

Breathing exercises for adults with asthma

Asthma is a common long-term condition that remains poorly controlled in many people despite the availability of pharmacological interventions, evidence-based treatment guidelines and care pathways.¹ There is considerable public interest in the use of non-pharmacological approaches for the treatment of asthma.² A survey of people with asthma reported that many have used complementary and alternative medicine, often without the knowledge of their clinical team.³ Such interventions include breathing techniques, herbal products, homeopathy and acupuncture. The role of breathing exercises within the management of asthma has been controversial, partly because early claims of effectiveness were exaggerated.⁴ UK national guidance and international guidelines on the management of asthma have included the option of breathing exercise programmes as an adjuvant to pharmacological treatment.^{5,6} Here we discuss the types of breathing exercises used and review the evidence for their effectiveness.

Background

Asthma has been associated with reduced CO₂ levels (hypocapnia) secondary to symptomatic hyperventilation, which may contribute to increased airway resistance and result in a cycle of worsening hypocapnia and further bronchospasm.⁷ An analysis of questionnaires returned by 219 of 307 people (aged 17–65 years) receiving treatment for asthma in a UK general practice (list size 7,033) found that about one third of women and one fifth of men had symptoms suggestive of dysfunctional breathing; patients were assessed using the Nijmegen questionnaire for symptoms associated with hyperventilation and dysfunctional breathing patterns rated on a 5-point scale ('never' to 'very often').⁸ A survey of 157 adults with asthma who were assessed in a Spanish pulmonary clinic using the Nijmegen questionnaire reported that 57 (36%) had 'hyperventilation syndrome'.⁹ However, few reliable studies have compared breathing patterns (particularly at times of bronchoconstriction) in people with asthma with breathing patterns in healthy subjects.^{2,4} In addition, the definition of dysfunctional breathing, its relationship to asthma and whether it is amenable to treatment has been questioned.¹⁰ Nevertheless, interventions aimed at normalising breathing patterns, reducing hyperventilation and increasing CO₂ levels have been promoted as an adjunct to the treatment of asthma.^{4,7}

Types of exercise

Breathing exercises for asthma have been divided into three main groups:⁴

- exercises aimed at manipulating the pattern of breathing, including techniques aimed at reducing hyperventilation (e.g. the Papworth method [Box 1], the Buteyko breathing technique [Box 2]); non-hyperventilatory techniques (e.g. yoga breathing); and improving breath control through singing or playing musical instruments;^{11,12}
- exercises aimed at increasing the strength and/or endurance of the diaphragm and respiratory muscles (inspiratory muscle training [IMT]);¹³ and
- exercises aimed at increasing the flexibility of the thoracic cage and improving posture (musculoskeletal training).

The role of exercises aimed at whole body conditioning (aerobic training) have been investigated in the management of asthma.^{14,15} However, they are not discussed further in this article.

Biofeedback training (e.g. assessment of expired CO₂ concentration, breathing rate and heart rate) is sometimes used with exercise training.^{4,16,17}

Box 1: Papworth method

The Papworth method focuses on the use of an appropriate breathing pattern to reduce hyperventilation and hyperinflation, increase CO₂ levels leading to reduced effects of hypocapnia and some symptoms attributed to bronchospasm.⁷

Elements include:²⁰

- Breathing training—diaphragmatic breathing with an emphasis on nose rather than mouth breathing. Hyperinflation, hyperventilation and habits such as yawning and sighing are discouraged.
- Education—recognition and management of stress responses, with specific reference to breathing patterns.
- Relaxation training.
- Integration of breathing and relaxation techniques into daily living.
- Home exercises supported by recorded audio instructions.

Box 2: Buteyko breathing technique

The Buteyko breathing technique uses controlled breathing and respiratory pauses to increase alveolar and arterial CO₂ tension, with the aim of reversing bronchospasm, normalising the breathing pattern and reducing breathlessness.⁷

Elements include:¹⁹

- Breathing training aimed at reducing hyperventilation by controlled reduction in breathing combined with periods of breath holding.
- Emphasis on nasal rather than oral breathing.
- Relaxation training.
- Advice about reducing medication use, nutrition and general health.

Assessing clinical efficacy

Many studies into the effects of breathing exercises in asthma involve small numbers of participants and have methodological limitations such as the difficulty in devising appropriate placebo control interventions; it is often not practical to hide treatment allocation from participants, so double-blinding may not be possible.⁷ Differences in the techniques used and poor description of the intervention makes analysis of the data difficult. For example, the term 'diaphragmatic breathing' is often used, but the exact meaning depends on where and when the practitioner trained, and so can be imprecise.¹⁸ Outcomes of studies have included quality of life indicators, ►

asthma symptoms, number of acute exacerbations and lung function.⁷ Breathing exercises often form one part of a treatment programme, which can also include advice on reducing the use of medication. This can invalidate medication use as an outcome measure in clinical research.¹⁹ Systematic reviews of trials of breathing exercises have been performed but heterogeneity has often prevented meta-analysis of data.⁷

Breathing exercises

Breathing exercises often form part of a complex intervention involving respiratory and non-respiratory components, sometimes referred to as breathing retraining.¹⁸ Respiratory components involve exercises that encourage patients to breathe through the nose, to use controlled shallow breathing, to reduce upper thoracic movement (chest breathing) and the use of breathholding or pauses.^{4,11} Although the number and duration of training sessions has not been standardised, three to four instruction sessions of physiotherapy spread over a period of about 6 weeks has been suggested.⁴ Patients are encouraged to practise the various techniques regularly and to incorporate them into their daily routine.

