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Yorke J, Fleming SL, Shuldham C.
Psychological interventions for adults with asthma.
Cochrane Database of Systematic Reviews 2006, Issue 1. Art. No.: CD002982.
DOI: [10.1002/14651858.CD002982.pub3](https://doi.org/10.1002/14651858.CD002982.pub3).

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[Intervention Review]

Psychological interventions for adults with asthma

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Editorial group: Cochrane Airways Group

Publication status and date: Edited (no change to conclusions), published in Issue 1, 2009.

Citation: Yorke J, Fleming SL, Shuldham C. Psychological interventions for adults with asthma. *Cochrane Database of Systematic Reviews* 2006, Issue 1. Art. No.: CD002982. DOI: [10.1002/14651858.CD002982.pub3](https://doi.org/10.1002/14651858.CD002982.pub3).

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ABSTRACT

Background

Many people have asthma, and for some their symptoms may be triggered by psychological factors. In addition, compliance with medical therapy may have a psychological dimension. Therefore, psychological interventions aim to reduce the burden of symptoms and improve management of the disease.

Objectives

To assess the effectiveness of psychological interventions for adults with asthma.

Search methods

The Cochrane Airways Group Specialised Register and PsycINFO were searched with pre-defined terms up until May 2007.

Selection criteria

Randomised controlled trials published in any language assessing the effects of a psychological intervention compared with a form of control in adult participants were included in the review. Our primary outcome was healthcare resource defined as: hospitalisation, emergency room visits and/or GP visits

Data collection and analysis

Two reviewers assessed the relevance of abstracts identified by electronic searching and retrieved agreed studies for further scrutiny. The studies that met the inclusion criteria were assembled and data extracted.

Main results

Fifteen studies, involving 687 participants, were included in the review. Study quality was poor and sample sizes were frequently small. However, some pooled effects were analysed. Three studies measured our primary outcome but individually did not report significant differences between treatment and control. The use of 'as needed' medications was reduced in two studies, (47 patients), by relaxation therapy (OR 4.47, CI 1.22 to 16.44). There was no significant difference in FEV1 for relaxation therapy in four studies of 150 patients, (SMD -0.01, CI -0.41 to 0.40). Quality of life, measured using the Asthma Quality of Life Questionnaire in two studies, (48 patients), showed a positive effect following CBT (WMD 0.71, CI 0.23 to 1.19). Peak Expiratory Flow outcome data in two studies, (51 patients), indicated a significant difference in favour of bio-feedback therapy (SMD 0.66, CI 0.09 to 1.23) but no significant difference following relaxation therapy (WMD 43 L/min, CI -5 to 92 L/min). There was no statistically significant improvement in depression levels following relaxation therapy (SMD 0.17, CI -0.25 to 0.59). The remainder of the findings between studies were conflicting. This may have been due to the different types of interventions used and the deficiencies in trial design.

Authors' conclusions

This review was unable to draw firm conclusions for the role of psychological interventions in asthma due to the absence of an adequate evidence base. Larger, well-conducted and reported randomised trials are required in this area, in order to determine the effects of these techniques in the treatment of asthma in adults.

PLAIN LANGUAGE SUMMARY**Psychological interventions for adults with asthma**

It is thought by some that psychological interventions can help people with asthma. Systematically, we searched the literature on psychological interventions to find valid studies that looked at the effects of providing mainly psychological interventions for adults with asthma. The studies found examined many different therapies and measured different physical and psychological outcomes; for these reasons, their results could not be easily combined. However, meta-analyses could be performed to determine the effect of Cognitive Behavioural Therapy (CBT) on quality of life, bio-feedback on PEF, and relaxation therapy on PEF and FEV1 and medication use. The available studies were completed with small numbers of people and the way the studies were conducted could be improved. More research with larger numbers of people and improved design needs to be done before it is known whether psychological interventions are effective in improving health outcomes for adults with asthma.

BACKGROUND

An estimated 5.1 million people in the UK have asthma (including 1.4 million children). Asthma is expensive, resulting in an estimated cost to the NHS in England of £850 million a year. There are also indirect costs to the economy as over 18 million working days are lost due to the disease each year. People with asthma also incur costs for medication, travel to GP surgeries and medical equipment (NAC 2001). The high frequency of the disease, and its attendant costs, have prompted the production of guidelines for the management of asthma (BTS 2003). These guidelines include medication management as well as recommendations to improve patients' self-management skills in the form of Asthma Action Plans. Most patients with asthma are treated in primary care and outpatient settings and the overall success of treatment relies on the contribution to effective management that the patient can bring to bear. This includes factors such as compliance with medical therapy, effective inhaler technique and the ability to manage psychological elements. Asthma has a psychological component, including emotion (Lehrer 1993), so the treatment of asthma increasingly needs to focus on the whole person, taking account of psychological as well as physiological elements. This means that evidence to support clinical staff in deciding upon the type, format and frequency of psychological techniques is needed. The aim of these strategies is to help reduce panic or fear, improve breathing and respiratory function and impact positively on general health and quality of life.

Literature is growing on the relationship between psychosocial factors and asthma. Bosley 1996 found in their review of studies on asthma deaths and near fatal asthma attacks that asthma deaths are related to lack of prompt medical treatment and lack of prompt action by patients and their relatives. They also suggested that there may be an association between psychiatric and asthma morbidity and that a near fatal attack may increase denial or psychiatric problems. Patient's attitudes to their illness may affect their coping skills and compliance with treatment. Because of the psychosocial effects of asthma, strategies such as cognitive-behavioural therapy (Kotses 1995), and group and individual counselling (Bailey 1990) are now integrated with educational packages about the self-management of asthma in order to improve health outcomes. Other psychotherapies that have been used are autogenic therapy (Henry 1993) and relaxation therapy (Lehrer 1994).

There is a growing body of work using review methodologies to assess the impact of a range of psychosocial interventions in asthma. For example, Devine 1996 showed that psycho educational programmes involving relaxation and behavioural techniques improved health outcomes for adults with asthma. Reviews have been undertaken on self-management education for asthmatic adults (Gibson 2002a), limited asthma education for adults (Gibson 2002b), family therapy for asthma in children (Yorke 2005a) and psychological interventions for children with asthma (Yorke 2005b). Gibson 2002a concluded that training in asthma self-management, which involves self-monitoring by peak flow or symptoms, coupled with regular medical review and a written plan, appears to improve health outcomes for adults with asthma. Training programmes, which enable people to adjust their medication, also appeared to be more effective than other forms of self-management. In contrast limited asthma education, meaning information only, did not appear to improve health outcomes in adults with asthma,

although perceived symptoms might improve (Gibson 2002b). Reviews led to the conclusion that more work is needed to elucidate the effect of providing information in the emergency department for adults (Gibson 2002b) and children (Haby 2002). Yorke 2005a in their review of the only two trials on family therapy in asthma and of 12 trials on psychotherapeutic interventions for children (Yorke 2005b) found some indication that this is a useful adjunct to medication for younger people with asthma.

These reviews do not answer questions specifically about psychological interventions and therefore a systematic review of the effectiveness of psychological interventions for adults with asthma is also required. When managing patients, clinical staff need to have reliable information on whether psychological techniques work, and if so which are the most effective, for which patients. It is also important to know whether interventions work best alone or in combination with each other, and whether it is better that patients are taught individually or in groups. If possible it would also be useful for staff and patients to know what benefits might be expected, and whether they are short-lived or last in the longer term.

OBJECTIVES

The purpose of this study was to conduct a systematic review of randomised controlled trials and a meta-analysis of all randomised trials where the efficacy of psychological interventions in modifying health and behavioural outcomes for adults with asthma was investigated.

The specific objectives were:

1. To assess the overall efficacy of psychological interventions compared with usual treatment in improving health and behavioural outcomes for adults with asthma.
2. To assess the comparative efficacy of different types of psychotherapy for adults with asthma.
3. To assess the comparative efficacy of individual and group formats of psychotherapy for adults with asthma.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs) comparing the effects of psychological interventions for adults with asthma. In the original protocol it was stated that this review would examine CCTs (case-controlled trials) on this subject as well, however as RCTs provide the stronger level of evidence, it was decided to concentrate on these only and a search strategy was designed to include RCTs. The original version of this review included two cross-over trials (Loew 2001; Mussell 1988). We consider this study design inappropriate for studies using psychological interventions as the influence of a treatment might continue after the intervention has been stopped and were therefore excluded from this systematic review.

Types of participants

Adults, both male and female, over 16 years of age with asthma who have been physician diagnosed or have been diagnosed using internationally established criteria (e.g. BTS guidelines).

Treatments in both in and out patient settings were included.

Types of interventions

Any type of psychological intervention used in the treatment of asthma in adults was considered for this review. Psychological interventions have a long history and have been defined as the procedure by which a therapist purposively and systematically attempts to influence a patient by psychological means so that the patient's symptoms decrease or there is a positive change in behaviour (Barendregt 1957). These interventions will be delivered by a trained practitioner or in consultation or supervision by a trained practitioner. Psychotherapy models were categorised according to their theoretical base as follows:

1. Cognitive behavioural therapy (incorporating core elements of both behavioural and cognitive models)

Using behavioural techniques to change negative thoughts mediating health behaviour. In asthma, this may address incorrect symptom attributions (over- or under-playing their significance) giving rise to suboptimal medication use, or may use systematic relaxation techniques to extinguish fear responses associated with psychosocial triggers.

2. Cognitive therapy

Identification and constructive management of damaging thoughts, such as perceptions of helplessness or inappropriate fear of asthma attack that can trigger episodes. Information (e.g. about the relationship between anxiety and bronchoconstriction) also targets cognitions.

3. Behavioural therapy

Concerned with identifying the processes by which behaviour has been learned via association, reward or observation and modifying behaviour using methods such as systematic desensitization, selective reinforcement and positive modelling. The behaviour itself, rather than underlying motivations, is the focus of behavioural interventions.

4. Relaxation therapy

Designed to control stress & anxiety. In asthma, may reduce panic or fear & improve breathing and respiratory function. Approaches include progressive relaxation (systematically creating tension and release in different parts of the body and/or via guided mental imagery), autogenic training (focuses on attending to bodily feelings and mentally controlling them), hypnosis (deep relaxation that may be induced using mental imagery, often accompanied by autosuggestion to create positive thoughts & feelings). Hypnosis is also thought to induce a state of suggestibility, facilitating both patients' insight into their unconscious motives or anxieties and the absorption of therapeutic messages.

5. Bio-feedback therapy

Feedback of biological indicators, which the subject learns to control using relaxation. May also be considered a behavioural intervention since the feedback can act as a reinforcer of improvement.

6. 'Supportive' counselling

Counselling involves talking over problems with a health professional. In supportive counselling, the counsellor simply aims

to be a good listener and provide emotional support, rather than offering a more targeted psychotherapeutic intervention. It generally focuses on problems in the here and now and has a short-term duration.

7. Individual and group format

Some therapies can be delivered to groups of individuals as well as single patients. Social interaction within a supportive non-judgmental peer group may increase self-esteem and encourage disclosure, both of which may (under appropriate circumstances) facilitate therapy.

Patient education programmes were only included where psychological therapy formed the major part of the intervention. Breathing retraining, yoga and massage therapies were not included in this review as these therapies were not considered to be primarily psychological in nature.

Types of outcome measures

For the purpose of this updated review the primary outcome has been changed from level of severity of asthma symptoms and psychological outcomes to health service utilisation. Health service utilisation would be expected to decrease after a psychological intervention if the secondary outcome measures improved. In addition, healthcare utilisation may help to indicate the economic viability of an intervention.

Primary outcomes

Health service utilisation (e.g. hospitalisation, emergency room visits and, GP visits)

Secondary outcomes

1. Asthma symptoms
2. Lung function (e.g. PEFR and FEV1)
3. Medication use
4. Absenteeism from college / work
5. Psychological variables (e.g. coping skills, anxiety, depression, asthma related behaviour, locus of control, self-esteem, self efficacy, quality of life and, psychological status)
6. Asthma knowledge

Search methods for identification of studies

The most recent searches were carried out up to May 2007.

