

Psychological interventions for children with asthma (Review)

Yorke J, Fleming SL, Shuldham C



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[Intervention Review]

Psychological interventions for children with asthma

Janelle Yorke¹, Sharon L Fleming², Caroline Shuldham³

¹School of Nursing, Faculty of Health and Social Care, University of Salford, Greater Manchester, UK. ²Department of Nursing and Quality, Royal Brompton and Harefield NHS Trust, London, UK. ³Royal Brompton and Harefield NHS Trust, London, UK

Contact address: Janelle Yorke, School of Nursing, Faculty of Health and Social Care, University of Salford, Federick Road campus, Greater Manchester, M6 6PU, UK. J.Yorke@salford.ac.uk

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ABSTRACT

Background

Asthma is a chronic disease of inflammation and smooth muscle dysfunction, including bronchoconstriction. These symptoms are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. Psychological factors may influence the symptoms and management of asthma in children in many ways, for example, evidence suggests that emotional stress can either precipitate or exacerbate both acute and chronic asthma.

Objectives

To assess the efficacy of psychological interventions in improving health and behavioural outcomes for children with asthma.

Search strategy

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

Selection criteria

Randomised controlled trials published in any language assessing the effects of a psychological intervention compared with a control intervention in children and adolescents with asthma were included in the review. Cross-over trials were considered inappropriate for studies using psychological interventions and were therefore excluded from this systematic review.

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

Twelve studies (588 children) were included in the review. Study quality was poor and sample sizes were frequently small. A meta-analysis was possible on two studies only examining the effects of relaxation therapy on PEFV which favoured the treatment group (32 L/min, 95% CI 13 to 50 L/min). No other meta-analysis could be performed due to the diversity of interventions and the outcomes assessed. In addition, many studies reported insufficient data.

Authors' conclusions

This review was unable to draw firm conclusions for the role of psychological interventions for children with asthma. This review demonstrates the absence of an adequate evidence base and highlights the need for well-conducted and reported randomised trials in this area.

PLAIN LANGUAGE SUMMARY

Psychological interventions for children with asthma

It is thought that psychological factors may play an important part in asthma, although this could not be determined in a previous review of psychological interventions in adults with asthma. Although there were twelve studies in this review that met inclusion criteria, the studies were small and study quality was poor. One finding did indicate that psychological interventions led to an improvement in peak flow. However, this finding would require confirmation in additional studies of better quality. No endorsement of psychological interventions can be made on the basis of the current literature.

BACKGROUND

Asthma is characterised by at least partial reversibility of airway obstruction (Stirling 2001). Symptoms of asthma include wheezing, breathlessness and coughing, particularly at night and in the morning (Global Initiative for Asthma (GINA 2003)). These symptoms are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. Asthma is also associated with frequent exacerbations, during which symptoms become more severe and distressing (Roberts 2004), and can be precipitated by a number of chemical, physical and emotional stimuli. Asthma symptoms have been shown to limit many physical, emotional and social aspects of a patient's life (Juniper 1992).

Psychological factors may influence the symptoms and management of asthma in children in many ways. There is evidence that emotional stress can either precipitate or exacerbate both acute and chronic asthma (Sandberg 2000). Psychological barriers, such as faulty symptom attribution, lack of knowledge, poor self-efficacy and desire for autonomy, may adversely affect therapeutic compliance in children and adolescents. Psychological barriers in parents, such as mental health problems and poor coping skills, may also detrimentally influence their children's asthma management (Lask 1979). However, Gustafsson 1994 concluded that dysfunctional family interaction seems to be the result rather than the cause of wheezing in children.

Several psychotherapeutic interventions may be employed to ameliorate these problems. These include family therapy, educational

interventions, behavioural therapies, cognitive therapies, cognitive behavioural therapy, relaxation techniques, psychodynamic psychotherapies and counselling, in both individual and group formats.

This systematic review examined the efficacy and effectiveness of these psychotherapeutic interventions for childhood asthma. Family therapy and educational interventions were excluded from this review, since Cochrane reviews on these topics already exist. In the case of interventions for children with asthma these include: Family therapy for asthma in children (Yorke 2005); Interventions for educating children who have attended the emergency room for asthma (Haby 2001) and Educational interventions for asthma in children (Wolf 2002).

OBJECTIVES

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

1. To assess the overall efficacy of psychotherapeutic interventions compared with usual treatment in improving health and behavioural outcomes for children with asthma.
2. To assess the comparative efficacy of different types of psychotherapy for children with asthma.

3. To assess the comparative efficacy of individual and group formats of psychotherapy for children with asthma.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCT) comparing the effects of psychological interventions for children with asthma were considered for inclusion. In the original protocol it was stated that this review would examine case-control trials (CCTs) 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 was designed to include RCTs only. Cross-over trials were considered 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

Children, both male and female, under the age of 18 years of age with asthma that has been diagnosed by a physician or diagnosed using internationally established criteria (e.g. [BTS 2003](#); [GINA 2003](#)).

Treatments in both in and out patient settings were included.

Types of interventions

Psychological interventions have a long history and have been identified as the procedure by which a therapist purposively and systematically attempts to influence a patient by psychological means so that the patients' symptoms decrease or there is a positive change in behaviour (Barendregt 1957). Psychotherapy models can be grouped according to their theoretical frameworks or methods of operation.

Approaches included:

I. Behavioural therapies

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

2. Cognitive therapies

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. Cognitive behaviour therapy

Incorporating the key elements of both behavioural and cognitive models.

4. Relaxation techniques with biofeedback and without biofeedback

Designed to control stress and anxiety which, in asthma, may improve breathing and respiratory function. The following approaches are used:

- i) Progressive relaxation: systematically creating tension and release in different parts of the body and/or via guided imagery.
- ii) Autogenic training: focuses on attending to bodily feelings and mentally controlling them.
- iii) Hypnosis: deep relaxation that may be induced using mental imagery, often accompanied by autosuggestion to create positive thoughts and feelings.
- iv) Biofeedback: feedback of biological indicators which the subject must control via relaxation. May also be considered a behavioural intervention since the feedback can act as a reinforcer.

5. Psychodynamic psychotherapies

Including psychoanalysis, psychosomatic therapy, hypnosis.

6. Counselling

Involves talking over problems with a health professional. In supportive counselling, the Counsellor aims to be a good listener and provide emotional support, rather than offering a more targeted psychotherapeutic intervention.

7. Group therapy

Psychotherapeutic interventions conducted in groups (e.g. group psychosomatic therapy).

Approaches excluded were:

Family therapy: this is the subject of another review recently updated by our group.

Educational approaches: such approaches are already the subject of several Cochrane reviews. For this reason, patient education programmes were only included where they comprised only part of a more complex psychotherapeutic intervention.

Breathing re-training exercises: these include a range of techniques for improving breathing control in asthma (e.g. Buteyko technique, yoga, and transcendental meditation). Although these may contain elements of certain psychotherapeutic interventions, such as relaxation and biofeedback, methods such as these are not regarded as standard psychotherapies. Furthermore, a Cochrane review has already been completed on this topic (Holloway 2004). For this reason, breathing re-training exercises were only included where they comprise only part of a more complex psychotherapeutic intervention.

Types of outcome measures

Primary outcomes

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

Secondary outcomes

1. Lung function (e.g. PEFR, FEV1 and spirometry)
2. Level of severity of asthma symptoms
3. Medication use
4. Absenteeism from school
5. Psychological questionnaires (e.g. coping skills, anxiety, depression, asthma related behaviour scales, locus of control, self-esteem, self efficacy, quality of life and, psychological status)
6. Change of behaviour scales
7. Asthma knowledge questionnaires

Search methods for identification of studies

Searches are updated annually; studies found by searches up to the end of April 2007 were included.

Electronic searches

The primary source of data was the Cochrane Airways Review Group Trials Register. In addition, the psychological database PsycINFO was also searched to identify pertinent studies not appearing in other medical databases. Descriptions of the search term applied to these databases are shown below.

The Airways Group Asthma Register was searched using the following terms:

(psychotherap* or "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* or "aversion therap*" or "nondirect therap*" or "play therap*" or psychoanalytic* or psychodrama* or relaxation* or role-play* or rational-emotive* or "reality therap*" or "socioenvironmental therap*" or cognitive* or "eclectic therap*" or "educational therap*" or "gestalt therap*" or existential* or expressive*

or experiential* or "interpersonal therap*" or "pastoral therap*" or "persuasion therap*" or autogenic* or "sensitivity train*" or mental or anxiety or depressi* or panic* or biofeedback*) AND (child* or infant* or paediat* or pediat* or adolesc* or teen* or young* or school*)

PsycINFO was searched using the following terms:

(Asthma [SG] OR Asthma[tw] OR Wheez[tw]) AND (Psychotherapeutic techniques [SH] OR Psychotherapy [SH] OR Cognitive techniques [SH] OR Personal therapy [SH] OR Therapeutic processes [SH] OR counseling [SH] OR Psychosocial [tw]) AND (Trial[tw] OR Experiment[tw] OR Controlled stud[tw] OR Comparative stud[tw] OR Random[tw] OR double-blind[tw] OR double blind[tw] OR Single-blind[tw] OR Single blind[tw] OR Controlled stud[tw] OR Comparative stud[tw]).

All searches were restricted to cases aged 18 years or less.

Searching other resources

Bibliographies of each identified trial were searched for additional papers that might contain relevant trials. Authors of all identified RCTs and key experts in the field were contacted and asked to identify further published or unpublished work.

Data collection and analysis

Selection of studies

Abstracts of articles identified using the search strategy were studied and those articles that appeared to meet the inclusion criteria were obtained in full text form. Two independent reviewers (JY and CS) established whether each study met the inclusion criteria as an RCT of a psychotherapeutic intervention for children with asthma according to the above inclusion criteria. Any disagreements were resolved by discussion and consultation with another reviewer (SF) as required. Where there was uncertainty about methods, interventions or outcome measures used, the authors were contacted.

