain intensity, generic functional status and behavioral outcomes, when compared with booklets of healthy information, standardized exercise programs, active management, best practice advise and standardized active physical treatment. There is strong evidence that a cognitive behavioral program plus a lifestyle change program added to a usual biomedical treatment program for chronic back or neck pain has positive effect. However, it is still unclear which type of biopsychosocial treatment is the most effective, which components of this approach are necessary and which are super flows. This seems especially relevant now that the biopsychosocial model has been widely accepted and multimodal or multidimensional treatment programs are becoming more and more popular. We

conclude that the biopsychosocial treatment approach is a promising method to improve health-related quality of life for patients with chronic back pain in the community.

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