Electronic searches

The Cochrane Airways Group Specialised Register of controlled trials was used to identify randomised controlled trials. The register includes references from CENTRAL, MEDLINE, EMBASE, CINAHL, handsearched respiratory journals and meeting abstracts. All records in the Register coded as 'asthma' were searched with the following terms:

"music therap*" or "art therap*" or "family therap*" or "group therap*" or "behavior therap*" or "behaviour therap*" or "milieu therap*" or "situational therap*" or "assertiveness therap*" or "aversion therap*" or "nondirect therap*" or "play therap*" or "psychoanalytic therap*" or "psychodrama therap*" or "relaxation therap*" or "role-play therap*" or "rational-emotive therap*" or "reality therap*" or "socioenvironmental therap*" or "cognitive

therap*" or "eclectic therap*" or "educational therap*" or "gestalt therap*" or "existential therap*" or "expressive therap*" or "experiential therap*" or "interpersonal therap*" or "pastoral therap*" or "persuasion therap*" or "relaxation therap*" or biofeedback* or psych* OR ((assertivness or autogenic or sensitivity or relaxation) AND train*) or mental or anxiety or depressi* or panic*

An advanced search of the Cochrane Central Register of Controlled Trials (CENTRAL) was also completed using the above search strategy. An extensive search was also made of the psychology database PsycINFO using the following search strategy: (Asthma\$ OR Wheez\$) AND (psychotherap\$ OR psychol\$).

Searching other resources

Bibliographies of each identified trial were also searched for additional papers that might contain relevant trials.

Data collection and analysis

Selection of studies

Two independent reviewers (SF & CS or JY & CS) established whether each study met the inclusion criteria as an RCT of a psychological intervention for adults with asthma according to the above inclusion criteria. Disagreements were resolved by discussion

Data extraction and management

Data were extracted and entered into Review Manager software.

Assessment of risk of bias in included studies

The methodological quality of the studies (allocation concealment) was independently assessed by two reviewers (SF & CS or JY & CS) using the following criteria for allocation concealment:

Grade A: adequate concealment

Grade B: uncertain

Grade C: clearly inadequate concealment

Grade D: not used

There were no disagreements on ratings given to studies.

Each study was also assessed using a modified 0 to 5 scale developed by [Jadad 1996](#) and summarised as follows:

1. Was the study described as randomised (1=yes;0=no)?
2. Was the outcome assessment blinded (1=yes;0=no)?
3. Was there a description of withdrawals and dropouts (1=yes;0=no)?
4. Was the method of randomisation well described and appropriate (1=yes;0=no)?
5. Was the method of blinding well described and appropriate (1=yes;0=no)?
6. Deduct one point if methods for randomisation or blinding were inappropriate.

Modification of this scale was essential as, due to the nature of the psychological interventions, it would be difficult to conduct double-blinded trials. Therefore in step 2 and 5 'double-blind' has been changed to 'blind'.

Where study methodology or the presentation or results was unclear, attempts were made to contact authors.

Data synthesis

For continuous outcomes, we pooled data with a fixed effect mean difference and 95% confidence intervals (CIs). Where heterogeneity was present (>0%) we performed a random effects analysis to incorporate statistical heterogeneity in to the pooled estimate. Where this altered the significance of the effect we have reported both sets of results. Where data were not available as Ns, means and SDs or SEMs, we have attempted to derive effect estimates based on the mean difference and an estimate for the variance based upon the published P value. This was subsequently entered as generic inverse variance data (GIV).

Dichotomous outcomes were entered as simple event rates for treatment and control groups. We pooled data with a fixed effect odds ratio (OR). Where heterogeneity was present (>0%) we performed a random effects analysis to incorporate statistical heterogeneity in to the pooled estimate. Where this altered the significance of the effect we have reported both sets of results. For significant outcomes, we calculated a number needed to treat (benefit) (NNT(b)) or number needed to treat (harm) (NNT(h)), based upon the OR with [Visual Rx](#).

RESULTS

Description of studies

Summary of the 15 eligible studies is given below. Details of individual studies are contained in the table 'Characteristics of included studies'.

Study Design

See Included Studies table. One new study ([Freeman 2005](#)) was added for the 2006 update, making a total of fifteen studies included in the review, with two publications from one study reporting different outcomes ([Henry 1993](#)). All were randomised and were conducted over a variety of durations (3 days to 12 months).

Study Participants

A total of 687 participants were included in this review. The studies were generally small with only one having more than a hundred people included ([Lehrer 1994](#) recruited 106 people) and the smallest ([Erskine 1979](#)) had 12. A power calculation to determine sample size was performed in two studies ([Epstein 2004](#); [Lehrer 1994](#)). Six studies included details about how many people were approached to join the research: [Deter 1983](#) where 90 people were invited and 27 declined to join and 34 agreed (no information is given about the other 29 people), [Epstein 2004](#) screened 329 people and 68 were randomised; [Hockemeyer 2002](#) recruited 60 participants and randomised 60; [Lehrer 1994](#) where 47 more people were screened than actually participated in the study. [Put 2003](#) invited 101 and 25 agreed. [Ross 2005](#) approached 86 people, 38 were excluded and [Wagaman 2000](#) where 90 people attended an initial interview resulting in 30 joining the research. No further data are provided from the other studies. [Freeman 2005](#) included a flow chart of participant inclusion.

In some studies a description of withdrawals was not given ([Henry 1993](#); [Mussell 1988](#); [Payette 1977](#); [Sommaruga 1995](#)). [Erskine 1979](#); [Ewer 1986](#); [Lehrer 1997](#); [Wagaman 2000](#) gave the numbers who withdrew but no details of their characteristics. [Deter 1983](#) did not mention withdrawals but eleven people appear not to have

completed the study and it is difficult to see what happened to patients, as the numbers do not tally. [Lehrer 1994](#) referred to patients who had dropped out, but also seemed to have a group who completed the treatment but for whom there are no measurements. Although [Put 2003](#) commented on missing data there was no other discussion about missing data and the potential impact this might have had on the findings. [Epstein 2004](#) provided a flow diagram of participant progress through the phases of the study and [Lehrer 2004](#) provided a table of participant adherence and drop-out rates. [Hockemeyer 2002](#) lost six participants between the pre- and post assessments. [Ross 2005](#) provided details of drop-outs and withdrawals. In the rest of the studies there was no clear plan enabling the reader to track easily the progress of patients approached or included in the trial and there was no discussion about missing data and the potential impact this might have had on the findings.

The severity of asthma varied from mild to severe, however not all studies reported this. Of note, the sample population included in [Ross 2005](#) had a co-existing asthma and panic disorder.

Outcome measures

A wide variety of outcomes were used. Health service utilisation was measured by three studies ([Deter 1983](#); [Sommaruga 1995](#); [Wagaman 2000](#)). Other objective measures included lung function such as FEV1, FVC and peak flow ([Epstein 2004](#); [Erskine 1979](#); [Ewer 1986](#); [Freeman 2005](#); [Henry 1993](#); [Hockemeyer 2002](#); [Lehrer 1994](#); [Lehrer 1997](#); [Lehrer 2004](#); [Payette 1977](#); [Put 2003](#); [Sommaruga 1995](#); [Wagaman 2000](#)) and medication usage ([Deter 1983](#); [Epstein 2004](#); [Lehrer 2004](#)). Asthma symptoms were also measured ([Erskine 1979](#); [Ewer 1986](#); [Freeman 2005](#); [Lehrer 1994](#); [Lehrer 1997](#); [Lehrer 2004](#); [Put 2003](#); [Ross 2005](#); [Sommaruga 1995](#); [Wagaman 2000](#)). In addition some researchers measured psychological traits such as anxiety ([Deter 1983](#); [Epstein 2004](#); [Ewer 1986](#); [Freeman 2005](#); [Sommaruga 1995](#); [Ross 2005](#); [Wagaman 2000](#)), depression ([Epstein 2004](#); [Freeman 2005](#); [Ross 2005](#)) fear ([Deter 1983](#)); health locus of control ([Freeman 2005](#); [Sommaruga 1995](#)), quality of life ([Epstein 2004](#); [Ross 2005](#)) and stress ([Hockemeyer 2002](#)).

Interventions used

The types of interventions investigated were diverse. Nine studies used some form of relaxation technique as their intervention including hypnosis ([Wagaman 2000](#); [Ewer 1986](#)), functional relaxation ([Deter 1983](#)), progressive relaxation ([Erskine 1979](#); [Lehrer 1994](#)), mental imagery ([Epstein 2004](#); [Freeman 2005](#)), self-administered relaxation therapy ([Hockemeyer 2002](#)) and autogenic training ([Henry 1993](#)). Three studies assessed biofeedback techniques including heart rate variability ([Lehrer 2004](#)), respiratory sinus arrhythmia ([Lehrer 1994](#)) and EMG ([Payette 1977](#)). In addition, cognitive behavioural therapy was combined with rehabilitation ([Sommaruga 1995](#)) and a psycho-educational programme which included behavioural and cognitive techniques ([Put 2003](#); [Ross 2005](#)) were also assessed. Details of the interventions used are described in the included studies table.

One study ([Deter 1983](#)) included two intervention groups - one receiving functional relaxation and the other autogenic therapy. The results section of the [Deter 1983](#) paper reports analysis from the functional relaxation group and the control group only and therefore is classified as a functional relaxation intervention in this review.

Another study ([Hockemeyer 2002](#)) included relaxation (taught and practiced using a tape-recorded relaxation training exercise), CBT workbook and writing exercises as the intervention. For the purpose of this review this study has been classified as a relaxation therapy intervention.

It should be pointed out that single methods are seldom used and most practicing therapists use an eclectic approach employing different combinations of therapies to suit the individual circumstances (e.g. presumed mechanism of influence, patient characteristics, therapist preferences). There is also considerable overlap between methods; for example, relaxation techniques are part of the armoury of tools used for behaviour modification. In asthma, all of these techniques are used in combination with drug therapies.

Results of the search

The previous version of this review summarised evidence from 15 included studies and 84 excluded studies. Electronic literature searches from April 2006 to April 2007 retrieved a total of 18 citations. Of these four were obtained as full-text articles but they failed to meet the eligibility criteria of the review ([Fernandes 2006](#); [Lehrer 2006](#); [Nickel 2006](#); [Song 2005](#): see table [Characteristics of excluded studies](#)). Two studies included in the original review ([Loew 1996](#); [Mussell 1988](#)) were excluded from the 2005 update as a crossover design was used and four studies were added ([Epstein 2004](#); [Hockemeyer 2002](#); [Lehrer 2004](#); [Ross 2005](#)). One study was added to the 2006 update ([Freeman 2005](#)). Therefore fifteen RCTs were appropriate for inclusion in this review (see Included Studies table).

Risk of bias in included studies

Overall the methodological quality of the studies was poor, with several weaknesses in experimental design. Jadad scores varied between 1 and 4 with three studies rated at 4 ([Freeman 2005](#); [Lehrer 2004](#); [Put 2003](#)) and two studies rated at 3 ([Ewer 1986](#); [Ross 2005](#)). The studies by [Epstein 2004](#); [Erskine 1979](#); [Lehrer 1994](#); [Sommaruga 1995](#) and [Wagaman 2000](#) were accorded 2 points while the rest ([Deter 1983](#); [Henry 1993](#); [Lehrer 1997](#); [Payette 1977](#)) received 1 point.

Only one study rated Grade A (adequate) for allocation concealment ([Ewer 1986](#)) the remainder being rated Grade B (unclear) ([Deter 1983](#); [Epstein 2004](#); [Erskine 1979](#); [Freeman 2005](#); [Henry 1993](#); [Hockemeyer 2002](#); [Lehrer 1994](#); [Lehrer 1997](#); [Payette 1977](#); [Lehrer 2004](#); [Put 2003](#); [Ross 2005](#); [Sommaruga 1995](#)) or Grade C (inadequate) ([Wagaman 2000](#)).

Where allocation concealment or the randomisation process was unclear, letters were sent to authors asking for this information. However, as most of these studies were completed some time ago, correspondence from only five authors ([Epstein 2004](#); [Ewer 1986](#); [Freeman 2005](#); [Lehrer 2004](#); [Sommaruga 1995](#)) was received (apart from information that authors had died or moved away).

Method of randomisation

Studies were randomised with patients allocated to control and experimental groups, however authors tended not to be clear as to whether all the patients who were eligible for the study were approached. Frequently the method of randomisation was not mentioned ([Deter 1983](#); [Erskine 1979](#); [Henry 1993](#); [Lehrer](#)

1994; Lehrer 1997; Payette 1977; Wagaman 2000). Freeman 2005 randomised participants in a 2 x 2 x 4 design; only data from the 2 x 2 groups were analysed as the third group also received Critical Thinking therapy which is not an included therapy for this review. Epstein 2004 used a block design and Lehrer 2004 described a restricted randomisation design. Hockemeyer 2002 does not describe the method of randomisation but refers to 'a failure to achieve acceptable randomisation'. Put 2003 had a system of drawing from unmarked envelopes. Ewer 1986 reported that the outpatient department sister, who had no other involvement in the study, was responsible for the randomisation and on correspondence confirmed randomisation was done by computer. Sommaruga 1995 also confirmed on correspondence that randomisation was done by computer. Therefore it is difficult in all the studies to gauge whether the method of randomisation was appropriate. This is reflected in the Jadad scores.