Data extraction and management

Data were extracted by two authors and entered on to generic pro forma, before being cross-checked 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 (JY and 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 the studies.

Each study was also assessed using the 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 on 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-blind trials. Therefore step 2 and 5 'double-blind' was changed to 'blind'.

There were four disagreements between the reviewers (JY and CS) which were resolved by discussion.

Where allocation concealment or the randomisation process was unclear, letters were sent to the authors asking for this information. However, as most of these studies were completed some time ago, correspondence from only two authors (Colland 1993; Dahl 1990) was received.

Data synthesis

Data were extracted and entered into RevMan 4.2. 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 direction 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. Where heterogeneity was present (>0%) we performed a random effects analysis to incorporate statistical heterogeneity in to the pooled estimate. Where this altered the direction of the effect we have reported both sets of results.

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Results of the search

Of 109 papers identified, 12 trials involving 588 children were eligible. Details of studies not meeting the entry criteria of this review are given in [Characteristics of excluded studies](#).

Included studies

Study Participants

The smallest study (Weingarten 1985) randomised 18 children and the largest study (Colland 1993) randomised 112 children. No studies reported a power calculation to determine sample size. The total number of participants eligible for inclusion was included in five studies (Colland 1993; Kotses 1991; Hua-Bin 2004; Perin 1992; Weingarten 1985). The number of eligible participants in Colland 1993 was 195 and 112 were randomised, Kohen 1996 100 and 33 randomised, Kotses 1991 39 and 33 randomised, Hua-Bin 2004 578 and 64 randomised, Perin 1992 250 and 81 randomised and Weingarten 1985 34 and 18 randomised. Reasons for exclusion from randomisation included having a very high or very low asthma coping score (Colland 1993), previous experience with the study intervention (Kohen 1995), participant request for specific group assignment (Kohen 1995), participant self withdrawal (Kohen 1995; Kotses 1991) and no reply to letter of invitation (Perin 1992). No reason for non-randomisation was given by Weingarten 1985. All other studies did not give the number of eligible participants and provided randomised numbers only.

Three studies reported a 100% participant completion rate (Khan 1973; Khan 1977; Hua-Bin 2004). Colland 1993 described participation by all those randomised during the 10 week intervention with no mention of a drop-out rate at 6 and 12 months follow-up. Dahl 1990 recorded one withdrawal due to unreliable reporting of data. Kohen 1996 stated that participants withdrew themselves from the study due to changing their minds, too long a commitment and dissatisfaction with the assigned group. Kotses 1991 and Perin 1992 also recorded participant self withdrawal but did not specify reasons. Alexander 1972; Perez 1999; Weingarten 1985 all stated a withdrawal rate from the study but no reasons were provided. There was no mention of withdrawals or drop outs in the Hock 1978 study.

Asthma severity ranged from mild to severe, however not all studies identified this or the origin of asthma diagnosis. Participants with psychopathology or organic brain pathology were excluded from Alexander 1972 and Hua-Bin 2004. Seven studies did not mention any inclusion or exclusion criteria, apart from asthma diagnosis (Colland 1993; Hock 1978; Khan 1973; Khan 1977; Kotses 1991;

Perez 1999; Weingarten 1985). Participants were recruited from a variety of places including asthma clinics, residential homes for intractable asthma and mailing lists.

Interventions used

The type of interventions included relaxation therapy (with and without biofeedback), behavioural therapy (BT) and combined cognitive behavioural therapy (CBT). Rarely was the theoretical underpinning of the therapy provided. Six studies used some form of relaxation technique as their intervention including Jacobsonian training (Alexander 1972); progressive relaxation (Hock 1978; Hua-Bin 2004); self-hypnosis (Kohen 1996); guided imagery (Perin 1992); not specified (Weingarten 1985). Three studies used some form of bio-feedback assisted relaxation technique including EMG (Kotses 1991); FEV1 (Khan 1973); airway resistance (Khan 1977). Other interventions used included behavioural therapy (BT) (Dahl 1990) and cognitive behavioural therapy (CBT) (Colland 1993; Perez 1998). Different placebo formats or different therapies were also used as control.

Of note, the methods described above were seldom used as single methods with many therapist adopting an eclectic approach employing different combinations of therapies and asthma educational aspects (Colland 1993; Dahl 1990; Perez 1998) and multi-disciplinary programmes (Weingarten 1985). In addition, relaxation therapy is often used in conjunction with behavioural and group therapy and educational interventions. All these psychological interventions were used in combination with drug therapies.

Outcomes

A variety of outcomes were used and many studies measured more than one type of outcome. Health care utilisation was measured and included hospital admissions (Khan 1973; Khan 1977) and emergency room visits (Khan 1973; Khan 1977; Kohen 1996). Asthma severity was measured in a number of ways including number of asthma attacks (Khan 1973; Khan 1977; Kotses 1991; Hock 1978; Hua-Bin 2004); asthma severity scales (Dahl 1990; Khan 1977; Kohen 1996; Kotses 1991); medication use (Dahl 1990; Khan 1973; Khan 1977; Hock 1978; Kotses 1991). Khan 1977 also combined data relating to duration of attack, medication taken, emergency room visits and hospital admissions to calculate an over-all effect of therapy. Lung function was also measured in a variety of ways including, FEV1:FVC (Kotses 1991); PEFr (Alexander 1972; Hock 1978; Kotses 1991; Weingarten 1985) and FEV1 (Hock 1978). Psychological indicators were measured using behaviour scales (Perin 1992) and psychological questionnaires related to self-efficacy (Perez 1999); coping (Colland 1993), anxiety (Colland 1993; Hua-Bin 2004), and depression (Hua-Bin 2004). School absenteeism (Dahl 1990; Kohen 1996; Perin 1992) and asthma knowledge (Colland 1993; Perez 1999) were also assessed.

Risk of bias in included studies

Studies were randomised with patients allocated to control and experimental groups. A secretary randomised patients using dice system in Colland 1993 (author correspondence) and Dahl 1990 used a computerised table method (author correspondence). The method of randomisation was not described in any of the other studies. Therefore, in the majority of studies it is difficult to ascertain whether the method of randomisation was appropriate.

Blinding was not mentioned by several studies (Alexander 1972; Colland 1993; Khan 1973; Khan 1977; Kotses 1991; Perez 1999; Perin 1992; Weingarten 1985). Kohen 1996 and Hua-Bin 2004 described only the primary physician as blind and Hock 1978 reported that the nurse recording FEV1 measures was blind to participants' allocation group.

The methodological quality of the studies was poor with the highest Jadad score being 4 (Hua-Bin 2004). Jadad scores were either one (Alexander 1972; Colland 1993; Kotses 1991; Khan 1973; Khan 1977; Perez 1999; Perin 1992; Weingarten 1985) or two (Dahl 1990; Hock 1978; Kohen 1996). The quality rating, following author correspondence, of only one study scored Grade A (adequate) for allocation concealment (Colland 1993). One RCT (Dahl 1990) had a score of C (inadequate) as the author was the sole therapist, who also measured the study outcomes, and was aware of participant allocation (this information was provided by the author following contact). All other studies scored Grade B (unclear).

Effects of interventions

Although several studies used relaxation (with or without biofeedback) or cognitive-behavioural therapy, the outcome measures were so diverse, it was not possible to pool any other results. Also, if the same outcomes were measured the data were presented in a method that could not be used (e.g. in graphical form or mean scores only with no standard deviations). Authors were contacted to ask for data from these studies but this met with little response. Where means and standard deviations were reported, 95% confidence intervals of the mean difference were calculated.

Primary outcome

Health care utilisation

Two studies (Khan 1973 and Khan 1977) examined the effect of bio-feedback assisted relaxation on hospital admission rates as dichotomous (Khan 1973) and continuous (Khan 1977) data. Neither study reported significant differences between treatment and control groups on hospital admission rates.

The impact of biofeedback (Khan 1973; Khan 1977) and self-hypnosis (Kohen 1996), on emergency room visits was examined. Fewer emergency room visits for acute asthma attacks, in the experimental group compared to the control group (OR 0.64, CI 0.10

to 4.10) were reported in one bio-feedback study (Khan 1973) and the study using self-hypnosis ($p < 0.001$) (Kohen 1996). Khan 1977 presented mean scores on a graph and a narrative description of no statistical significance between the intervention and control groups. Due to insufficient reporting of data Khan 1977 a pooled effect could not be calculated to assess the effects of bio-feedback on healthcare utilization.

Secondary outcomes

Lung function

Lung function was measured in a variety of ways in four studies (Alexander 1972; Hock 1978; Kotses 1991; Weingarten 1985).

FEV1:FVC was measured by Kotses 1991. However only mean scores were presented on a graph with no standard deviations or other statistical analysis. During long-term follow up a significant improvement in the experimental group FEV1:FVC was reported ($p < 0.01$, analysis of variance). Readers are referred to the original paper for data on this ratio.

Four studies (Alexander 1972; Dahl 1990; Kotses 1991; Weingarten 1985) reported PEFr outcome data. Alexander 1972 and Weingarten 1985 used relaxation therapy and presented data that could be pooled for a meta-analysis. There was a significant difference in favour of relaxation therapy in the change from baseline in peak flow (Mean Difference 31.73 litres, 95% CI 13.14 to 50.32). Kotses 1991 found no significant difference in PEFr between the experimental group morning mean 312 (SD 116) and the control group morning mean 328 (SD 135) (CI -107.91 to 75.91) or experimental group evening mean 321 (SD 116) compared to the control group evening mean 341 (SD 127) (CI -108.72 to 68.72). Dahl 1990 reported no significant improvement in PEFr for either the intervention or control group following behavioural therapy (BT) but no data were provided to support this.