Sometimes a researcher blinded to the participants group assessed the outcomes. Put 2003 used independent researchers who were unaware of the patient's treatment allocation. Ewer 1986 involved the outpatient department sister who was blind to the patient's group and although the author conducted the intervention, they are clear that the challenge test was conducted with a researcher who was blinded. Assessment of outcome in Payette 1977 was not blinded and in Lehrer 1997 and Freeman 2005, the same person undertook the treatment intervention and measurement. Wagaman 2000 stated that assessments and medical assessments were blinded, but the investigator performed the interventions and delivered the psychometric assessments. Epstein 2004 stated that the assessors performing the monthly physical assessments were blind to participant allocation. All other authors failed to mention whether the assessment of outcomes was blinded or not.

In general therefore, the conclusion reached about the quality of the studies reflects the comment made by Ritz 2001:653, in his overlapping systematic review, that 'most of the few available studies suffer from inadequacies in experimental design, instrumentation, procedures and/or reporting of results'.

Effects of interventions

Primary outcome

Health Service Utilisation

Three studies (Deter 1983; Sommaruga 1995; Wagaman 2000) examined this outcome and there were no significant differences between experimental and control groups. Deter 1983 found no significant decrease in healthcare utilisation in the group receiving relaxation compared to the control group. A narrative stating that the results are not significant at the 5% level is the only data provided. Sommaruga 1995 found numbers of hospitalisation days and number of emergency visits were decreased for both the intervention group (an asthma rehabilitation programme) and the control group (data to support this are not provided, apart from $P < 0.05$). Numbers were too small in the Wagaman 2000 study on hypnosis to test for statistical differences for this outcome. Due to varying interventions and insufficient reporting of data a pooled effect could not be performed.

Secondary outcomes

Asthma symptoms

This was measured in a variety of ways in eleven studies of which six used a form of relaxation therapy (Epstein 2004; Erskine 1979; Ewer 1986; Freeman 2005; Lehrer 1994; Wagaman 2000), two used bio-feedback techniques (Lehrer 1997; Lehrer 2004) and three used CBT (Put 2003; Ross 2005; Sommaruga 1995).

The Asthma Quality of Life Questionnaire (AQLQ) (Juniper 1992), which includes asthma symptom categories, was used as an outcome measure in three studies. Two studies used CBT (Put 2003; Ross 2005) and one used mental imagery relaxation (Epstein 2004). A meta-analysis could be performed with the two CBT studies (Put 2003; Ross 2005). This analysis indicated a significant difference in favour of CBT for the Total AQLQ (WMD 0.71, CI 0.23 to 1.19). Epstein 2004 found no significant improvement in the intervention group Total AQLQ mean 5.25 (SD 1.39) compared to the control group mean 4.89 (SD 1.45). Means and standard deviations were obtained through author correspondence and a narrative description of no significance difference between the two groups using repeated measures of ANOVA was provided in the paper.

The Asthma Symptom Checklist (ASC) (Kinsman 1973) was used as an outcome measure in four studies. Three studies examined relaxation therapy (Lehrer 1994; Ewer 1986; Wagaman 2000) and one used CBT (Put 2003). Lehrer 1994 showed within group differences for hyperventilation severity over the course of treatment with relaxation ($F=3.97$, $df=2,106$, $P<0.04$), but there were no significant differences between groups. Nocturnal symptoms i.e. sleep, and wheeze, activity, cough and phlegm were reported in one study (Ewer 1986). They examined the impact of hypnosis on people with a history of mild to moderate asthma. Patients were separated as to whether they scored high or low on a scale to measure their susceptibility to hypnosis (Stanford hypnotic clinical scale). Daily symptom scores, the rating scale is not given, were averaged for the first two and the last two weeks of the treatment period. In the high susceptibility group who received the hypnosis intervention, the subjective scores for nocturnal symptoms, wheeze and activity limitations improved after treatment. Mean percentage change in symptom scores was -62 ($P < 0.05$) for sleep, -53 ($P < 0.001$) for wheeze and -58 ($P < 0.01$) for activity. No significant change was found in either the low susceptibility treatment or control groups. The study by Wagaman 2000 had group numbers that were too small to allow statistical analysis to test for differences, however the whole sample had a decrease in overall symptoms post intervention when compared to pre-intervention measurement, however no usable data were presented. Frequency of acute attacks as measured by patient diaries were unable to be assessed statistically due to the small sample and the infrequency of these attacks. Put 2003 showed a significant improvement in the intervention group compared to the control group for the sub-categories of obstruction ($P = 0.04$), fatigue ($P < 0.001$) and irritation ($P = 0.03$) but not for dyspnoea, hyperventilation and anxiety.

Self-reported asthma wheeze was measured in two studies examining relaxation techniques (Epstein 2004; Freeman 2005). Meta-analysis indicated no significant improvement in the group receiving relaxation therapy (WMD -0.07, CI -0.69 to 0.56). Frequency of coughing did not significantly decrease in the group receiving relaxation therapy (mean 10.90, SD 10.15) compared to the control

group (mean 13.80, SD 16.63) ($P = 0.3$) (Freeman 2005). Freeman 2005 also reported no significant increase in self-reported activity level in the intervention group (mean 15.90, SD 12.85) compared to the control group (mean 14.30, SD 18.24) ($P = 0.76$).

Ross 2005 measured the number of asthma symptom free days during 14 days of CBT and found no significant interactions between group and test occasion ($F(1,18) = 1.11$, $P = 0.31$) using 2×2 ANOVA.

Bronchoconstriction and hyperventilation were measured in a study by Lehrer 1997. Within group differences, before and after treatment with bio-feedback, were not significant for bronchoconstriction and hyperventilation. Between group differences were not reported and mean scores were provided with no SD. Lehrer 2004 also investigated the effects of bio-feedback on these outcomes. Symptoms in the bio-feedback group were found to decrease significantly from the first to the last sessions ($P = 0.02$) but not in the control group.

One study (Sommaruga 1995) of an asthma rehabilitation programme including cognitive behavioural therapy resulted in both the intervention group and the control group having less asthma attacks (data to support this are not provided, apart from $P < 0.05$).

Lung Function

Eleven studies (Erskine 1979; Ewer 1986; Freeman 2005; Henry 1993; Hockemeyer 2002; Lehrer 1994; Lehrer 1997; Lehrer 2004; Payette 1977; Put 2003; Wagaman 2000) included lung function as an outcome to measure the effectiveness of their intervention. Eight of these (Epstein 2004; Erskine 1979; Ewer 1986; Freeman 2005; Henry 1993; Hockemeyer 2002; Lehrer 1994; Wagaman 2000) used a form of relaxation as the intervention. Epstein 2004; Ewer 1986; Henry 1993 measured FEV1 and following additional data being provided by correspondence with Epstein 2004, a meta-analysis could be performed. This analysis indicated no significant difference in favour of relaxation therapy for FEV1 (SMD -0.01, CI -0.41 to 0.40).

A pooled effect of two studies (Freeman 2005; Ewer 1986) following relaxation therapy indicated no statistically significant improvement in PEF measurements (WMD 43 L/min, CI -5 to 92 L/min).

Hockemeyer 2002 measured FEV1/FVC, with the ratio expressed as a percentage, following relaxation and found a statistically significant improvement in the intervention group mean 102.0 compared to the control mean 93.7 ($F(1,54) = 4.57$, $P = 0.38$). Also measured by Hockemeyer 2002 was FEV1% predicated. No statistically significant improvement in the intervention group mean 111.5 compared to the control mean 99.8 ($F(1,54) = 3.41$, $P = 0.71$) was found.

FEV1 % predicted improved significantly in the group receiving autogenic therapy (mean 83.3, SD 16, $P < 0.001$) but not in the control group (mean 76.3 SD 21.8, $P > 0.05$) Henry 1993.

Lehrer 1997 and Lehrer 2004 used bio-feedback therapy and presented PEF outcome data that could be pooled for a meta-analysis. This indicated no significant difference in favour of bio-feedback therapy (SMD 0.66, CI 0.09 to 1.23). Payette 1977 found no significant differences between groups for FVC, FEV1, FEV1/FVC (ratio of FEV1 and FVC) after EMG biofeedback training.

Ross 2005 described peak flow variability during 14 days of CBT. The results of 2×2 ANOVA showed no significant interaction between group and test occasion ($F(1,18) = 2.45$, $P = 0.14$).

Ewer 1986 also measured PEF and airways resistance and found no significant improvement between the relaxation and control group for both variables. Within group analysis (Ewer 1986) found significant improvement in FVC (forced vital capacity) for both intervention (6.9%) and control groups (5.03%) $P < 0.002$ and MEF (mid expiratory flow) (50%) for the treatment group after hypnosis of 11.7% ($P < 0.002$) and 14.7% ($P < 0.05$) respectively when compared to baseline measurements.

Methacholine challenge test.

A methacholine challenge test to detect improvement of asthma following intervention was used in two RCTs. One adopted a hypnotic technique to relax subjects (Ewer 1986) and the other study used relaxation training (Lehrer 1994). No significant treatment effects were shown in the RCT using relaxation training. In the trial using a hypnotic technique the most important finding was a significant improvement in bronchial hyper-responsiveness for patients with a high susceptibility for hypnosis. The data using mean PC20 (SEM) were 9.09 (1.71) before treatment and 15.9 (2.79) after treatment ($P = 0.008$), where PC20 is the provocation concentration of methacholine that caused a 20% fall in FEV1.

Medication use

Six studies examined intervention effects on treatment (Deter 1983; Epstein 2004; Ewer 1986; Lehrer 1997; Lehrer 2004; Wagaman 2000). Epstein 2004 and Wagaman 2000 described a decrease in or discontinuation of, medications following relaxation therapy. A pooled effect from these two studies demonstrated a positive response to treatment (OR 4.47, CI 1.22 to 16.44). This translates to a number needed to treat of 3 (95% CI 2 to 28) (see Figure 1). For the sub-group of people with a high susceptibility to hypnosis, Ewer 1986 found the relaxation group had significantly less bronchodilator use after treatment (mean 34.0 puffs/day (SD 7.8) when compared to before treatment (46.0 (7.2), $P < 0.05$). Deter 1983, also using relaxation, found a significant difference in the numbers of people in the experimental group ($n = 4$) who required less bronchodilators when compared to the control ($n = 0$; $P < 0.05$).

Figure 1. Based on the findings of this review this image shows that when relaxation/autogenic therapy is given to 100 patients, on average 3 would need to be treated in order to induce a reduction in the amount of bronchodilator used. The data analysed showed that 22/100 people would be able to do this anyway, but that an additional 34/100 people could achieve this with treatment.

The effect of bio-feedback on medication use yielded conflicting results. One study ([Lehrer 2004](#)) reported a significant improvement in the intervention group mean 5.15 (SD 2.78) compared to the control group mean 7.58 (SD 2.68) and another [Lehrer 1997](#) found no significant differences when measuring amounts of inhaled or oral steroids taken at 6 weeks post intervention. Each trial used a different method of measuring this outcome so effects could not be pooled.

Absenteeism from work or school

Two studies examined this outcome by using patient diaries ([Wagaman 2000](#)) and recording the number of work/school absences ([Sommaruga 1995](#)). Work/school absences were significantly decreased post-intervention for both the asthma rehabilitation group and the control group (data to support this are not provided, apart from $P < 0.05$). Numbers were too small in each group to test for statistical differences in the [Wagaman 2000](#) study.

Psychological Health Status

Anxiety

Anxiety was used as an outcome measure in eight studies ([Deter 1983](#); [Epstein 2004](#); [Ewer 1986](#); [Freeman 2005](#); [Put 2003](#); [Ross 2005](#); [Sommaruga 1995](#); [Wagaman 2000](#)) using a variety of interventions and measurement techniques. The effect of relaxation on anxiety levels was investigated in five studies ([Deter 1983](#); [Epstein 2004](#); [Ewer 1986](#); [Freeman 2005](#); [Wagaman 2000](#)). [Freeman 2005](#) assessed anxiety levels using the Profiles of Mood States (POMS) ([McNair 2003](#)) and reported no statistically significant difference in the relaxation group (mean 28, SD 7.58) compared to the control group (mean 22, SD 8.14) ($P = 0.054$). [Deter 1983](#) used the

Minnesota Multiphasic Personality Inventory (MMPI) and showed an increase for the intervention as compared to the control group which is referred to as 'a tendency to react positively'. However, the magnitude was small with an increase or decrease of one point only, which is unlikely to have either clinical or statistical significance. Anxiety was measured using the State-trait Anxiety Inventory ([Spielberger 1970](#)) in [Epstein 2004](#) and [Ewer 1986](#). [Ewer 1986](#) presented no data. [Epstein 2004](#) included a narrative conclusion of no statistical difference between the groups, using univariate-repeated measure-ANOVA. Means and SD were provided following author correspondence for Trait Anxiety (intervention mean 42.0, SD 13.11 and control mean 38.63, SD 11.90) and State Anxiety (intervention mean 39.09, SD 13.0 and control mean 42.85, SD 15.24). State anxiety was assessed in [Wagaman 2000](#). The groups were too small to allow statistical analysis to test for differences between the two intervention groups and the control group, however the whole sample had a significant decrease in anxiety post intervention (at one year follow up) when compared to pre-intervention measurement (mean change -12.09; $t = 4.13$; $P < 0.01$). The same study assessed neuroticism, extraversion and lying (Eysenck Personality Inventory), repressive coping (Marlowe Crowne Social Desirability Scale ([Crowne 1960](#))), self-control methods to the solution of behavioural problems (Self-Control Schedule ([Rosenbaum 1980](#))), and catastrophising (Dysfunctional Cognition Inventory ([Zocco 1985](#))). There were no significant differences found.

Trait anxiety was measured by [Sommaruga 1995](#) following CBT. Patients were treated in an Asthma Rehabilitation Group involving education and a cognitive behavioural intervention. There were significant differences between baseline and one year follow up

in those who received the intervention, in respect of trait anxiety (data at enrolment (t0) showed a mean 43.2 (SD 10.0) and at 1 year (t1) 36.7 (9.1), $P < 0.0005$), psychophysiological disorder (t0 48.7 (9.3) t1 45.1 (9.4), $P < 0.02$) and depressive symptoms (t0 5.8 (3.7) t1 3.6 (3.0), $P < 0.006$), but not for psychophysiological disorder in the control group. There are other outcomes studying optimism, negative staff regard, internal awareness, external control, psychological stigma and authoritarian attitude from a Respiratory Illness Questionnaire (Staudenmayer 1978). Within group analyses showed significant decreases for external control (data at enrolment (t0) showed a mean 10.1 (SD 3.8) and at 1 year (t1) 8.4 (3.5), $P < 0.05$) and psychological stigma (t0 9.0 (3.8), t1 7.5 (3.8), $P < 0.03$) in the intervention group and psychological stigma (t0 10.2 (5.6) t1 7.8 (3.8) $P < 0.03$) in the control group. Anxiety is a sub-scale on the asthma symptom checklist used by Put 2003 following CBT. No significant differences between groups were found. Ross 2005 measured anxiety using the Sheehan Patient Rated Anxiety Scale (SPRAS) (Sheehan 1986). The results of 2 x 2 ANOVA showed a statistically significant interaction between group and test occasion $F(1,22) = 12.75$, $P < 0.01$.

Depression

Two studies measured depression as an outcome (Epstein 2004; Freeman 2005) following relaxation therapy. Epstein 2004 provided a narrative of no statistical difference between the groups using univariate-repeated measure-ANOVA is provided. However, means and SDs were provided following author correspondence for the Beck Depression Inventory (BDI) (intervention group: 7.84, 6.98 and control group: 7.0, 6.74). Freeman 2005 used the POMS and reported no statistically significant improvement post relaxation therapy (intervention group mean 28, SD 8.82 and control group mean 24, SD 7.80, $P = 0.27$). Meta-analysis of these two studies showed no significant improvement in depression level (SMD 0.17, CI -0.25 to 0.59).

Ross 2005 also measured depression using the BDI to examine the effects of CBT. Results of 2 x 2 ANOVA analysis demonstrated no statistical improvement ($F(1,22) = 2.94$, $P < 0.10$) between the two groups.

Health Locus of Control

Health locus of control, including internal beliefs, and external control through powerful others and chance was measured using the Health Locus of Control Scale (Wallston 1976) in an Italian version in a study investigating the effects of CBT (Sommaruga 1995). There were no significant differences between baseline and one year follow-up except an increase in beliefs about 'external chance' in the control group. 'External chance' on the Health Locus of Control Scale measures the belief that health depends on casual factors and luck (t0 9.9 (3.5) t1 11.5 (3.0) $P < 0.03$). Freeman 2005 measured health locus of control, following relaxation therapy, using the Health Attribution Test (Achterberg 1992). No statistical difference between the intervention group and control group was reported for the measurements of internal control ($P = 0.55$), powerful others ($P = 0.84$) and chance ($P = 0.7$).

Other psychological outcomes

Panic/fear and fatigue using an asthma symptom checklist (Lehrer 1994) showed differences over the course of treatment with relaxation therapy in an RCT. They report no significant differences between groups, but panic/fear severity did decrease for the whole

sample ($F = 3.34$, $df = 2, 104$, $P < 0.02$). Wagaman 2000 also included panic/fear and fatigue but did not present usable data.

Psychological symptoms were examined in a RCT of relaxation therapy, using a self-report weekly symptom questionnaire incorporating a five-point severity rating scale (Erskine 1979). Data showed no difference between the two groups (muscular relaxation, and mental and muscular relaxation) and patients overall did not show any significant reduction in symptoms and signs. Freeman 2005 assessed the effect of imagery relaxation using the Knowledge, Attitude, and Self-efficacy Asthma Questionnaire (Wigal 1993). Compared to the control group and the group receiving therapy showed a statistically significant improvement in attitude (intervention group mean 90, SD 7.14; control group mean 80, SD 9.46; $P = 0.0094$) and self-efficacy (intervention group mean 89, SD 9.46; control group mean 77, SD 10.02; $P = 0.00061$) but not asthma knowledge (intervention group mean 15, SD 2.42; control group mean 13, SD 2.76; $P = 0.4$).

Psychological elements were examined in a trial of autogenic therapy (Henry 1993) with measures of the patient's state-'vegetative', emotional, behavioural, cognitive and reactivity to stress with no significant differences between baseline and follow up in either group, with the exception of 'vegetative' state in the experimental group (mean difference (SD) 1.83 (2.69) $P < 0.05$). A Negative Emotionality Scale, which incorporates measures of negative affectivity as a personality trait, including irritability, nervousness and emotional instability was used by Put 2003. People in the experimental group had a decrease in scores, suggesting improvement, and there were significant differences between experimental and control groups ($F(2,42) = 10.8$, $P = 0.0002$).

Temperament was studied in Payette 1977 using the Taylor-Johnson Temperament Analysis (Taylor 1974) with no significant differences found between a group receiving biofeedback training and a control group.

Lehrer 1994 included measures of the most relaxed and tense moment in a session using a 9-point Likert scale. They found a significant treatment effect for relaxation during the training session, with the waiting list group being less relaxed (mean 4.2 (SD 1.5)) than the progressive relaxation groups (2.8 (1.4)) during their eighth session ($P < 0.05$, 95% CI 0.6 to 2.2).

Henry 1993 found no significant differences between groups when measuring reactivity to stress. Reactivity to stress is the extent to which the body reacts to stressors. It can be assessed by comparing physiological measures in a resting state (baseline or relaxation) to those in the presence of a physical or psychological stressor.

Hockemeyer 2002 measured participant stress levels using the Perceived Stress Scale (Cohen 1983). ANCOVA (controlling for age, age of diagnosis, and perceived stress levels at baseline) did not reveal any significant differences between groups in perceived stress levels at the end of a four week CBT program ($F(1,54) = 1.48$, $P = 0.230$).

Outcome measures not included in the review protocol

Markers of Inflammation

Immunoglobulins (IgE, IgA, IgM, IgG) were measured in Deter 1983 and showed that 82% ($n = 19$) of patients had a raised IgE, 8% ($n = 2$)

raised IgM values and 4% (n=1) raised IgE. There was much missing data and immunoglobulins were not used as an outcome measure.

Patient Satisfaction

Patient satisfaction with the intervention, and a report on its effectiveness, were mentioned by [Lehrer 1994](#) but no data are presented and no further comment was made about these measures. [Ross 2005](#) assessed participant satisfaction with their CBT program using the Patient Satisfaction Questionnaire (developed by the research team). On a scale of 1 to 4, participants' mean (SD) ratings of their satisfaction were as follows: extent to which the program met their needs 3.5 (0.5); extent to which the program helped them cope with their asthma 3.6 (0.6); extent to which the program helped them cope with their panic 3.6 (0.5); and confidence in recommending the program to others 3.9 (0.2). [Hockemeyer 2002](#) assessed participant satisfaction with a self-delivered workbook on relaxation, CBT exercises, and writing therapy. This was assessed using a pre-developed tool ([Borkovec 1972](#)). A greater satisfaction with therapy was found in the intervention group mean 33.73 (SD 6.91) compared to the placebo group mean 26.67 (SD 9.03) ($P < 0.01$).

Withdrawals

Data relating to drop-outs was provided by eight studies ([Lehrer 2004](#); [Sommaruga 1995](#); [Put 2003](#); [Hockemeyer 2002](#); [Erskine 1979](#); [Ewer 1986](#); [Epstein 2004](#); [Freeman 2005](#)). A pooled effect for participant withdrawals was performed for relaxation ([Erskine 1979](#); [Epstein 2004](#); [Ewer 1986](#); [Freeman 2005](#); [Hockemeyer 2002](#)) which demonstrated no significant difference between the intervention group and control group (OR 0.76, CI 0.40 to 1.44). One study using bio-feedback ([Lehrer 2004](#)) as the intervention reported the drop-out rate of the intervention group (5 of 22) and the control group (2 of 25). [Sommaruga 1995](#) stated that no participants dropped out of the CBT group, whilst four dropped out of the control during the follow-up. [Put 2003](#) reported a high drop-out rate in the group receiving CBT (10 of 24) and the control group (13 of 24).

DISCUSSION

This systematic review evaluated fifteen trials of varied psychological interventions for adults with asthma and found that generally these interventions do not decrease health service utilisation, or decrease frequency, severity and duration of asthma symptoms. However, due to the poor quality of these studies any results and conclusions must be viewed with caution. In addition, usable statistical results were often not available in the papers. This limited firm conclusions being made as to the effect of psychological interventions for adults with asthma. The psychological interventions themselves were varied, did not necessarily have a clear theoretical underpinning and were not always well described.

Health care utilisation is increasingly being used as a primary outcome in drug trials and other studies on patients with asthma. This being the case, the primary outcome of this review also reflects this. However, few trials included in this review measured this outcome. In addition, it is assumed that self-report measures were used, and these may not give accurate data. This review cannot draw any conclusions as to the effect of psychological interventions on healthcare utilisation by adults with asthma. This outcome

needs be included in future trials of psychological intervention for adults with asthma.

Lung function was measured as an outcome in a number of studies and two separate meta-analyses were performed. Although bio-feedback was found to improve PEF significantly ([Lehrer 1997](#); [Lehrer 2004](#)) relaxation therapy did not have such an impact on FEV1 ([Epstein 2004](#); [Ewer 1986](#); [Henry 1993](#)) or PEF ([Ewer 1986](#); [Freeman 2005](#)). However, these meta-analysis do not include large patient numbers. Another meta-analysis found that relaxation therapy ([Epstein 2004](#); [Wagaman 2000](#)) had a positive effect on discontinuation and decrease of medications. Again this meta-analysis included a small number of participants ($n = 47$).

The AQLQ ([Juniper 1992](#)) was used as an outcome measure ([Epstein 2004](#); [Put 2003](#); [Ross 2005](#)). This consistency provided for a meta-analysis to be performed on the two studies assessing the effect of CBT ([Put 2003](#); [Ross 2005](#)). This indicated a significant improvement in Total AQLQ scores in the group receiving CBT compared to the control. Further use of the AQLQ would be beneficial in further assessing the impact of CBT on this outcome. These studies also analysed each sub-category of the AQLQ to assess the impact of therapy on specific outcomes. This generally produced conflicting results between studies.

The ASC ([Kinsman 1973](#)) was also adopted more than once as an outcome measure ([Ewer 1986](#); [Lehrer 1994](#); [Wagaman 2000](#)). Whilst these studies used relaxation therapy no meta-analysis could be performed due to small sample sizes ([Wagaman 2000](#)) and the presentation of within group analysis only ([Ewer 1986](#)). As such, no conclusion as to the benefits of relaxation therapy on the ASC outcomes can be provided.