Hock 1978 reported no significant improvements in FEV1 measures following progressive relaxation therapy (mean 2.0; SD 0.38) compared to no therapy (mean 1.8; SD 0.03) (CI -0.12 to 0.52).

Asthma symptoms

Self-rated asthma severity

Two studies (Kohen 1996; Kotses 1991) measured asthma severity as reported by participants. Kohen 1996 reported a significant improvement following relaxation therapy, from year 1 to year 2 of follow-up, in the experimental group (52% average decrease) compared to the control group (35% average decrease) ($p < 0.025$). Following biofeedback assisted relaxation Kotses 1991 reported no significant difference in asthma severity between the treatment group mean 1.10 (SD 0.14) and control group mean 0.96 (SD

0.43) (CI -0.10 to 0.38). No pooled effect could be performed due to insufficient data.

Number of attacks

The effect of bio-feedback assisted relaxation on the number of asthma attacks was measured by three studies (Khan 1973; Khan 1977; Kotses 1991). Khan 1973 reported a significant improvement in the experimental group ($p < 0.05$) compared to the control group. Khan 1977 found a significant decline in number of asthma attacks in the experimental 'reactors' group compared to the control 'reactors' group but not between the 'non-reactors' experimental group and the control 'non-reactors' group, however no data were provided to support this conclusion. Kotses 1991 stated no significant difference in the number of asthma attacks between the experimental mean 1.32 (SD 2.24) and control mean 1.46 (SD 2.14) following bio-feedback assisted relaxation (CI -1.73 to 1.45).

Hock 1978 and Hua-Bin 2004 identified significant improvements in asthma symptoms following progressive relaxation. Hock 1978 found a significant decline in asthma attacks in the experimental group mean (0.44) compared to the control group mean (0.13). No other data to support this conclusion were provided. Hua-Bin 2004 reported a significant improvement in both the experimental group daytime mean 0.98 (SD 0.29) compared to the control group daytime mean 1.90 (SD 0.41) ($p < 0.01$) and the experimental group night time mean 1.15 (0.42) compared to the control group night time mean 2.11 (SD 0.58) ($p = < 0.01$).

'As needed' medication use

Following BT, Dahl 1990 described a significant decrease in the experimental group's use of 'as needed' medication ($p < 0.05$) compared to the control group. Bio-feedback yielded conflicting results. Khan 1973 found a significant improvement in the treatment group ($p < 0.001$) compared to the control group. Whereas, Kotses 1991 found no significant difference between the experimental group mean 2.18 (SD 5.03) and the control group mean 2.92 (SD 3.97) (CI -3.99 to 2.51). Khan 1977 also found no improvement in the intervention group however no data is provided to support this conclusion. Hock 1978, following progressive relaxation, identified fewer patients in the experimental group (3 of 9) had changes in their medication use than the control group (6 of 8) but this difference was not statistically significant.

Khan 1977 reported an asthma severity score that combined duration of attack, medication taken, emergency room visits and hospitalisations comparing the difference between experimental 'reactors' (ER) to control 'reactors' (CR) and experimental 'non-reactors' (ENR) to control 'non-reactors' (CNR). However, means are presented on a graph with no standard deviations and only a narrative report of statistical significance. No significant difference was reported between the ER group mean 25 and the CR group

mean 18. A significant difference was reported between the ENR group mean 15 and the CNR group mean 50.

Asthma Knowledge

Cognitive Behavioural Therapy was found to significantly improve asthma knowledge scores in the experimental group mean 15.99 (SD 1.17) compared to the control group mean 13.3 (SD 1.34) (CI 2.16 to 3.22) (Colland 1993). Perez 1999 also identified a significant increase in asthma knowledge in the experimental group mean (2.49) compared to the control group mean (2.17) ($p < 0.01$) following CBT. Data from Colland 1993 and Perez 1999 could not be pooled due to insufficient data. Perin 1992 described an improvement in asthma knowledge that reached statistical significance following guided imagery assisted relaxation in the experimental group (mean increase from 11.76 to 13.76, $p < 0.01$) but not in the control group.

School absenteeism

Following guided imagery assisted relaxation Kohen 1996 and Perin 1992 recorded conflicting results. Kohen 1996 described a significant decrease in school absenteeism in the experimental group rate (1.5) compared to the control group rate (6.1) ($p < 0.001$) Perin 1992 found no significant improvement in the treatment group mean 0.24 (SD 0.90) compared to the control group mean 0.22 (SD 1.00) (0.02, CI -0.48 to 0.52). Dahl 1990 reported that BT significantly reduced school absenteeism as percentage of change from baseline in the experimental group compared to the control group ($p < 0.05$).

Behaviour change

Perin 1992 used the Child Behaviour Checklist to assess psychological adjustment before and after relaxation and found no significant improvement in the relaxation group mean 54.40 (SD 8.80) compared to the control group mean 55.0 (SD = 8.90) (CI -5.24 to 4.04).

Psychological Questionnaires

Self-efficacy

Perez 1999 identified a significant improvement in self management scores in the group receiving CBT (mean 21.77) compared to the control group (mean 17.16) ($p < 0.001$).

Coping

Colland 1993 reported a significant improvement in asthma coping mean scores in the group receiving CBT (43.97; SD 3.03) compared to the control group (40.45; SD 3.75) (CI 1.93 to 5.11).

Anxiety

Colland 1993 found no significant changes in Trait anxiety levels in the CBT group mean 30.65 (SD 7.15) compared to the control group mean 31.42 (SD 7.13) (CI 1.93 to 5.11). Asthma specific anxiety, in extremely anxious children, was reduced significantly in the experimental group compared to the control group ($p < 0.05$, with no supporting data provided).

Trait anxiety was also measured, following bio feedback assisted relaxation, by Kotses 1991 using the Children's State-Trait Anxiety Inventory. Mean anxiety scores are displayed in graphical form only with no SD and participants in the experimental group are described as having improved significantly more than those in the control group but no data are provided to support this conclusion. Anxiety measured using the child anxiety related disorder (SCARED) was significantly improved in the intervention group mean 18.27 (SD 6.95) receiving progressive relaxation compared to the control group mean 23.21 (SD 7.26) ($p = < 0.01$) (Hua-Bin 2004).

Depression

Depression measured using the depression self rating scale for children (DSRSC) was improved significantly in the intervention group mean 8.62 (SD 3.95) receiving progressive relaxation compared to the control group mean 12.97 (SD 4.69) ($p = < 0.01$) (Hua-Bin 2004).

Asthma Attitude

Kotses 1991 measured asthma attitude using the Asthma Attitude Survey for Children following bio-feedback training. Mean scores are displayed in graphical format only with no SD. Participants in the experimental group were described to have greater improvement in asthma attitude scores compared to the control, but no data are provided to support this claim.

Self-concept

Self-concept was examined by Kotses 1991 using the Piers-Harris Self-Concept Scale following bio-feedback training. Mean self-concept scores are displayed in graphical form only with no SD. Participants in both experimental and control groups are reported as having similar scores but no data are provided to support this statement.

Kohen 1996 described measuring psychological outcomes but provided no details as to what the actual measurements were and provided no data, stating only that statistical analysis showed no significant difference between groups.

DISCUSSION

This systematic review evaluated 12 trials of varied psychosocial interventions for children with asthma. However, due to the poor quality of these studies any results and conclusions must be viewed with caution. The psychological interventions themselves were varied, did not necessarily have a clear theoretical underpinning and were not always well described. In addition, it must be noted that this review involves studies which have used psychological interventions in addition to traditional pharmacological treatments and not as an alternative. The review found that generally these interventions yielded conflicting results in relation to the effects on health care utilisation, lung function, asthma symptoms, school absenteeism and numerous psychological outcomes. This may, to some degree, be a result of small sample sizes and poor control within the studies.

Healthcare utilisation was measured in three studies. Hospital admission rates were not decreased following bio-feedback (Khan 1973; Khan 1977) but emergency room visits were in a single study (Khan 1973). In addition, self-hypnosis assisted relaxation was also found to reduce emergency room visits, again in a single study (Kohen 1996).

Lung function was measured using a variety of means, including PEF and FEV1. Alexander 1972 and Weingarten 1985 measured the effect of relaxation therapy on PEF which showed a pooled effect favouring the treatment group compared to the control group. However, no significant improvement in PEF was found following biofeedback training (Kotses 1991) or Behavioural Therapy (BT) which was a within group analysis (Dahl 1990). Hock 1978 reported a significant improvement in FEV1 following relaxation training.

Asthma symptoms, as defined by self-rated reports, number of asthma attacks and use of 'as needed' medications were also found to have varied results following psychological interventions. A trial determining the effects of self-hypnosis (Kohen 1996) found self-rated reports of asthma improved for the intervention group however, another using biofeedback (Kotses 1991) found no improvement. Trials measuring the use of 'as needed' medications also yielded conflicting results in which an improvement following BT was reported (Dahl 1990) but not following progressive relaxation (Hock 1978) or bio-feedback (Kotses 1991).

Psychological interventions, namely bio-feedback and progressive relaxation, were generally found to have a positive effect on reducing the number of asthma attacks experienced by participants. Biofeedback training significantly decreased the number of asthma attacks in two studies (Khan 1973; Khan 1977) but not in another (Kotses 1991) and progressive relaxation yielded positive outcomes in two studies (Hock 1978; Hua-Bin 2004).

All three studies measuring asthma knowledge as an outcome reported positive effects including two studies using CBT (Colland 1993; Perez 1999) and one study using guided imagery relaxation (Perin 1992). Trials examining the effects of psychological

interventions on school absenteeism generally reported positive outcomes. Kohen 1996 found positive results following hypnosis and Dahl 1990 also found positive results following BT although, Perin 1992 did not find any improvement in school absenteeism following guided imagery assisted relaxation.