The psychological outcomes examined were numerous and diverse and there seems to be no consensus as to which psychological outcomes are conceptually linked to asthma or to the psychological interventions being studied. For example, although a number of studies measured anxiety as an outcome ([Deter 1983](#); [Epstein 2004](#); [Ewer 1986](#); [Freeman 2005](#); [Put 2003](#); [Ross 2005](#); [Sommaruga 1995](#); [Wagaman 2000](#)) the interventions used varied and the anxiety measurement tools also varied. This prevented any pooled result being analysed. In addition, depression was measured using the Beck Depression Inventory (Beck 1987) by two studies however, one used relaxation as the intervention ([Epstein 2004](#)) and the other CBT ([Ross 2005](#)).

Participant satisfaction with the intervention was only assessed in three studies ([Hockemeyer 2002](#); [Lehrer 1994](#); [Ross 2005](#)). However, the rigour of this assessment is difficult to ascertain. [Lehrer 1994](#) acknowledged that the assessment was performed but presented no data nor further comment. [Ross 2005](#) reported data on this outcome however, a tool developed by the research team was used with no evidence of validity or reliability described. [Hockemeyer 2002](#) used a pre developed tool which indicated greater participant satisfaction in the intervention group compared to the placebo.

There is a general view that asthma is connected with psychological elements in the person ([Lehrer 1993](#)). This may involve a cause and effect relationship and because psychology and emotion are involved it is thought that psychological techniques may have a positive effect on patient outcomes. There is a large worldwide literature base supporting these ideas but this review shows that questions of effectiveness have not yet been answered. It is clearly

a difficult area to investigate and presents challenges for the design of good RCTs. Researchers have to recruit sufficient numbers of subjects to show an effect if there is one, ensure appropriate randomisation and blinding techniques and follow up subjects for a reasonable period.

RCTs evaluating this area are diverse. They study a mixed group of psychological techniques, which are difficult to classify due to the different methods used to deliver the intervention. This resulted in heterogeneous interventions even when the technique was given the same classification by study authors.

The diversity of the interventions was also complicated by a multiplicity of outcomes and the tools used to measure these. There is no consensus on which outcomes a psychological intervention might influence and the conceptual link between them. The most common outcome used in the studies reviewed was lung function; twelve of the studies evaluated this. However, whilst lung function was widely assessed, different measurements were taken, for example % predicted FEV1 and PEF L/min. Health care utilisation is increasingly being used as a primary outcome in drug trials and other studies on patients with asthma. This being the case, the primary outcome of this review was changed as being hospitalised or being ill enough to visit the GP may be the most important outcome for the patient. Few trials have used this outcome. It is assumed that self-report measures were used, and these may not give accurate data.

The psychological outcomes adopted were even more numerous and diverse and there seems to be no consensus as to which psychological outcomes are conceptually linked to asthma or to the psychological interventions being studied.

It is apparent that this body of work does not seem to have a clear direction where current work is influenced by previous studies. Most of these small studies were done by trialists who, with the exception of Lehrer's team, did only one study. This has resulted in diverse studies looking at diverse interventions reporting on large numbers of different outcomes.

AUTHORS' CONCLUSIONS

Implications for practice

Because of the poor methodological quality and small sample sizes of the trials included, this review can draw no conclusions as to the effectiveness of psychological techniques for adults with asthma. However, some promising results did emerge from meta-

analysis performed for the effect of CBT on quality of life, bio-feedback on PEF and relaxation on medication use. Many of the other outcomes measured yielded conflicting results. The results from current RCTs in the field do not allow us to answer adequately any of our original objectives. This review cannot therefore provide guidance for clinical practice.

Implications for research

Larger RCTs with good methodological quality are needed. There are a limited number of rigorous trials in this area and comparisons are frustrated by diversity of outcomes and poor results reporting. All pertinent results should be reported with means and standard deviations to aid comparisons.

There does not seem to be a developed programme of research for evaluating psychological interventions for adults with asthma, with many research teams doing just one study. Researchers in the field should agree common interventions, taxonomy and outcome indicators. There is a question over how appropriate it is to conduct RCTs of psychological interventions at all. This mainly has to do with the fact that in practice isolated therapies are seldom used and treatment plans are individualised to patients as complex self-management plans.

Evaluation using an RCT in the clinical setting may mean that the intervention is so tightly controlled that even if effectiveness were proven it might be difficult to transfer the intervention into routine clinical practice. Research funding should target a range of good quality research, including well designed rigorous RCTs, to determine the effectiveness and cost effectiveness of psychological techniques that have a sound theoretical base, with common taxonomy and outcome indicators and which can be used in the real world with individual patients who have differing needs and get better at different speeds.

ACKNOWLEDGEMENTS

The authors of this review would like to thank the members of the Cochrane airways group; Toby Lasserson and Elizabeth Arnold for their continued support and encouragement. Thanks to the following people for translating studies: Gianni Ferrara (Italian), Keiji Hayashi (Japanese), Toby Lasserson (French and German), Sam Lasserson (Spanish), Makiko Meguro (Spanish and Japanese) and to Dr. Mike McKean for editing the review. Two anonymous expert peer reviewers also gave valuable input for which we are grateful.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Deter 1983

Methods	RCT (parallel design). Method of randomisation: randomised into 3 groups, method not described. Outcome assessment: method not described. Withdrawals and dropouts: not described. Jadad score 1.
Participants	90 eligible for inclusion. 31 randomised, 23 completed. Intervention 1-7. Intervention 2-8. Control- 8. Age range given in categories: <30=7, 30-50=14, >50=10. Mean age: 43.5 years. Sex: Male 14, female 17. Asthma diagnosis by physicians using Scadding's (1976) criteria for clinical and body plethysmographic examinations. Severity of asthma: Light (10), medium (9), Severe (12). Hospital clinic setting (Germany). Inclusion criteria: Clinic patients with asthma but not had group therapy. Exclusion criteria: patients who had received group therapy in the past.
Interventions	Intervention 1: Exchange of information, discussion sessions and autogenic training (7) Intervention 2: Exchange of information, discussion sessions and functional relaxation (8) Control: waiting group offered intervention after one year (8). 40 sessions delivered over 12 months.

Deter 1983 (Continued)

Intervention delivered by physicians ('internists and psychosomatics).

Outcomes	Use of bronchodilators; use of steroids; use of inhalation sprays; pulmonary function (resistance and conductance); psychological state and anxiety (MMPI fear index), patients' observation of their own bodies; GP visits; hospitalisation (number of days). Measured at baseline and 12 months.
Notes	Comparison between functional relaxation and control only. Data presented as change scores between groups with no SD. No sample size calculation.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Epstein 2004

Methods	RCT (parallel design). Method of randomisation: block design. Withdrawals: flow diagram provided.
Participants	Number eligible: 329, randomised: 68, Intervention: 34, control: 34. Number analysed: intervention: 17, control: 16. E male: 27%, E Female 73%; C male 43%, C female 57%.
Interventions	Intervention: mental imagery relaxation, control: usual care.
Outcomes	Lung function, anxiety, Asthma Quality of Life Questionnaire, depression.
Notes	Author contacted for extra data

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Erskine 1979

Methods	RCT (parallel design). Randomisation method: Patients matched in pairs according to age, sex, FEV1, and severity of asthma, then randomly allocated to one of the 2 intervention groups. Method of randomisation not described. Withdrawals and dropouts: 2 patients withdrawn, characteristics not described. Jadad score 2.
Participants	Number eligible not stated. 12 randomised, 10 completed. Intervention 1- 5. Intervention 2- 5. Age: 16-46 years, mean age 30. Sex: not stated. Physician diagnosed asthma using ATS criteria. Severity: Moderate or severe, numbers not stated. Setting not stated (authors from Australia). Inclusion criteria: moderate and severe asthma. Exclusion criteria not stated.

Erskine 1979 (Continued)

Interventions	Intervention 1: Muscular and mental relaxation techniques. Intervention 2: muscular relaxation techniques. No control group Intervention given once a week for 4 weeks. Intervention delivered by 'the therapist'.
Outcomes	FEV1, weekly symptom questionnaire (Kinsman et al. 1973), daily symptom questionnaire (locally designed), subjective severity rating (5 point scale); Self report measurements - psychological, physical and bronchoconstriction; Post treatment questionnaire: expectations of treatment, success of the treatment, frequency of relaxation performed at home. Outcomes measured once a week for 3 weeks pre-treatment, during treatment and 6 weeks after (13 weeks in total).
Notes	No imputable data in this trial. Results are reported as means without standard deviations. FEV1 data is graphical only. No sample size calculation.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Ewer 1986

Methods	RCT (parallel design). Randomisation method: Not clear in paper but used computerised randomisation tables, allocation concealed (from correspondence with TE). Outcome assessment blinded. Withdrawals and dropouts described. Jadad score: 3.
Participants	Number eligible not stated. 44 randomised, 39 completed. Intervention (low susceptibility to hypnosis)- 10. Intervention (high susceptibility to hypnosis)- 12. Control (low susceptibility to hypnosis)- 7. Control (high susceptibility to hypnosis)- 10. Age: 18-45. Sex: Male 15, female, 24. Physician diagnosed asthma. Severity: mild to moderate, numbers not stated. Setting: asthma clinic, patients recruited from the local community (New Zealand). Inclusion criteria: History of mild to moderate asthma. Exclusion criteria: a reduction of less than 20% in the ratio of forced expiratory volume in one second to forced vital capacity with the maximum concentration of methacholine, a history of severe asthma, concurrent systemic steroid treatment, pregnancy, history of psychosis or relevant medical illness.
Interventions	Intervention: Hypnotic induction with progressive relaxation, progression of guided imageries, ego enhancement, self hypnosis. Half hour sessions over six weeks. Intervention delivered by physician (project leader). Control: half hour sessions with asthma nurse over 6 weeks.
Outcomes	FVC, FEV1, FEV1/FVC (%), PEF, MEF at 50% VC. FRC, RV and airways resistance measured by Collins Plethysmograph, bronchial responsiveness, subjective sensitivity. Diary recordings of PEF twice daily, daily use of drugs, symptoms related to asthma (cough, activity limitation, wheeze, phlegm, nocturnal symptoms), psychological profile using STAI (Spielberger et al 1970), Zung's self rating depression scale (Zung 1965) and Pilowsky's illness behaviour questionnaire (Pilowsky et al 1969).

Ewer 1986 (Continued)

Outcomes measured before and one week after treatment for lung function, methacholine challenge test, and psychological profiles.

Notes
Psychological profile results reported in another paper (not published).
No sample size calculation.
(author delivered intervention but outcome assessment was blinded).

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	Study investigators unaware as to order of treatment group assignment (Cochrane Grade A).

Freeman 2005

Methods	RCT (parallel design). Researcher not blind.	
Participants	Number eligible 70. 70 randomised, intervention group 25, control group 30. Age Intervention group: 44.7(9.24), control group: 45.3(10.87). Intervention group: M(5), F(20); control group: M(6), F(24), asthma severity: mild 23, moderate 34, severe 13.	
Interventions	Intervention: mental imagery relaxation. Control: waiting list	
Outcomes	asthma symptoms, mood states, health attributions, behaviour.	
Notes	Author contacted for copy of PhD to supplement information in publication.	
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Henry 1993

Methods	RCT (parallel design). Randomisation method: not stated. Outcome assessment method: not stated. Withdrawals and dropouts: not described. Jadad score 1.	
Participants	Number eligible not stated. 24 randomised, Intervention 12, Placebo 12. Dropout rate not stated. Age: 18-58 years (mean 39.66). Sex: Male 3, female 21. Physician diagnosed chronic asthma. Severity: moderate to severe. Numbers not stated. Setting: Hospital clinic in Spain. Inclusion criteria: presence of psychopathological disorders or psychosocial factors associated with the asthmatic disorder requiring treatment as well as imperfect control of asthma with conventional medical treatment; Spirometric evidence of bronchial asthma; age between 18 and 60 years. Exclusion criteria: severe disorders; mental retardation or other contraindications for autogenic therapy.	
Interventions	Intervention: Autogenic therapy. Placebo: supportive group psychotherapy including an educational component.	

Henry 1993 (Continued)

Intervention and placebo group sessions one hour a week over eight months.
Delivered by 'the therapist'.