A variety of psychological outcomes were assessed. Overall, CBT, progressive relaxation and BT were found to have a positive effect on participants self-efficacy (Perez 1999), coping (Colland 1993), anxiety (Colland 1993; Kotses 1991; Hua-Bin 2004), depression (Hua-Bin 2004) and asthma attitude (Kotses 1991).

The collective analysis of psychological interventions for children with asthma was difficult to assess in this review due to the diversity of techniques used, the variety of outcomes measured and the variation in findings in the absence of well-designed and powered trials. In addition, those studies using the same interventions and outcomes frequently reported insufficient data preventing the pooling of results. The most common outcome measure was the number of asthma attacks, however, the five studies measuring this used a variety of interventions. Lung function was also frequently assessed but again the studies measuring this outcome used a number of different interventions. Only two studies (Alexander 1972; Weingarten 1985) were able to be pooled. The theoretical underpinning of the intervention used and its link to the management of asthma in children was rarely discussed in any of the studies.

AUTHORS' CONCLUSIONS

Implications for practice

Because of the poor quality and small sample sizes of the included studies results must be viewed with caution. This review can draw no conclusions as to the effectiveness of psychological interventions for children with asthma and cannot provide guidance for clinical practice.

Implications for research

Larger RCTs with good methodological quality and adequate reporting of data are needed. No conclusions as to what type of intervention is most appropriate for children with asthma can be made and a general consensus as to the type of outcomes that are most relevant to this patient group is needed. The most limiting aspect of this review was the diversity of measured outcomes even when the same type of psychological technique was being utilised. Perhaps an explanation for this is that most of the included studies were conducted by research teams doing just one study. A programme of research evaluating psychological interventions for children with asthma would assist in reaching agreement as to the most appropriate psychological interventions for children and the outcome indicators that might be indicative of improvement in children with asthma.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Alexander 1972

Methods	RCT, between group analysis. Method of randomisation: randomised into 2 groups, method not described. Withdrawals and dropouts: 8, 2 from experimental group and 6 from control group. Jadad score: 1	
Participants	44 eligible for inclusion, 44 randomised, 20 in experimental, 16 in control. Age: 10-15 years, mean age 11.9 Sex: Male 18, Female: 18 Residents of a home for chronic intractable asthmatic children. Severity of asthma: defined by use of corticosteroids- 40% in experimental group and 31% in control group. Inclusion criteria: not stated. Exclusion criteria: mental retardation, organic brain pathology, evidence of psychopathology.	
Interventions	Intervention Group: Jacobsonian relaxation training Control Group: inactivity 6 sessions delivered over 8 days. Intervention delivered by the 'experimenter'.	
Outcomes	PEFR Outcomes measured over last 3 sessions.	
Notes	Data presented as mean scores with no SD. No sample size calculation.	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Colland 1993

Methods	RCT, between group analysis. Method of randomisation: randomised into 3 groups, method not described in paper but secretary randomised using dice system (from correspondence with VC) Outcome assessment: not blind, no withdrawals or dropouts. Jadad score: 1	
Participants	195 eligible, 112 randomised, 112 completed, 48 in experimental group, 34 in control group 1, 30 in control group 2. Age: 8 - 12 years, mean age 10 Sex: Male 119, Female 76	

Colland 1993 (Continued)

	<p>Participants from out patient clinics (Denmark) Asthma diagnosed by paediatrician Interventions performed in patients home Asthma severity measured by paediatrician Inclusion criteria: treated by a paediatrician for longer than 1 year, severity score minimum 1 on a 1-9 point scale, age between 8-13 years, could speak Dutch and absent from school because of asthma more than once a year. Exclusion criteria: not described</p>
Interventions	<p>Intervention Group 1: Cognitive behavioral therapy with self management training, developmental psychology and group therapy. Intervention Group 2: Information session. Control Group: no intervention Control: no intervention 10 sessions delivered over 10 weeks. Intervention delivered by '2 trainers', one a behaviour therapist and the other person with experience in working with groups of children.</p>
Outcomes	<p>School absenteeism, asthma knowledge, coping and anxiety. Outcomes measured pre-test, 1 month, 6 months and 12 months.</p>
Notes	<p>Data presented as mean scores with no SD (SD from correspondence with VC).</p>

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Study investigators unaware as to order of treatment group assignment (Cochran Grade A)

Dahl 1990

Methods	<p>RCT, between group analysis. Method of randomisation: randomised into 2 groups, method not described in paper but computerised table used (from correspondence with JD). Only the sole therapist had any knowledge of which group the participants belonged to. Outcome assessment: not blind, 1 withdrawal from treatment group. Jadad score: 2</p>
Participants	<p>20 patients randomised, 1 withdrawal, 9 in the experimental group and 10 in the control group. Age: 12 years Male 11, Female 8 Asthma diagnosis by paediatrician (from correspondence with JD) Asthma severity: severe (from correspondence with JD) Participants from a hospital clinic (Sweden) Intervention delivered in home or school environment Inclusion criteria: using continual B2 agonist therapy Exclusion criteria: not described</p>

Dahl 1990 (Continued)

Interventions	Intervention Group 1: Behavioral therapy with discrimination training of asthma signals, self management of breathing, counterconditioning of learned fear response, compliance training and contingency management of asthma related behaviour. Control Group 1: Usual care 4 sessions delivered over 4 weeks.	
Outcomes	Medication use, school absenteeism and experience of asthma- self report. PEFr and panic also assessed but no results given in paper (JD contacted but data not available).	
Notes	Data presented as percentage change on a graph. JD contacted but no other data available.	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Hock 1978

Methods	RCT, between group analysis. Randomised into 5 groups: 3 experimental and 2 control. Nurse measuring FEV1 was blind to group allocation. No description of withdrawals or drop outs. Jadad score: 2	
Participants	43 males randomised. 9 in experimental group 1, 9 in experimental group 2, 10 in experimental group 3: 7 in control group 1, 8 in control group 2. Age: 10-17 years, mean 12.4 Asthma diagnosis and severity not described. Recruited from an allergy out patient department. Intervention delivered in an outpatient department. No inclusion or exclusion criteria described.	
Interventions	Intervention 1: progressive relaxation using imagery. Intervention 2: Assertive training using role play. Intervention 3: Combined relaxation and assertive training. Control 1: Usual care Control 2 Received normal medical treatment plus sat quietly in a leaderless group. Intervention delivered over 8 weeks, 1 session per week.	
Outcomes	FEV1, number of asthmatic attacks and medication changes. Measured at pre, week 4 and 8 and 1 week post completion of treatment (week 9).	
Notes	FEV1 data presented as mean scores and 95% confidence intervals. Number of asthmatic attacks presented as mean scores with no SD. Medication changes presented as number of patients in each group that had a change.	

Hock 1978 (Continued)

Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Hua-Bin 2004

Methods	RCT, between group analysis. Randomised into 2 groups, method not described. Outcome assessment: single-blinded evaluation of Doctor's recording asthma symptoms. Withdrawals and dropouts: all participants reported as completing study. Jadad score: 4
Participants	578 eligible, 64 randomly assigned to control or intervention group. 31 in experimental group, 33 in control group. Age: Experimental group 10.2 years (+/- 0.6) and control group 10.5 (+/-0.8). Recruited from the Department of Pediatrics from one hospital. Inclusion criteria: Asthma diagnosis using GINA, aged between 8-14 years old, mild to moderate asthma, no intelligence or cognitive disorder, patients and parents willing to cooperate. Exclusion criteria: organic psychiatric disorders. Asthma diagnosis according to GINA criteria. Male: 38, Female: 26
Interventions	Intervention Group: Progressive relaxation Control Group: Care as normal Intervention group received relaxation training for 4 weeks. Relaxation tapes and training provided for parents to facilitate therapy every night 30 minutes before sleep. Relaxation technique taught by 'experts'.
Outcomes	Anxiety and depression, rate of days with no asthma symptoms, scores of daytime asthma symptoms, scores of nighttime asthma symptoms, number of asthma attacks, evaluative effects of parents and doctors.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Khan 1973

Methods	RCT, between group analysis. Randomised into 2 groups, then further divided into 'reactors' and 'non-reactors'. Outcome assessment not blind. No description of withdrawals or drop outs. Jadad score: 1	
Participants	20 patients randomised, 10 in experimental group and 10 in control group. Age: 8-15 years, no mean age provided. Sex of participants not described. Asthma diagnosis and severity not described. No inclusion or exclusion criteria described. Participants sourced from an allergy clinic.	
Interventions	Intervention 1: Biofeedback, counter-conditioning. Control: care as normal. Intervention delivered over 6 months, initial training 5 sessions, second training for 10 sessions then refresher training period of 5 sessions after first, second, third and sixth month.	
Outcomes	Emergency room visits, hospitalisations, medication use, number of attacks. Outcomes measured at 8, 9 or 10 months.	
Notes	Data presented as counts for each participant.	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Khan 1977

Methods	RCT, between group analysis. Randomised into 2 groups, then further divided into 'reactors' and non-reactors'. Primary physician blinded. Eight participants dropped out during selection period were replaced. Four drop-outs after selection period were not replaced. Jadad score: 1	
Participants	80 children randomised, 40 in experimental group and 40 in control group. Age: 8-15 years, no mean age provided. Sex of participants not described. Asthma diagnosis and severity not described. No inclusion or exclusion criteria described. Participants sourced from an allergy clinic. Intervention provided in a clinic setting.	
Interventions	Intervention 1: Biofeedback training (preliminary training 5-8 sessions, link training 10 sessions). Control: seen once per week for collection of diary data only.	