Outcomes	FVC, FVC % predicted, FEV1, FEV1 % predicted, FEF 25-75, FEF 25-75 % predicted, MEF 50, MEF 50 % predicted. Measured at pre-treatment and post treatment, exact measurement points not stated. Psychological outcomes (reported in separate Spanish publication): 'reactivity to stress' measured by questionnaire with four sub scales vegetative, emotional, cognitive and behavioural (Gonzalez de Rivera, 1983). Measured before and after treatment (exact time not given).
Notes	Within group differences reported for all lung function outcomes. Between and within group differences reported for psychological outcomes. No sample size calculation.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Hockemeyer 2002

Methods	RCT (parallel design). Randomisation method: not described. Single blind. Drop-outs described. Jadad 3.
Participants	Number eligible 60, 60 randomised. 6 lost to follow-up. Intervention: 27, placebo control 27.
Interventions	Intervention: multi-component self-administered stress-management package (relaxation, CBT, emotional writing), control: education, brain teasers, writing on time management).
Outcomes	FEV1%, FEV1, perceived stress.
Notes	Classified as relaxation therapy.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Lehrer 1994

Methods	RCT (parallel design). Randomisation method: not stated. Outcome measurement method: described but not stated if blinded. Withdrawals and dropouts: described. Jadad score 2.
Participants	153 eligible after telephone screening. 106 randomised after further screening. 72 completed. Intervention 1- 25, Intervention 2- 26, Control- 21. Age: 18-65 years. Sex: Male 51, female 55. Physician confirmed diagnosis of asthma.

Lehrer 1994 (Continued)

Severity: mild to moderate (on average), numbers not stated.
Setting: Not clear but may have been hospital clinic in USA, may have several centres.
Inclusion criteria: Physician diagnosed asthma by history, physical examination, measurement of diffusion capacity and spirometry; Bronchial hyperreactivity to methacholine challenge test.
Exclusion criteria: Gross psychopathology, psychoactive medications, smokers, pregnant women, prior exposure to any form of relaxation therapy, asthma triggered only by exposure to specific easily avoided allergens, pulmonary disease other than asthma.

Interventions	Intervention 1: Progressive muscle relaxation. Intervention 2 : listening to relaxing music. Control (waiting list). 8 sessions with one hour a day at home (of intervention) in between sessions. Length of programme not given. Interventions delivered by 'relaxation therapist'.
Outcomes	Methacholine challenge test results, FEV1, FVC, Peak flow, FEF50, asthma symptom checklist (Kinsman et al 1973), relaxation questionnaire (9 point Likert scale), daily medication consumption and symptoms as reported in a log, Semantic differential rating (Osgood, 1957) of treatment and relationship with relaxation therapist and respiratory physician. Outcomes for intervention groups measured at baseline and after each session. Control group had three measurement points (time not stated).
Notes	Lung function outcomes presented graphically. Sample size calculation done.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Lehrer 1997

Methods	RCT (parallel design). Randomisation method: not stated. Outcome measurement method: described but not blinded. Withdrawals and dropouts: numbers given but not described. Jadad score: 1.
Participants	Number eligible not stated. 17 randomised, 15 completed. Intervention 1-5, Intervention 2-6, Control-4. Age: 18-65 years (mean 37.8). Sex: Males 5, females 12. Asthma diagnosis by respiratory physician. Severity: not stated. Setting: not clear but may be hospital asthma clinic. Inclusion criteria: History of recurrent asthma in the prior 12 months, wheeze that responds to B2 aerosol therapy OR positive methacholine challenge test in the last 12 months OR bronchodilator response on the laboratory of $\geq 20\%$ in FEV1; abnormal spirometry (FEV1 < 80% or FEF50% < 60%) in prior 12 months. Exclusion criteria: Chronic bronchitis or sinusitis, emphysema or non-asthma respiratory disease, smoker, previous experience of a relaxation procedure, cardiovascular or neurological disease, psychiatric disorder requiring psychoactive medication or which might interfere with understanding of treatment procedures and/or co-operation with them.
Interventions	Intervention 1: Respiratory Sinus Arrhythmia Biofeedback. RSA biofeedback given, then instruction given to increase amplitude of respiratory sinus rhythms. No relaxation or autogenic instructions were used.

Lehrer 1997 (Continued)

Intervention 2: EMG Biofeedback. Instruction given to relax shoulder muscles and breathe automatically. Electrodes measured thoracic muscle activity. Autogenic and progressive muscle relaxation methods used with incentive spirometry and EMG feedback.

Control (waiting list): Three testing sessions at two week intervals where participants were told to relax with eyes open.

6 intervention sessions given at weekly intervals (30 minutes each).

Training and testing done by same person (co-author), Profession not stated.

Outcomes	Respiratory impedance (ri); end tidal CO ₂ ; thoracic and abdominal breathing; peak respiratory flow; minute volume; heart "period" (R-R) intervals and amplitude, sensations of relaxation by Relaxation Inventory (Crist et al, 1989), Asthma symptoms (frequency of symptoms in previous week), Medication consumption Outcomes measured at one, four and six weeks.
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Notes	No sample size calculation.
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Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Lehrer 2004

Methods	RCT (parallel design). Randomisation method: restricted(age, sex, ethnicity, asthma severity). 4 groups.
Participants	Number eligible: 94, Full protocol: 23, Biofeedback only: 22, placebo: 24, control 25.
Interventions	Full protocol: HRV biofeedback, breathing training, Group 1: HRV biofeedback, Group 3: placebo biofeedback, Group 4: waiting list control. We compared group 2 and group 4.
Outcomes	Lung function, asthma symptoms, asthma exacerbations
Notes	Lung function data provided by author correspondence.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Payette 1977

Methods	RCT (parallel design). Method of randomisation: not stated. Outcome assessment described but not blinded. Withdrawals and dropouts not described. Jadad score 1.
Participants	Number eligible not stated. 18 adults randomised. Intervention: 11, Control: 7 Dropout rate not stated. Age: 22-67 years. Sex: 5 males, 13 females.

Payette 1977 (Continued)

Asthma diagnosis by medical diagnosis.
Severity of asthma not stated.
Setting: Asthma and allergy outpatient clinic at Tucson Medical Center, Arizona, USA.
Inclusion criteria: Primary medical diagnosis of asthma, in adequate health to complete the study, over age of 18, patient of the asthma clinic.

Interventions	Intervention:EMG biofeedback training-surface electrodes applied to lower frontalis muscle, subjects told to relax using biofeedback auditory and visual signals from frontalis muscle area. Told by lowering tone and microvolt setting they were relaxing. Control: Instructions to relax as best they could while reclining in comfortable recliner chair. 12 treatment sessions given over 20 minutes. Length of study not stated. Intervention given by investigator.	
Outcomes	Blood pressure; Pulmonary function tests- FVC, FEV1, %FEV1/FVC; Schedule of Recent Experiences (SRE); Taylor-Johnson Temperament Analysis (Taylor et al 1974). Outcomes measured at baseline. Blood pressure and pulmonary function tests measured before and after each session. At 2 post-baseline sessions after the treatment sessions the SRE and The Taylor-Johnson Temperament Analysis were administered. All outcomes were also measured at 30 days following the last session.	
Notes	No sample size calculation. Results presented graphically and by statistical tables, mean scores not presented.	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Put 2003

Methods	RCT (parallel design). Method of randomisation: drawing of envelopes. Outcome assessment: performed by independent researchers unaware of treatment allocation. Withdrawals and dropouts: described. Jadad score 4	
Participants	Number eligible 101. 25 adults randomised with one drop out from each group. Intervention: 12. Waiting list control: 11. Age: mean 43 years in intervention group, mean 48 years in control group. Sex: males 11, females 12. Asthma diagnosis by ATS criteria at least 6 months earlier. Severity: Mild 7, Moderate 15, Severe 1. Setting: University hospital outpatient pulmonary clinic, Belgium. Inclusion criteria: Asthma diagnosis using ATS criteria at least 6 months earlier. Experience of asthma complaints and impairment despite adequate medical treatment. Exclusion criteria: Aged less than 18 or over 65 years, occupational asthma, nicotine, drug or alcohol abuse, absence of asthma symptoms during the last 6 months, brittle asthma, previous participation in an educational or other asthma programme.	
Interventions	Intervention: Psycho-educational programme where the patients' personal illness representations, or their cognitions regarding origin, symptoms, course and therapy of their illness were identified. Information about the pathophysiology of asthma, mechanisms of medication, eliciting factors etc. was provided in an interactive way. Behavioural techniques such as self-monitoring/self observation, stim-	

Put 2003 (Continued)

ulus control, and response control were also taught. Certain parts of the programme were elaborated upon according to individual need.
Control: waiting list.
Programme delivered by two independent researchers. Profession not stated. Delivered over 3 months in 6 one hour individual sessions.

Outcomes	Health related limitations in quality of life during the past 2 weeks assessed by McMaster Asthma Quality of Life Questionnaire (Juniper et al, 1992), Subjective symptomatology of asthma measured by Asthma Symptom checklist (Kinsman et al 1973), Negative affectivity as a personality trait including negative emotional conditions (irritability, nervousness, emotional instability was measured by Negative Emotionality Scale (Tellegen et al, 1988). Frequency of non-adherent behavior was measured by The Adherent Scale (Brooks et al, 1994). Patients' knowledge regarding asthma, attitude towards the illness, and self-efficacy regarding perceived ability to control the disorder was measured by The Knowledge, Attitude, and Self-efficacy Asthma Questionnaire (KASE-AQ) (Wigal et al, 1993). Outcome measurement was done at baseline, 3 months and 6 months for the control group; baseline, immediately after the treatment interventions and 3 months later for the intervention group. Assessment done by researchers blind to the treatment allocation. PEF was measured by the subjects at home twice daily during 14 consecutive days.
Notes	No sample size calculation. Randomisation method is unclear, states done by sealed envelopes but no description of method is given. Between group analysis done by repeated measures analysis of variance.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Ross 2005

Methods	RCT (parallel design). Method of randomisation: not described. Blinding not described. Jada 3.
Participants	86 approached, 48 randomised, intervention 24, control 24. 25 completed (15 intervention, 10 control). E age 37.87 (SD 10.49), C age 40.70 (SD 12.57).
Interventions	Intervention CBT and education, control: waiting list.
Outcomes	Psychological measures asthma symptoms.
Notes	No sample size calculation.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Sommaruga 1995

Methods	RCT (parallel design). Method of randomisation: Not clear in paper but used computerised randomisation tables (from correspondence with MS). Outcome measurement: described but not stated as blinded.
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Sommaruga 1995 (Continued)

Withdrawals and dropouts: not described.
Jadad score: 2.

Participants	Number eligible not stated. 40 randomised, 36 completed. Intervention- 20, control-16. Age: mean 48.0 range not reported. Sex: Males 21, females 19. Asthma diagnosis according to ATS criteria (1987). Severity: not stated, all using drug therapy. In-patients with asthma. Setting: Hospital Respiratory Department in Italy (inpatients). Inclusion criteria: Asthma diagnosed according to ATS guidelines. Exclusion criteria not stated.
Interventions	Intervention: Asthma Rehabilitation group involving education and cognitive behavioural intervention with medical treatment following international guidelines. Control: Medical treatment following international guidelines. Education programme was delivered by physician, physiotherapist and psychologist twice during admission and quarterly for 12 months. Cognitive behavioural intervention delivered by psychologist during 3 individual meetings.
Outcomes	Trait anxiety measured by STAI (Spielberger et al. 1970); Depression, assessed by QD questionnaire; Psychophysiological disorders, assessed by QPF from Cognitive behavioural assessment questionnaire (Sanavio et al. 1986); emotional reactions to asthmatic crises, assessed by Asthma Symptom Checklist (Kinsman et al. 1973) in Italian version; Optimism, negative staff regard, specific internal awareness, external control psychological stigma, authoritarian attitude, assessed by Respiratory Illness Opinion Survey (Staudenmayer et al. 1978); Internal beliefs, external powerful others and external chance assessed by Health Locus of Control Scale (Wallston et al. 1976) (Italian Version). Outcomes measured at baseline and at one year.
Notes	No sample size calculation, Within group analysis only.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Wagaman 2000

Methods	RCT (parallel design). Method of randomisation: Following hypnotic susceptibility and psychometric testing, participants were stratified according to hypnotic susceptibility (large representation (46%) of highly hypnotisable subjects). Randomised to three groups. Randomisation method not described. Outcome assessment: Assessments and medical examinations blinded, but investigator performed interventions and delivered psychometric assessments. Withdrawals and dropouts: 9 withdrawals, no description given. Jadad score: 2.
Participants	Number eligible: 90. 45 met inclusion criteria after interview. 30 adults randomised, 21 completed. Intervention 1: hypnotic control group- symptom control (7), Intervention 2: Hypnotic suggestion group- immune function and airway relaxation (7), Placebo control (7). Age: 19-65 years (mean 41.0) Sex: Males 3, Females 18. Asthma diagnosed by physicians.

Wagaman 2000 (Continued)

Severity of asthma: Moderate to moderately severe- classified using National Institute of Health Guidelines.

Setting: Allergy and Immunology private practice.

Inclusion criteria: Full time local residents, non-smokers at present, inexperience with hypnosis and other similar techniques, not receiving immunotherapy.

Exclusion criteria: History of past or present psychiatric disorders, past or present psychotropic drug use, significant secondary gain, significant psychosocial problems, recent major loss (death, job, divorce).

Interventions	<p>Intervention 1: Hypnotic control group with taped hypnotic sessions directed at symptom relief through ability to relax smooth airway muscle. Intervention 2: Hypnotic suggestion group, taped hypnotic sessions directed at improvement of immune function, resolution of inflammation and biochemical relief of bronchospasm.</p> <p>Control: Non hypnotic placebo group, taped session of neurophonic tones- told may or may not contain subliminal suggestions pertaining to asthma care and control.</p> <p>6 sessions for each group delivered by hypnosis therapist (author), 3 one week apart, 3 reinforcement sessions delivered at 3 month intervals. Tapes used by participants daily and for symptom relief.</p>
Outcomes	<p>Daily patient diaries of PEF, asthma symptom score, frequency of use of PRN medication, work/school absences, private doctor visits, emergency room visits, and hospitalisations. Recorded for 3 to 4 months before sessions commenced and for one year afterwards.</p> <p>Initial and final interview done.</p> <p>Clinical assessments done every 3 months by physicians blind to group allocation- FEV1, FEF 25-75%, PEF. Psychometric testing done by author at baseline and one year follow up. Eysenck Personality Inventory to measure neuroticism, extraversion, and lying. Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe 1960) to measure repressive coping. STAI (Spielberger et al. 1970) to measure anxiety. Self-control schedule (Rosenbaum 1980) to measure the solution of behavioural problems. Dysfunctional Cognition Inventory (Zocco 1984)- catastrophizing scale, Asthma Symptom Checklist (Kinsman et al. 1973).</p>
Notes	<p>No sample size calculation.</p> <p>Data presented in graphical form.</p> <p>Mainly within group analysis.</p>

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	Information not available (Cochrane Grade B)

Abbreviations-

ATS American Thoracic Society, EMG- Electro-myogram, FEF- Forced expiratory flow, FEV1- Forced expiratory volume over one second, FEV1/FVC- ratio of FEV1 and FVC, FRC- Functional residual capacity, FVC- Forced vital capacity, MEF- Mid expiratory flow, PEF- Peak expiratory flow, RCT- Randomised controlled trial, RV- Residual volume, SD- Standard Deviation, STAI- State-Trait Anxiety Inventory, VC- Vital capacity.

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Ago 1976	CCT of teaching patients about the mind-body relationship
Allen 1995	RCT of a self-management programme
Anon 1968	RCT of hypnosis in adults and children. Unable to separate data

Study	Reason for exclusion
Bailey 1990	RCT of a self-management programme. Intervention was mainly education with a small element of counselling
Barendregt 1957	CCT of group psychotherapy
Ben-Zvi 1982	Before and after study of hypnosis
Bosley 1995	Abstract only - unclear if RCT or CCT
Boulet 1995	CCT of an education only programme
Cambach 1997	RCT of pulmonary rehabilitation including asthma and chronic obstructive pulmonary disease (COPD) patients
Ciurluini 1993	CCT of psychotherapy techniques
Clark 1997	Review of self-management education programmes
Coen 1996	RCT of relaxation. Study includes adults and children. Unable to separate data
Conte 1981	Review of psychotherapy for medically ill patients
Cox 1991	CCT of rehabilitation. Study includes asthma and COPD patients. Unable to separate data
De Vries 2004	Not randomised - patients allocated to treatment on an alternate basis.
Deter 1983a	Cost effectiveness study based on data of included study (Deter 1983)
Devine 1996	Meta-analysis of psychoeducational care
Erskine-Milliss 1987	Two studies of biofeedback in adults and children (before and after study)
Fernandes 2006	RCT evaluating the effect of multi-disciplinary education and multi- family psychotherapy.
Franco 1982	CCT of hypnosis
Fujii 1997	Case study of step-down management of asthma
Gashynova 2005	RCT evaluating the influence of psychological intervention. No details of the psychological rehabilitation content provided (author contact attempted).
Ghosh 1998	RCT of self-management without psychotherapy in adults and children
Groen 1960	Clinical study, not controlled or randomised
Grover 2002	CCT of Cognitive Behavioural Therapy
Hackman 2000	Review of hypnosis in adults and children with asthma
Haire-Joshu 1993	Survey, focus groups and interview to assess patients' attitudes according to clinical setting
Hajjar 1999	Review of behavioural interventions in asthma
Harding 1982	CCT Of biofeedback training

Study	Reason for exclusion
Hashizume 1996	Psychosomatic therapies in a before and after study
Hirokawa 1992	CCT of biofeedback apparatus
Huntley 2002	Review of relaxation therapies for asthma
Jonckheere 1997	Review of psychosomatic issues in a range of diseases
Kang 1993	Before and after study of the impact of psychological factors in adolescents.
Kaptein 1987	Review (COPD)
Kern-Buell 2000	Adults and children included in RCT on relaxation
Khateeb 1995	Meta-analysis of psychotherapy
Klingelhofer 1988	Review of asthma self-management programmes
Kolbe 1996	Knowledge of self-management outcome measure validity study
Kotses 1991	CCT of self-management without psychotherapy
Kotses 1995	RCT of self-management without psychotherapy
Kotses 1996	RCT of self-management, primarily education although some received a relaxation tape
Lahdensuo 1996	RCT of a self-management programme
Laidlaw 1994	Before and after study of hypnosis
Langewitz 2005	RCT of self-hypnosis on hay fever symptoms. Participants had mild asthma. Outcome measures related to hay fever symptoms only.
Lehrer 1986	CCT of relaxation and biofeedback
Lehrer 1992	Review of psychological approaches in asthma
Lehrer 1993	Review of the relationship between emotion and asthma
Lehrer 1997a	Analysis of data from 1994 study (included) to study the physiological relationship between pulmonary function and autonomic control of the heart.
Lehrer 2003	Evaluation of biofeedback with healthy adults
Lehrer 2006	Additional analysis from a previously published study evaluating the effects of biofeedback (See included studies Lehrer 2004).
Levendel 1980	Narrative review of the biofeedback method
Lewith 1996	Review of complementary therapies in asthma
Linden 1994	Review of autogenic training in a range of diseases
Loew 1996	Before and after study of functional relaxation

Study	Reason for exclusion
Loew 2001	Crossover study.
Maes 1988	CCT of an education and behaviour modification intervention
Matts 1973	Review of the treatment of bronchospasm (including psychological)
Moore 1965	CCT of behavioural therapy. Adults and children included in study
Murphy 1989	CCT of hypnotic susceptibility and relaxation
Mussell 1988	Crossover study.
Nagata 1995	Before and after study of a psychosomatic treatment
Negley-Parker 1986	Case report of hypnotherapy of families of children with chronic illness
Nickel 2005	RCT of relaxation therapy in adolescent patients. Author unable to separate data to include only participants 16 years or older.
Nickel 2006	RCT evaluating relaxation therapy for pregnant women with asthma.
Nowobilski 2005	RCT of music therapy - no psychological input.
Peper 1992	CCT of behavioural and desensitization programme using biofeedback
Richter 1982	Review of psychosomatic aspects of asthma
Richter 1987	Review of behavioural therapy and relaxation
Ringsberg 1990	RCT of self-management without psychotherapy
Ritz 2001	Systematic review of relaxation therapies for asthma
Sachs 1993	CCT of relaxation training
Sauer 1978	CCT of autogenic training
Schaeffer 1975	CCT of self-training
Sclare 1957	CCT of group therapy
Smith 2005	RCT of mostly educational intervention
Snyder 1987	RCT of self-management without psychotherapy
Song 2005	Quasi-experimental study (allocation based on hospital number) evaluating relaxation, breathing exercises and individual psychological intervention.
Spieß 1988	RCT of education intervention (non-randomised sub group received relaxation therapy)
Stepans 2000	RCT of patients with asthma and COPD. Unable to separate data.
Steptoe 1981	CCT of biofeedback, non asthmatic volunteers included
Stout 1997	RCT of breathing retraining only

Study	Reason for exclusion
Stuhr 1996	Review of psychosomatic and psychotherapy research
Vedanthan 1998	RCT of yoga
Vickers 1997	Survey and review of complementary therapies
Wilson 1975	Cross-over study of transcendental meditation
Wilson 1993	RCT of self-management without psychotherapy
Zukiwski 2002	RCT of two different forms of relaxation (no control group).

Characteristics of ongoing studies *[ordered by study ID]*

Harrison

Trial name or title	The Coping with Asthma Study: A randomised controlled trial and economic evaluation of a home-based coping skills training programme for high risk asthma sufferers.
Methods	
Participants	92 patients aged 15-66 (mean 36.46) recruited mainly from 5 hospital respiratory departments in Norfolk and Suffolk with a small number recruited from general practice. The setting for the study is the community (patient's homes) with the intervention co-ordinated via the lead hospital. Patients are recruited on the basis that they have severe asthma as indicated by them being on British Thoracic Society Step 4/5 treatment and/or having had previous admissions for asthma. The patients are also deemed to be at risk of future adverse asthma outcomes due to failure to attend clinic appointments or comply with their asthma management in other ways (e.g. non-compliance with medication or changes in medication, failure to keep peak flow records when asked)
Interventions	Four fortnightly home visits of approximately one hour in length conducted by an asthma nurse for two months, supplemented by phone calls between visits and monthly for four months after the last visit, making a 6 month intervention in total. Patients are also able to phone the asthma nurse throughout and after the duration of the intervention. The nurse provides asthma education, self-management and coping skills training and, with clinical supervision from a general practitioner with psychiatric training and Health Psychologist, aims to address co-existing psychosocial problems which compromise effective asthma management. The intervention takes a cognitive behavioural approach and involves liaison with/referral to other medical, psychological or social services as necessary. The control group continues with routine care comprising usual use of primary, secondary and emergency health services which varies to some degree across the hospitals involved.
Outcomes	Primary outcome: Asthma control assessed via a score from a brief questionnaire asking about asthma symptoms in the past month (questionnaire based on recommendations from Royal College of Physicians Asthma Outcomes seminar 1999, used in previous local studies, reliability and validity work being undertaken). Secondary outcomes: Quality of life assessed via the Living with Asthma

Harrison (Continued)

Questionnaire (Hyland) and Short Form 36 (Ware et al).
Economic evaluation will also involve assessment of direct health care, social service and patient costs and indirect costs.
Additional/explanatory outcomes: Psychiatric morbidity assessed via the General Health Questionnaire 12 and Hospital Anxiety & Depression Scale, attack and everyday coping assessed via the Asthma Coping Questionnaire (Maes & Schlosser), perceived control assessed via the Perceived Control of Asthma Questionnaire (Katz et al), attack management and compliance assessed via 2 sub-scales of the Revised Asthma Problem Behavior Checklist (Creer et al) and compliance scale of Moriskey, readiness to change asthma self management behaviour assessed via an Asthma Stage of Change Questionnaire developed for the study and supplemented with additional questions on performance of self management behaviours (trigger avoidance, peak flow monitoring, smoking, exercise etc.)
Outcomes are assessed via self administered questionnaires completed by patients during interviews in their home conducted at baseline and 2, 6 and 12 months after entry into the study. The primary endpoint is 6 months (the end of the intervention for those receiving the nurse programme).

Starting date	September 1999
Contact information	Study researcher: Jane Smith, School of Medicine, Health Policy & Practice, University of East Anglia, Norwich, NR4 7TJ, UK. Email: j.r.smith@uea.ac.uk, Phone: 01603 593584 Principal investigator: Dr Brian Harrison, Department of Respiratory Medicine, Norfolk & Norwich University Hospital NHS Trust, Colney Lane, Norwich, NR4 7UY, UK. Email: brian.harrison@norfolk-norwich.thenhs.com, Phone: 01603 289642.
Notes	Expected completion early 2003 Funded by the British Lung Foundation with sponsorship from the Community Fund (formerly National Lottery Charities Board)

DATA AND ANALYSES

Comparison 1. Bio-feedback therapy versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 FEV1 (% predicted)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Medication use	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Withdrawals	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
4 PEF	2	51	Std. Mean Difference (IV, Fixed, 95% CI)	0.66 [0.09, 1.23]
5 Exacerbations (use of oral corticosteroids)	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
6 Symptoms	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
6.1 Bronchoconstriction	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.2 Hypoventilation	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 1.1. Comparison 1 Bio-feedback therapy versus control, Outcome 1 FEV1 (% predicted).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Lehrer 2004	17	79.8 (19.9)	23	74.9 (26)		4.93[-9.32,19.18]
					Favours control	Favours treatment

Analysis 1.2. Comparison 1 Bio-feedback therapy versus control, Outcome 2 Medication use.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Lehrer 2004	17	5.2 (2.8)	23	7.6 (2.7)		-2.43[-4.15,-0.71]
					Favours treatment	Favours control

Analysis 1.3. Comparison 1 Bio-feedback therapy versus control, Outcome 3 Withdrawals.