Khan 1977 (Continued)

	All participants followed up for 1 year.	
Outcomes	Medication use, emergency room visits, hospitalisations, number and duration and of asthma attacks and asthma severity.	
Notes	Data presented as mean scores with no SD.	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Kohen 1996

Methods	RCT, between group analysis. 100 participants eligible for inclusion, 33 initially enrolled, 28 randomised into 4 groups. No blinding described. Jadad score: 2	
Participants	28 participants randomised into 4 groups, 7 in each group. Age: 7-12 years, no mean age provided. Sex: 23 males and 10 females. Asthma diagnosis made by primary physician. Asthma severity not described. Inclusion criteria: not formally taught RMI techniques. Exclusion criteria: requesting allocation to a specific group. Participants sourced from medical centre and letters sent to pediatricians, GP's and allergists. Intervention provided in a clinic setting.	
Interventions	Intervention 1: Relaxation Mental Imagery training (self hypnosis). Intervention 2: Waking suggestion (no hypnosis). Control 1: Attention placebo (no hypnosis or asthma discussion). Control 2: No intervention.	
Outcomes	Emergency room visits, psychological evaluation, school absenteeism, PFT's and asthma severity.	
Notes	Same data presented in study above.	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Kotses 1991

Methods	RCT, between group analysis. Randomised into 2 groups, method not described. Blinding not described. Withdrawals and drop outs: 2 from both groups. Jadad score: 1
Participants	39 eligible, 33 randomised, 4 dropped out post randomisation. 15 in experimental group and 14 in control group. Age: 7 - 16 years, mean age males 11.9 and females 11.36. Sex: 20 males and 9 females. Diagnosed by pulmonary physician according ATS guidelines. Severity: rated by parents as 'mostly moderate'. No inclusion or exclusion criteria described. Source of participants and place of intervention not described.
Interventions	Intervention 1: Biofeedback assisted relaxation (facial relaxation). Control: Facial stability Intervention delivered at baseline 1 session per week for 4 weeks, training 1 session per week for 8 weeks, short term follow-up 1 session per week for 4 weeks and, long term follow-up 1 session per month for 4 months.
Outcomes	Asthma severity, lung function, medication use, frequency of attacks, attitude, self-concept and anxiety. Outcomes measured at pre, 8 weeks, 12 weeks and 8 months.
Notes	Data presented as mean scores and SD for lung function, asthma severity, medication use, number attacks and means with no SD for attitude and anxiety. Letter sent to HK for further information but no reply.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Perez 1999

Methods	RCT, between group analysis. Method of randomisation: randomised into 2 groups, method not described. Blinding not mentioned. No withdrawals or dropouts described. 29 patients randomised, 17 in treatment group and 12 in control group. Jadad score: 1
Participants	29 patients randomised, 17 in treatment group and 12 in control group. Age: range 6-14 years, no mean given. Male 13, Female 16 Asthma diagnosis made by medical doctor Severity: 55.2% mild, 41.4% moderate, 3.4% severe Patients sourced from a clinic

Perez 1999 (Continued)

Interventions	Intervention 1: Cognitive-behavioural therapy Control: usual care Intervention delivered over 6 sessions.	
Outcomes	Asthma knowledge, self management, morbidity index (combined emergencies and severity).	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Perin 1992

Methods	RCT, between group analysis. Randomisation: randomised into 2 groups, method not described. Blinding not mentioned. Withdrawals and drop outs described. Jadad score: 1	
Participants	250 patients eligible, 81 randomised and 56 completed trial. 25 participants attended only a portion of the intervention and were not included in the post test analysis. Number completing trial was 29 in treatment group and 27 in control group. Age: 6 - 14 years, mean age 9.3. Sex: 35 males and 21 females. Ethnicity: 85% described as white. Asthma severity: 18 mild, 29 moderate and 6 severe. Source of participants: 90% from community pediatric practice and others from general practice and allergy clinics. Inclusion criteria: diagnosed with asthma for at least 6 months, receiving hyposensitisation injections or B-adrenergic dilators or aminophylline.	
Interventions	Intervention 1: Relaxation training including deep breathing and guided imagery. Control: usual care. Intervention delivered over 4 weeks, 1 session per week.	
Outcomes	Asthma severity, child perceived stress, asthma knowledge, child behavior. Outcomes measured pre and post intervention at 4 weeks.	
Notes	Data presented as mean scores and SD for all outcomes. Letter sent to JP requesting further information related to concealment and randomisation but no reply.	
Risk of bias		
Item	Authors' judgement	Description

Perin 1992 (Continued)

Allocation concealment?	Unclear	Information not available (Cochrane Grade B)
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Weingarten 1985

Methods	RCT, within group analysis. Randomised into 2 groups, method not described. Then 'as a further control' 10 children joined a 'psychologist only' group. Blinding not mentioned. Withdrawals and drop outs described. Jadad score: 1
Participants	34 patients eligible, 18 randomised, 10 assigned to a group. Number in experimental group 11 and 9 in control and 10 assigned to psychologist only group. Age: 8 - 11 years Sex: 21 males and 13 females. Source of participants: Asthma Diagnostic Register.
Interventions	Intervention 1: physiotherapy 12 sessions, 2 per week for 6 weeks and psychologist (relaxation techniques) 4 sessions for 4 weeks and social worker for 1 session per week for 10 weeks. Control Group 1: usual care Control Group 2: assigned to psychologist only (excluded from analysis in this review)
Outcomes	PEFR reported only. Measured at pre test and post intervention (end of 10 week program).
Notes	Data presented as percentage change. Random assignment only described for the multi-professional group and control group. Paper does not clearly state if 'psychologist only' group was randomly assigned.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Information not available (Cochrane Grade B)

Characteristics of excluded studies [ordered by study ID]

Alaniz 1992	Descriptive study on self management behaviours
Aleman 1992	RCT of an educational program without psychotherapy
Alexander 1979	Before and after study of relaxation training
Andrews 1998	Descriptive study of alternative therapies

(Continued)

Annett 1994	Review of neuropsychological dysfunction in asthmatic children
Annett 2001	RCT of asthma management without psychotherapy
Aronoff 1975	CCT of hypnosis
Backman 1981	CCT of psychological interventions
Barnett 1992	Before and after study of asthma management programme
Bender 2000	RCT of asthma education programme (CAMP)
Burkhart 1996	RTC evaluating the effectiveness of cognitive social learning theory.
Burkhart 2005	Secondary analysis of an asthma self-management programme
Chernoff 2002	RCT of family intervention with different diagnosis - unable to separate asthma data.
Clark 1988	RCT of education program with no psychotherapy
Coen 1996	RCT of biofeedback and relaxation on subjects aged between 12-22 years, unable to separate data
Cooper 1964	Case report
Corley 1987	RCT of education program
Creer 1971	Case study of two children
Creer 1979	Review of self-management
Creer 1980	Review of self-management strategies
Creer 1988	RCT of asthma education with minimal relaxation therapy only
Dekker 1957	Case report
Diamond 1959	Review of hypnosis with reference to specific cases
Ernst 1998	Commentary
Erskine 1979	RCT of relaxation therapy for adults
Feldman 1976	Case reports
Fernandez 1993	CCT of hypnosis for children with asthma

(Continued)

Field 1995	Before and after design of massage therapy
Field 1998	Comparison of massage with relaxation therapies (inadequate control)
Florin 1985	CCT of facial expressions of emotion and physiologic reactions to comedy and induced stress in children with asthma
Gardner 1968	Case reports of behavioural therapy
Gebert 1998	RCT of asthma education
Gustafsson 1986	RCT of family therapy
Hochstadt 1980	Before and after test of behavioural therapy
Hock 1977	Report of preliminary data presented in Hock 1978
Hockemeyer 2002	RCT of stress management. Age group 18-51 years
Holzheimer 1998	RCT of asthma education with no psychological interventions
Horton 1978	CCT of bronchoconstrictive suggestion in adults
Huhes 1991	RCT of a home program with no psychotherapy
Janson 1994	Descriptive study of anxiety and depression in adults
Kashani 1988	Descriptive study of psychopathology and self concept in children
Kern-Buell 2000	RCT of biofeedback assisted relaxation including adolescents and adults. Total group separated for analysis of depression scores but not the number of adolescents and adults in each group (unable to use data)
Klennert 2000	Descriptive study of behavioral and emotional adjustments
Kohen 1984	Before and after design of self-hypnosis
Kohen 1986	Case reports of self hypnosis
Kohen 1995	Duplicate publication of Kohen 1996
Kohen 1997	Before and after study design of hypnosis therapy
Kotses 1976	CCT of biofeedback
Kotses 1978	CCT of relaxation training
Larsson 1992	Review of behavioral treatment

(Continued)

Lask 1979	RCT of family therapy
LaVelle 1998	Cross over design comparing music and massage therapy
Le Fevre 1997	Review of psychological management
Lehrer 1986	CCT of relaxation therapy in adults
Lehrer 1994	RCT of relaxation therapy in adults
Lehrer 1997	CCT of relaxation therapy in adults
Liu 2001	RCT of asthma education with minimal psychological interventions
Loew 1996	Crossover study with no provision of first arm data.
Long 1958	Reported two studies with no psychotherapy
Mattson 1975	Review on psychological aspects and a case review
McNabb 1986	Descriptive study of self-management
Miklich 1977	CCT of behavioural treatment in children
Miller 1994	Descriptive study assessing relationships among emotional responsivity, physiologic reactivity, airway reactivity and pulmonary function in children with asthma
Monleon 1994	Re analysis of previous data set
Moore 1965	RCT Latin Square Design (participants are own control). Mixed adults and children
Nickel 2005	RCT of relaxation for adolescent female asthmatics - unable to separate age groups
Norrish 1977	Descriptive study of physiological and psychological aspects
Otsuka 2005	Not randomised
Padur 1995	Comparison of children with asthma and other conditions
Park 1996	Retrospective study of cognitive behavioural therapy
Patterson 2005	RCT of asthma education programme
Paul 1969	Before and after design of hypnosis
Paully 1967	Descriptive-correlational study of physiological and psychological correlations in children

(Continued)

Persaud 1996	RCT of education program with no psychological interventions
Phillip 1972	CCT of relaxation in children and adults
Rakos 1985	RCT of a self administered package
Rietveld 2000	RCT examining exposure to different negative emotional stimuli, no psychological interventions
Rievtveld 1998	RCT of negative emotions and asthma
Robertson 1993	Descriptive study about asthma in children
Rubin 1989	RCT of computerised education program
Scherr 1975	CCT of biofeedback technique
Scherr 1978	CCT of biofeedback technique
Seligman 1970	Before and after design of a conditioning program
Smith 1970	Case report of hypnotic suggestion
Smith 1986	RCT of an educational program
Szczepanski 1996	CCT of family therapy and education programme
Tal 1976	Descriptive study
Tal 1990	RCT of family focused education
Van Lith 1969	Before and after study of relaxation therapy in normal subjects
Vazquez 1992	CCT of self management programme
Vazquez 1993a	CCT of relaxation training and self management
Vazquez 1993b	CCT of relaxation training and self management - same study as above
Vazquez 1993c	CCT of relaxation training
Weiss 1970	Before and after design of the effects of suggestion
Weiss 1987	RCT of self-management (superstuff) with no psychological intervention
Zelter 1980	Before and after study of self hypnosis

DATA AND ANALYSES

Comparison 1. Psychological interventions versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Hospital Admissions	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Biofeedback	1		Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
2 Emergency room visits	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 Biofeedback	1		Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
3 Depression	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Number of asthma attacks	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
4.1 Biofeedback	1		Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
5 Mean change in PEF	2	56	Litres/min (Fixed, 95% CI)	31.73 [13.14, 50.32]
5.1 Relaxation therapy	2	56	Litres/min (Fixed, 95% CI)	31.73 [13.14, 50.32]
6 Knowledge	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6.1 CBT	2		Mean Difference (IV, Fixed, 95% CI)	Not estimable
7 Mean number of asthma attacks (month)	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7.1 Biofeedback	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
7.2 Relaxation	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
8 Symptoms	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8.1 Biofeedback	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
9 Increase in 'as needed' medication	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
9.1 Relaxation	1		Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
10 Mean change in rescue medication (puffs/month)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10.1 Biofeedback	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
11 Change in rescue medication usage per day	1		% change (Fixed, 95% CI)	Totals not selected
11.1 Relaxation	1		% change (Fixed, 95% CI)	Not estimable
12 FEV1:FVC	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12.1 Biofeedback	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
13 Am PEF (Litres/min - absolute scores)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13.1 Biofeedback	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
14 Pm PEF (Litres/min - absolute scores)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
14.1 Biofeedback	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
15 FEV1 (Litres - absolute scores)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
15.1 Relaxation	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
16 Mean daytime asthmatic symptoms	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
17 Days missed from school (per month)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
17.1 Relaxation	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
18 Change of behaviour scale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
18.1 Relaxation	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable

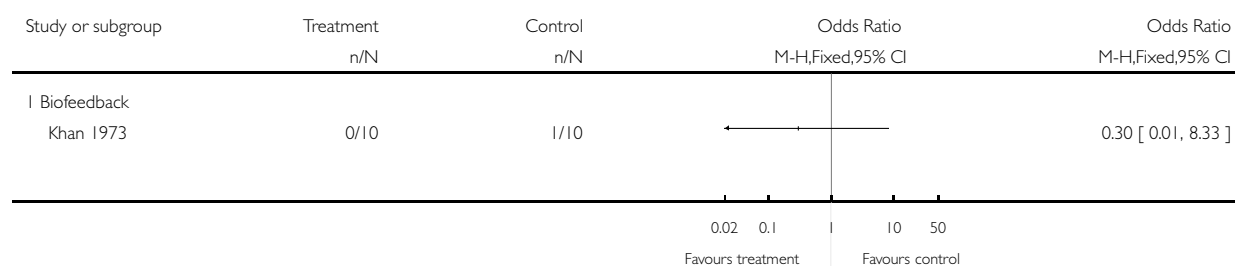
19 Self-efficacy	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
19.1 CBT	1	Mean Difference (IV, Fixed, 95% CI)	Not estimable
20 Coping	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
20.1 CBT	1	Mean Difference (IV, Fixed, 95% CI)	Not estimable
21 Anxiety	2	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
21.1 CBT	1	Mean Difference (IV, Fixed, 95% CI)	Not estimable
21.2 Relaxation	1	Mean Difference (IV, Fixed, 95% CI)	Not estimable
22 Mean night time asthma symptoms	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Analysis 1.1. Comparison 1 Psychological interventions versus control, Outcome 1 Hospital Admissions.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 1 Hospital Admissions

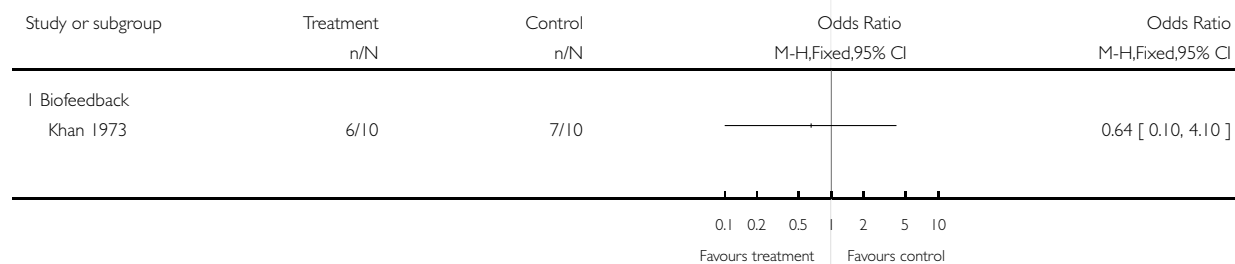


Analysis 1.2. Comparison 1 Psychological interventions versus control, Outcome 2 Emergency room visits.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 2 Emergency room visits

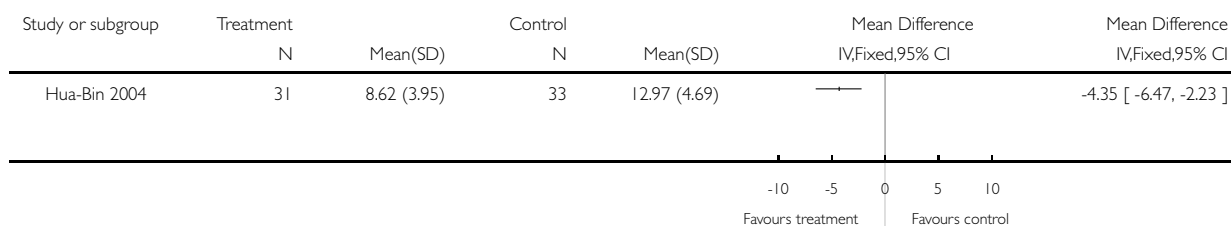


Analysis I.3. Comparison I Psychological interventions versus control, Outcome 3 Depression.

Review: Psychological interventions for children with asthma

Comparison: I Psychological interventions versus control

Outcome: 3 Depression

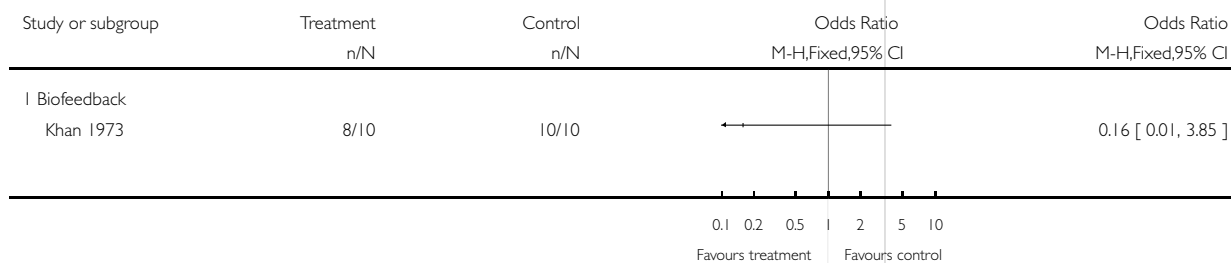


Analysis I.4. Comparison I Psychological interventions versus control, Outcome 4 Number of asthma attacks.

Review: Psychological interventions for children with asthma

Comparison: I Psychological interventions versus control

Outcome: 4 Number of asthma attacks

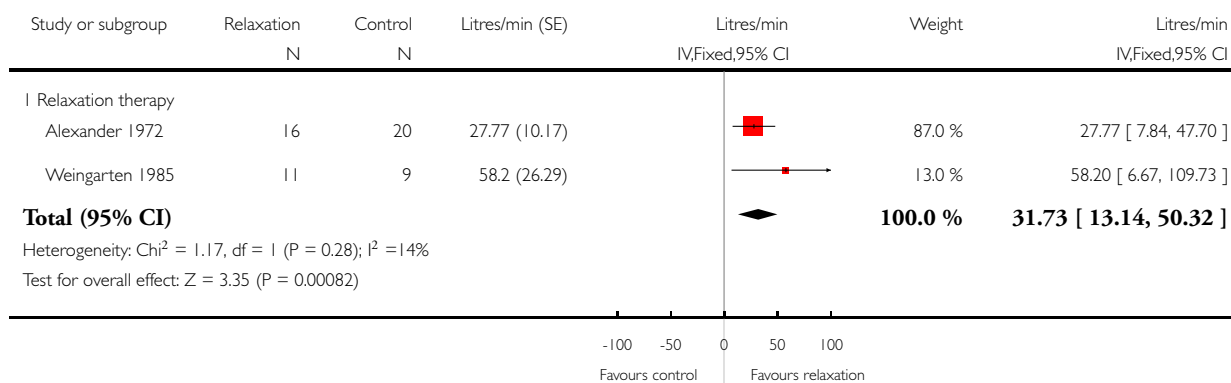


Analysis 1.5. Comparison 1 Psychological interventions versus control, Outcome 5 Mean change in PEF.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 5 Mean change in PEF