Study or subgroup	Treatment		Control		Odds Ratio	Odds Ratio
	n/N		n/N		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI
Lehrer 2004	5/22		2/25			3.38[0.58,19.57]
					Favours treatment	Favours control

Analysis 1.4. Comparison 1 Bio-feedback therapy versus control, Outcome 4 PEF.

Study or subgroup	Treatment		Control		Std. Mean Difference	Weight	Std. Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI		Fixed, 95% CI
Lehrer 1997	6	603 (366)	5	400 (175)		21.57%	0.63[-0.61,1.86]
Lehrer 2004	17	97.3 (26)	23	78.5 (28.6)		78.43%	0.67[0.02,1.31]
Total ***	23		28			100%	0.66[0.09,1.23]
Heterogeneity: Tau ² =0; Chi ² =0, df=1(P=0.95); I ² =0%							
Test for overall effect: Z=2.26(P=0.02)							
					Favours control		Favours treatment

Analysis 1.5. Comparison 1 Bio-feedback therapy versus control, Outcome 5 Exacerbations (use of oral corticosteroids).

Analysis 1.6. Comparison 1 Bio-feedback therapy versus control, Outcome 6 Symptoms.

Study or subgroup	Treatment		Control		Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
	N	Mean(SD)	N	Mean(SD)		
1.6.1 Bronchoconstriction						
Lehrer 1997	5	1.8 (0)	4	2.3 (0)		Not estimable
1.6.2 Hypoventilation						
Lehrer 1997	5	1.1 (0)	4	1.7 (0)		Not estimable

Comparison 2. Cognitive behavioural therapy versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Asthma quality of life questionnaire	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 Total	2	48	Mean Difference (IV, Fixed, 95% CI)	0.71 [0.23, 1.19]
1.2 Activity level	1	23	Mean Difference (IV, Fixed, 95% CI)	1.20 [0.59, 1.81]
1.3 Symptoms	1	23	Mean Difference (IV, Fixed, 95% CI)	0.70 [0.16, 1.24]
1.4 Emotions	1	23	Mean Difference (IV, Fixed, 95% CI)	1.30 [0.59, 2.01]
1.5 Environment	1	23	Mean Difference (IV, Fixed, 95% CI)	0.70 [-0.08, 1.48]
2 Asthma symptoms checklist	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Obstruction	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 Dyspnoea	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.3 Fatigue	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.4 Hyperventilation	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.5 Anxiety	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.6 Irritation	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3 Diurnal PEF (Litres/min)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Nocturnal PEF (Litres/min)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Negative emotional score (NEM)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6 Adherence scale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7 Trait anxiety scale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8 Psychophysiological disorder	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Depressive symptoms	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9.1 Depression subscale	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
9.2 Beck Depression Inventory	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
10 Asthma Quality of Life Questionnaire - Total	2	48	Mean Difference (IV, Fixed, 95% CI)	0.71 [0.23, 1.19]
11 Peak flow variability	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12 Withdrawals	2	88	Odds Ratio (M-H, Fixed, 95% CI)	0.42 [0.15, 1.15]
13 Health locus of control	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13.1 Total score	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13.2 Internal beliefs	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13.3 External-powerful-others	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13.4 External chance	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
14 Symptom free days	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
15 Sheehan patient rated anxiety scale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Analysis 2.1. Comparison 2 Cognitive behavioural therapy versus control, Outcome 1 Asthma quality of life questionnaire.

Study or subgroup	Treatment		Control		Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
	N	Mean(SD)	N	Mean(SD)			
2.1.1 Total							
Put 2003	12	5.7 (0.6)	11	4.7 (0.7)		79.82%	1[0.46,1.54]
Ross 2005	15	5.1 (1.2)	10	5.5 (1.4)		20.18%	-0.45[-1.51,0.61]
Subtotal ***	27		21			100%	0.71[0.23,1.19]

Analysis 2.2. Comparison 2 Cognitive behavioural therapy versus control, Outcome 2 Asthma symptoms checklist.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Put 2003	12	1.9 (0.9)	11	2.4 (0.9)		-0.5[-1.24,0.24]
					Favours treatment	Favours control

Analysis 2.3. Comparison 2 Cognitive behavioural therapy versus control, Outcome 3 Diurnal PEF (Litres/min).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Put 2003	12	430 (93)	10	398 (82)		32[-41.16,105.16]
					Favours control	Favours treatment

Analysis 2.4. Comparison 2 Cognitive behavioural therapy versus control, Outcome 4 Nocturnal PEF (Litres/min).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Put 2003	12	423 (81)	10	375 (103)		48[-30.59,126.59]
					Favours control	Favours treatment

Analysis 2.5. Comparison 2 Cognitive behavioural therapy versus control, Outcome 5 Negative emotional score (NEM).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Put 2003	12	2.4 (2.6)	11	7.1 (2.9)		-4.7[-6.96,-2.44]
					Favours control	Favours treatment

Analysis 2.6. Comparison 2 Cognitive behavioural therapy versus control, Outcome 6 Adherence scale.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Put 2003	12	7 (1.6)	11	8.4 (2.1)		-1.4[-2.94,0.14]
					Favours treatment	Favours control

Analysis 2.7. Comparison 2 Cognitive behavioural therapy versus control, Outcome 7 Trait anxiety scale.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Sommaruga 1995	20	36.7 (9.1)	16	32.4 (5.6)		4.3[-0.54,9.14]
					Favours treatment	Favours control

Analysis 2.8. Comparison 2 Cognitive behavioural therapy versus control, Outcome 8 Psychophysiological disorder.

Analysis 2.9. Comparison 2 Cognitive behavioural therapy versus control, Outcome 9 Depressive symptoms.

Analysis 2.10. Comparison 2 Cognitive behavioural therapy versus control, Outcome 10 Asthma Quality of Life Questionnaire - Total.

Analysis 2.11. Comparison 2 Cognitive behavioural therapy versus control, Outcome 11 Peak flow variability.

Analysis 2.12. Comparison 2 Cognitive behavioural therapy versus control, Outcome 12 Withdrawals.

Analysis 2.13. Comparison 2 Cognitive behavioural therapy versus control, Outcome 13 Health locus of control.

Analysis 2.14. Comparison 2 Cognitive behavioural therapy versus control, Outcome 14 Symptom free days.

Analysis 2.15. Comparison 2 Cognitive behavioural therapy versus control, Outcome 15 Sheehan patient rated anxiety scale.

Comparison 3. Relaxation/hypnosis/autogenic therapy versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Increase in medication usage	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Decrease/discontinuation of medication	2	47	Odds Ratio (M-H, Fixed, 95% CI)	4.47 [1.22, 16.44]
3 FVC	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Withdrawals	5	249	Odds Ratio (M-H, Fixed, 95% CI)	0.76 [0.40, 1.44]
5 FEV1	4	150	Std. Mean Difference (IV, Fixed, 95% CI)	-0.01 [-0.41, 0.40]
6 PEF (Litres/min)	2	94	Mean Difference (IV, Fixed, 95% CI)	43.41 [-5.30, 92.12]
7 Airway resistance (cm H2O/Litre/second)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8 Medication usage (puffs/day)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Spielberger's Trait Anxiety score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10 Spielberger's State Anxiety score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11 Depression	2	88	Std. Mean Difference (IV, Fixed, 95% CI)	0.17 [-0.25, 0.59]
12 Asthma Quality of Life Questionnaire	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12.1 Total	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
12.2 Symptoms	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13 Symptoms - wheeze	2	88	Mean Difference (IV, Fixed, 95% CI)	-0.07 [-0.69, 0.56]
14 FEV1%	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
15 Symptoms - attacks	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
16 Symptoms - cough	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
17 Anxiety	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
18 Attitude	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
19 Self-efficacy	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Analysis 3.1. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 1 Increase in medication usage.

Analysis 3.2. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 2 Decrease/discontinuation of medication.

Analysis 3.3. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 3 FVC.

Analysis 3.4. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 4 Withdrawals.

Analysis 3.5. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 5 FEV1.

Analysis 3.6. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 6 PEF (Litres/min).

Analysis 3.7. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 7 Airway resistance (cm H2O/Litre/second).

Analysis 3.8. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 8 Medication usage (puffs/day).

Analysis 3.9. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 9 Spielberger's Trait Anxiety score.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Epstein 2004	17	41.2 (11.9)	16	38.6 (11.9)		2.52[-5.59,10.63]
					Favours treatment Favours control	

Analysis 3.10. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 10 Spielberger's State Anxiety score.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Epstein 2004	17	36.2 (11.4)	16	42.9 (15.2)		-6.64[-15.88,2.6]
					Favours treatment Favours control	

Analysis 3.11. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 11 Depression.

Study or subgroup	Treatment		Control		Std. Mean Difference	Weight	Std. Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI		Fixed, 95% CI
Epstein 2004	17	4.9 (5.9)	16	7 (6.7)		38.01%	-0.33[-1.02,0.36]
Freeman 2005	25	28 (8.8)	30	24 (7.8)		61.99%	0.48[-0.06,1.02]
Total ***	42		46			100%	0.17[-0.25,0.59]
Heterogeneity: Tau ² =0; Chi ² =3.28, df=1(P=0.07); I ² =69.51%							
Test for overall effect: Z=0.78(P=0.43)							
					Favours treatment Favours control		

Analysis 3.12. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 12 Asthma Quality of Life Questionnaire.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
3.12.1 Total						
Epstein 2004	17	5.3 (1.4)	16	4.9 (1.5)		0.36[-0.61,1.33]
3.12.2 Symptoms						
Epstein 2004	17	61 (17)	16	57 (20)		4[-8.7,16.7]
					Favours treatment Favours control	

Analysis 3.13. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 13 Symptoms - wheeze.

Analysis 3.14. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 14 FEV1%.

Analysis 3.15. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 15 Symptoms - attacks.

Analysis 3.16. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 16 Symptoms - cough.

Analysis 3.17. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 17 Anxiety.

Analysis 3.18. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 18 Attitude.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Freeman 2005	25	90.2 (7.1)	30	80 (9.5)		10.2[5.81,14.59]
					Favours treatment -10 -5 0 5 10 Favours control	

Analysis 3.19. Comparison 3 Relaxation/hypnosis/autogenic therapy versus control, Outcome 19 Self-efficacy.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Freeman 2005	25	89.2 (9.5)	30	77.4 (10)		11.8[6.64,16.96]
					Favours control -10 -5 0 5 10 Favours treatment	

WHAT'S NEW

Date	Event	Description
20 August 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 2, 2000

Review first published: Issue 3, 2003

Date	Event	Description
31 August 2006	New search has been performed	This update reflects data from one new study (Freeman 2005). Fifteen studies are now included in the review. The conclusions of the review were not significantly altered.
22 August 2005	New citation required and conclusions have changed	<p>This update reflects data from four new studies (Epstein 2004; Hockemeyer 2002; Lehrer 2004; Ross 2005). Two studies previously included have now been excluded from this review as they were of crossover design (Loew 2001; Mussell 198) and as such are prone to carryover effects.</p> <p>Fourteen studies are now included in the review. Some pooled effects were analysed with new data. 'As needed' medication usage was lower with relaxation therapy compared with control (OR 4.47, CI 1.22 to 16.44). Quality of life, measured using the Asthma Quality of Life Questionnaire showed a positive effect following CBT (WMD 0.71, CI 0.23 to 1.19). Peak Expiratory Flow outcome data indicated a significant difference in favour of bio-feedback therapy (SMD 0.66, CI 0.09 to 1.23). There was no significant difference in favour of relaxation therapy for FEV1 (SMD -0.01, CI -0.41 to 0.40). Study quality remains poor, casting some question over the validity of the findings in the review. Improved reporting of study conduct would help to determine the robustness of the randomisation procedures.</p>

CONTRIBUTIONS OF AUTHORS

JY, SF and CS developed the protocol and assessed abstracts for potential inclusion in the review. JY analysed the results and wrote up the findings and discussion. CS & SF provided advice and input on the write up of the findings and discussion. MM gave editorial support and guidance throughout.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- Garfield Weston Foundation, UK.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We excluded crossover studies in the most recent versions of this review, since unlearning psychological treatments such as counselling would be impossible to ascertain prior to crossing over to receive comparator therapy.

INDEX TERMS

Medical Subject Headings (MeSH)

*Psychotherapy; Asthma [psychology] [*therapy]; Health Services Needs and Demand [statistics & numerical data]; Randomized Controlled Trials as Topic

MeSH check words

Adult; Humans