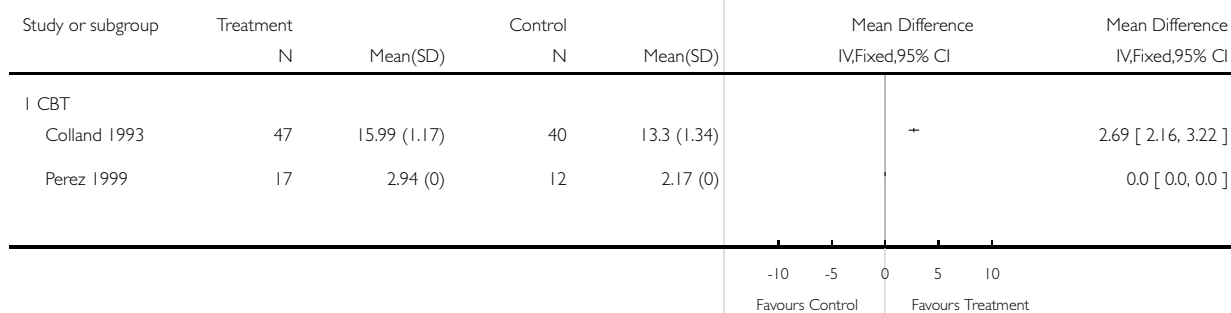


Analysis 1.6. Comparison 1 Psychological interventions versus control, Outcome 6 Knowledge.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 6 Knowledge

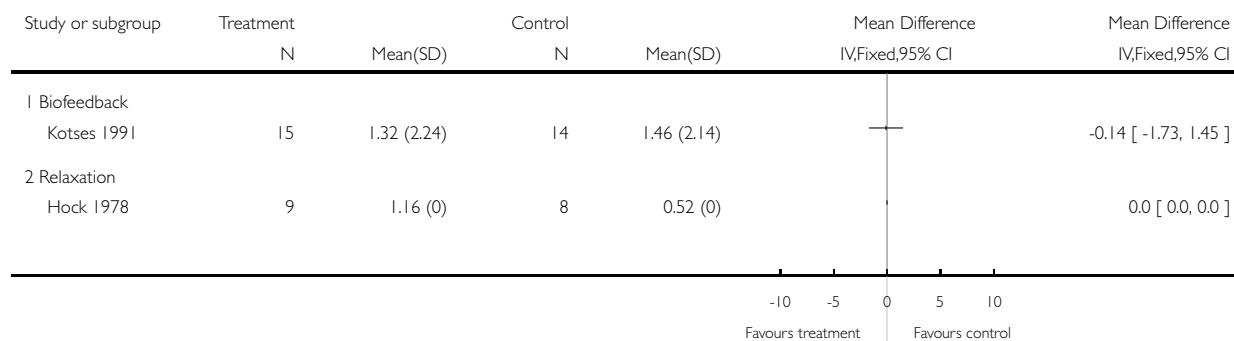


Analysis 1.7. Comparison 1 Psychological interventions versus control, Outcome 7 Mean number of asthma attacks (month).

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 7 Mean number of asthma attacks (month)



Analysis 1.8. Comparison 1 Psychological interventions versus control, Outcome 8 Symptoms.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 8 Symptoms

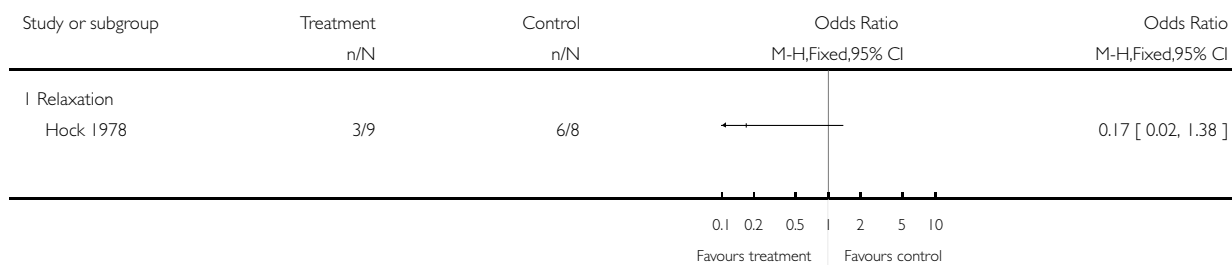


Analysis 1.9. Comparison 1 Psychological interventions versus control, Outcome 9 Increase in 'as needed' medication.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 9 Increase in 'as needed' medication

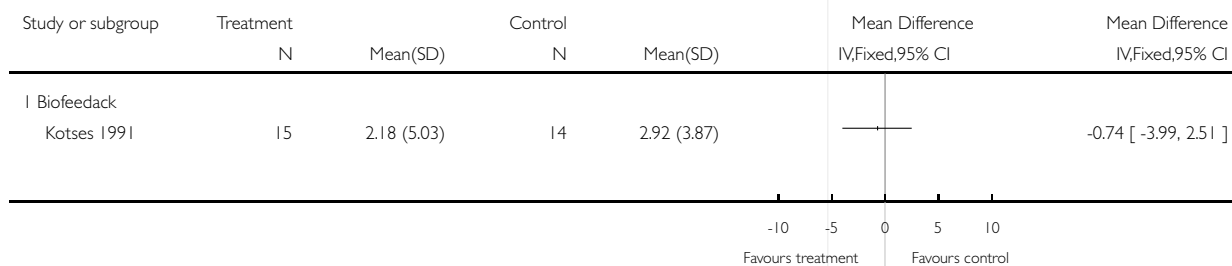


Analysis 1.10. Comparison 1 Psychological interventions versus control, Outcome 10 Mean change in rescue medication (puffs/month).

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 10 Mean change in rescue medication (puffs/month)

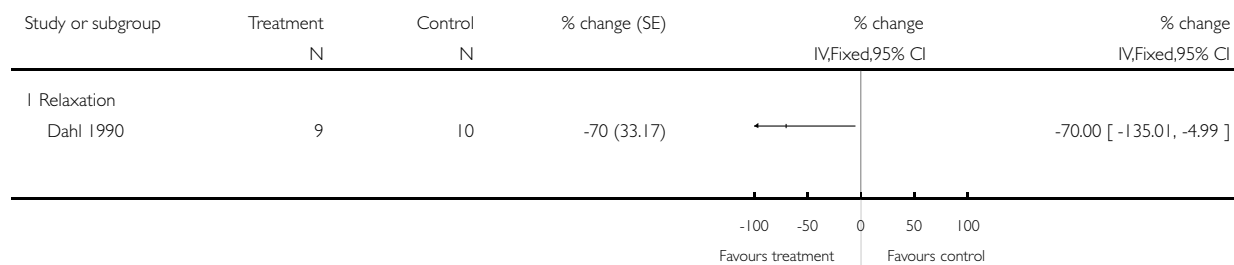


Analysis 1.11. Comparison 1 Psychological interventions versus control, Outcome 11 Change in rescue medication usage per day.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 11 Change in rescue medication usage per day

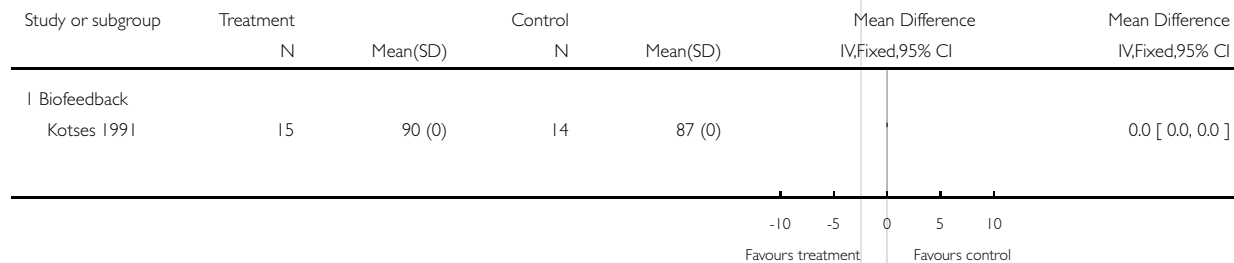


Analysis 1.12. Comparison 1 Psychological interventions versus control, Outcome 12 FEV1:FVC.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 12 FEV1:FVC

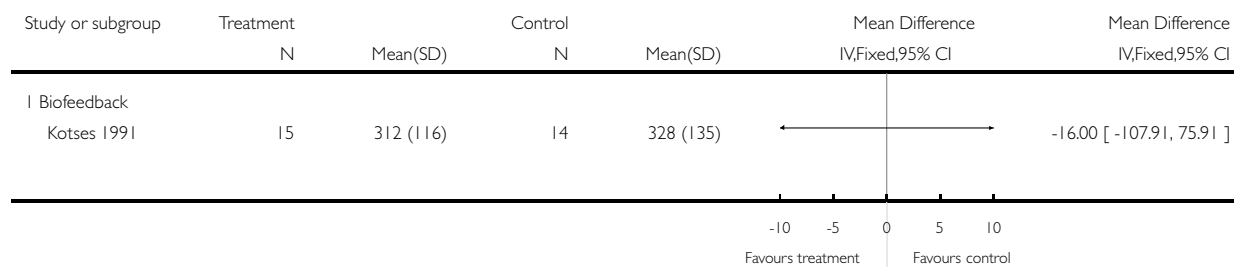


Analysis 1.13. Comparison 1 Psychological interventions versus control, Outcome 13 Am PEF (Litres/min - absolute scores).

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 13 Am PEF (Litres/min - absolute scores)



Analysis 1.14. Comparison 1 Psychological interventions versus control, Outcome 14 Pm PEF (Litres/min - absolute scores).

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 14 Pm PEF (Litres/min - absolute scores)

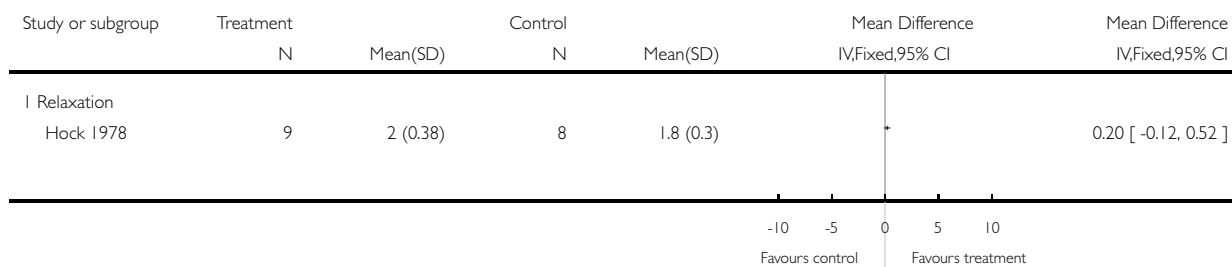


Analysis 1.15. Comparison 1 Psychological interventions versus control, Outcome 15 FEV1 (Litres - absolute scores).

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 15 FEV1 (Litres - absolute scores)

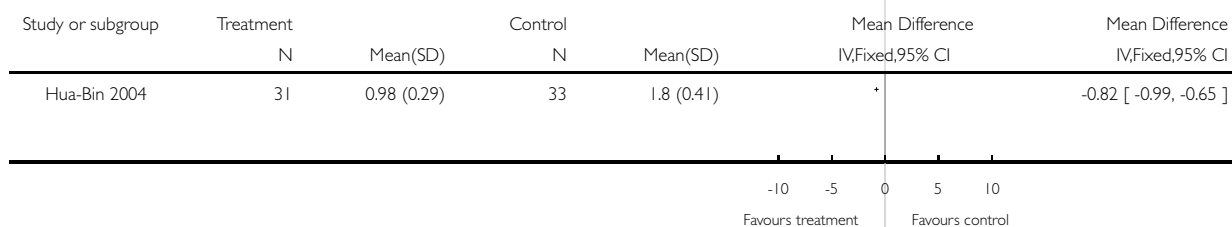


Analysis 1.16. Comparison 1 Psychological interventions versus control, Outcome 16 Mean daytime asthmatic symptoms.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 16 Mean daytime asthmatic symptoms



Analysis 1.17. Comparison 1 Psychological interventions versus control, Outcome 17 Days missed from school (per month).

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 17 Days missed from school (per month)

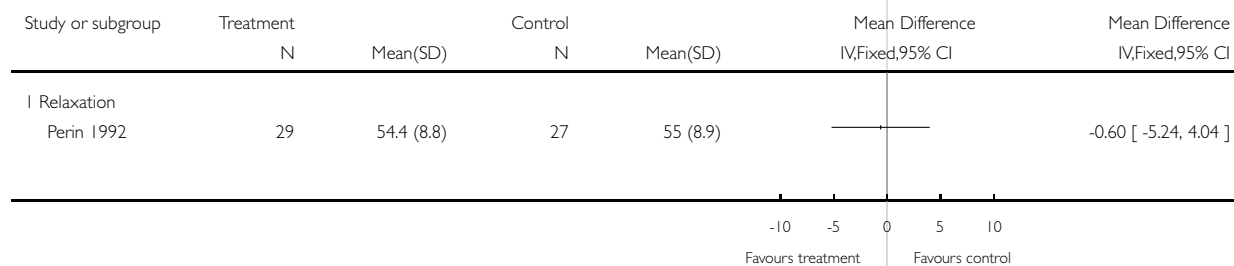


Analysis 1.18. Comparison 1 Psychological interventions versus control, Outcome 18 Change of behaviour scale.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 18 Change of behaviour scale

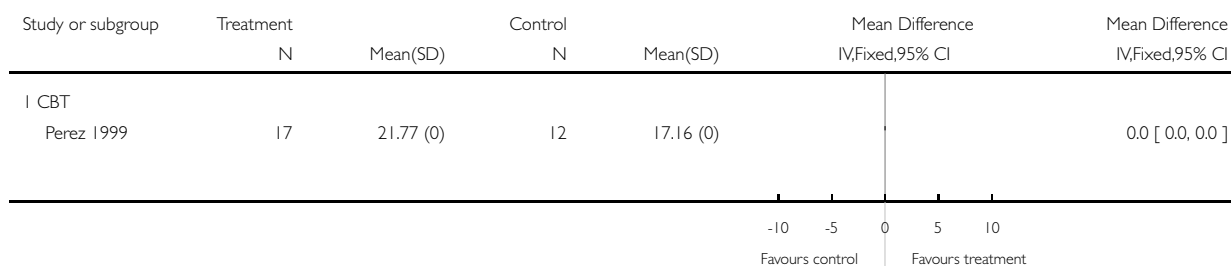


Analysis 1.19. Comparison 1 Psychological interventions versus control, Outcome 19 Self-efficacy.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 19 Self-efficacy

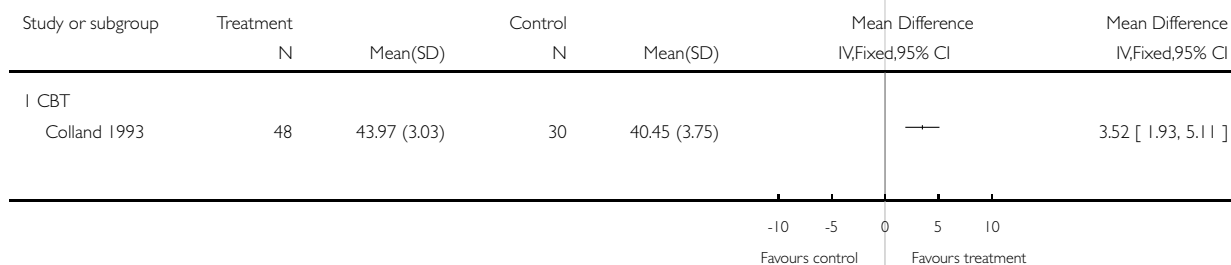


Analysis 1.20. Comparison 1 Psychological interventions versus control, Outcome 20 Coping.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 20 Coping

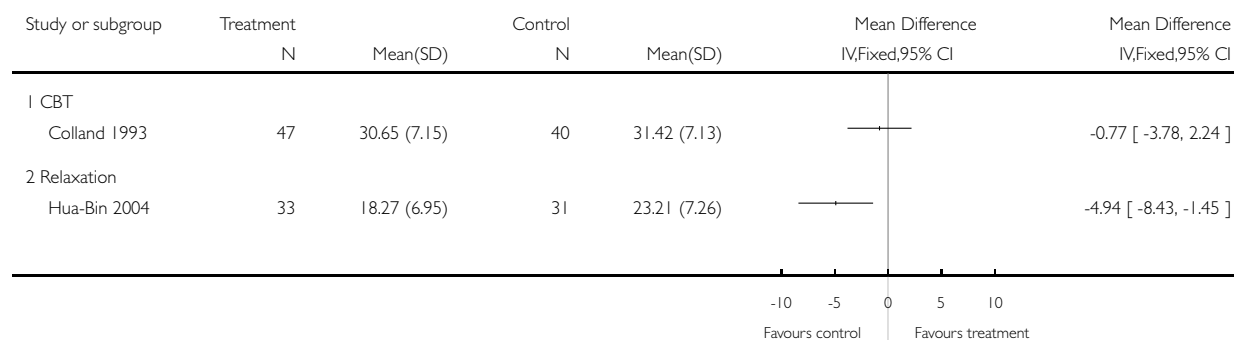


Analysis 1.21. Comparison 1 Psychological interventions versus control, Outcome 21 Anxiety.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 21 Anxiety

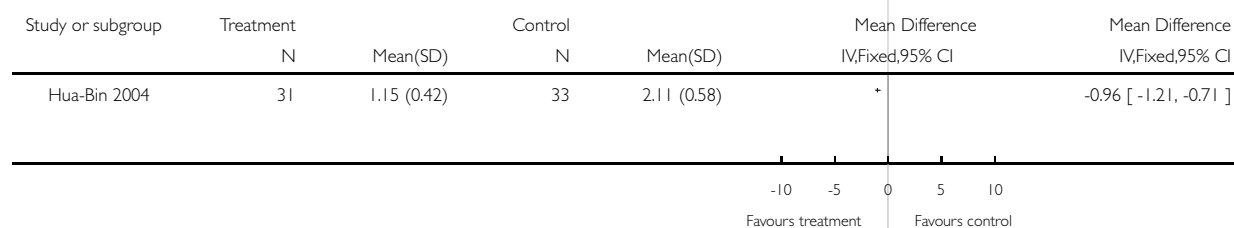


Analysis 1.22. Comparison 1 Psychological interventions versus control, Outcome 22 Mean night time asthma symptoms.

Review: Psychological interventions for children with asthma

Comparison: 1 Psychological interventions versus control

Outcome: 22 Mean night time asthma symptoms



WHAT'S NEW

Last assessed as up-to-date: 3 April 2007.

20 August 2008 Amended Converted to new review format.

HISTORY

Protocol first published: Issue 4, 2001

Review first published: Issue 4, 2005

10 September 2004	New citation required and conclusions have changed	Substantive amendment
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CONTRIBUTIONS OF AUTHORS

JY: Initiated review, assessed studies, extracted & entered data, write-up

SF: Provided input with protocol, checked data and write-up

CS: Provided input with protocol, assessed studies, checked data and write-up

DECLARATIONS OF INTEREST

None known.

INDEX TERMS

Medical Subject Headings (MeSH)

Adolescent; Asthma [psychology; *therapy]; Behavior Therapy [methods]; Psychotherapy [*methods]; Randomized Controlled Trials as Topic; Relaxation Therapy

MeSH check words

Child; Humans