Non-respiratory components may include advice on nutrition and use of medication, asthma education, aerobic exercise prescription, and psychological support to address the associated anxiety and depression that can accompany asthma.^{2,16} In clinical practice, instruction is usually delivered individually by an appropriately trained therapist. The minimum length and number of instruction sessions required is not known, and tends to be individualised according to the needs and/or learning speed of the patient.⁴

Evidence

A systematic review of breathing exercises in the treatment of asthma performed for the USA Agency for Healthcare Research and Quality (AHRQ) found 22 randomised studies that met the inclusion criteria.¹¹ Limitations of the trials included the small size of many studies (≤ 30 participants in 68% of trials), the lack of appropriate blinding and the potential inclusion of people with conditions other than asthma. Comparisons included:

- hyperventilation reduction (including Papworth and Buteyko techniques) versus controls (eight studies, 1,088 participants) and hyperventilation reduction versus other breathing techniques (four studies, 285 participants);
- yoga breathing versus controls (five studies, 360 participants);
- IMT versus controls (five studies, 169 participants); and
- other non-hyperventilation reduction techniques versus controls (two studies, 153 participants).

Meta-analysis was carried out when at least three evaluable trials were available. The review found low-quality evidence that hyperventilation reduction techniques (particularly those that involved ≥ 5 hours of patient contact) achieved a statistically significant reduction in self-reported symptoms and a reduction in medication use (1.5–2.5 puffs of β_2 agonist per day), but with no improvement in pulmonary function. For asthma symptoms, the standardised mean difference (SMD) in effect size for the four trials with sufficient data to be included in the meta-analysis was -1.39 (95% CI -2.1 to -0.17). Hyperventilation reduction techniques were not associated with any harms in adults. The review concluded that “Behavioural approaches that include hyperventilation reduction techniques can improve asthma symptoms or reduce reliever medication use over 6–12 months in adults with poorly controlled asthma, and have no known harmful effects. However, available evidence is limited in its strength and applicability to the United States”.

A *Cochrane* review of breathing exercises for adults with mild to moderate asthma considered 13 studies (906 participants) of which five were also included in the AHRQ review.⁷ The trials differed in the type of breathing exercises performed, number of participants, number and duration of sessions completed, outcomes reported and statistical analysis. Six of seven studies reporting asthma symptoms showed significant differences

favouring breathing exercises. All eight studies that assessed quality of life reported an improvement in this outcome. Effects on lung function were more variable, with no difference reported in 5 of the 11 studies, while the other six showed a significant difference favouring breathing exercises. Meta-analysis was possible only for symptoms and Asthma Quality of Life Questionnaire (AQLQ) due to substantial heterogeneity among the studies. Each meta-analysis included only two studies and showed a significant difference favouring breathing exercises for both parameters (mean difference [MD] -3.22 , 95% CI -6.31 to -0.13 , $p=0.04$ for asthma symptoms; MD 0.79 , 95% CI 0.50 to 1.08 , $p<0.00001$ for change in AQLQ).

Another systematic review of breathing exercises in asthma management included 32 randomised controlled trials of breathing retraining compared with control interventions (of which 13 were also included in the USA review and eight in the *Cochrane* review; four studies were included in all three reviews) plus 11 non-randomised trials.²¹ Four of the six trials that evaluated the Buteyko technique found a significant decrease in β_2 agonist use compared with controls and two found a decrease in use of inhaled corticosteroids. Four studies of Buteyko technique and three of physiotherapy found improvements in one or more quality-of-life parameter or anxiety/depression score, but none showed an improvement in lung function.

Yoga

Yoga training can involve not only breathing exercises but also physical postures and meditation.²²

Evidence

Meta-analysis of the effects of yoga compared with usual care for asthma (14 trials, 824 participants) found statistically significant evidence of effects on asthma control (SMD 10.64 , 95% CI 1.98 to 57.19 ; $p=0.006$), asthma symptoms (SMD -0.37 , 95% CI -0.55 to -0.19 ; $p<0.001$) and quality of life (SMD 0.86 , 95% CI 0.39 to 1.33 ; $p<0.001$).²² No effects were found compared to sham yoga (stretching or a placebo device meant to mimic typical yoga breathing patterns) or other breathing exercises. However, the authors commented on the low methodological quality of the included trials.

The AHRQ review concluded that there is low-strength evidence that yoga breathing techniques may improve pulmonary function in adults.¹¹

Inspiratory muscle training

The aim of IMT is to increase strength or endurance of the diaphragm and accessory muscles of inspiration.¹³ The technique most widely used is pressure threshold loading. This uses a device with a spring-loaded one-way valve that produces resistance to inspiration at a predetermined and constant pressure.

Evidence

A *Cochrane* review included five studies (113 adult participants) involving the use of an external IMT device, three of which were from a single research group.¹³ Meta-analysis found a statistically significant increase in inspiratory muscle strength as measured by maximal inspiratory pressure (four studies, 84 participants; MD $13.34\text{cmH}_2\text{O}$, 95% CI 4.70 to 21.98 ; $p=0.0025$), but overall there was no statistically significant difference between the IMT and control group for the outcomes of respiratory function parameters, sensation of dyspnoea and use of β_2 agonist. The review concluded that there was currently no evidence to support or refute the use of IMT in asthma.

The Alexander Technique

The Alexander Technique is a form of physical therapy involving a series of movements designed to correct posture and bring the body into natural alignment to help it function efficiently.²³ It is also reported to aid relaxation. Some practitioners claim benefits for those who desire greater ease and efficiency of breathing, including asthmatics.

Evidence

A recent *Cochrane* review found no trial evidence to support the use of the technique in asthma.

Music therapy

Music therapy provides targeted intervention by a therapist that can involve singing, playing an instrument, listening to and/or moving to music.¹²

Evidence

A systematic review of music therapy did not identify any randomised controlled trials of playing musical instruments or singing.¹² Five non-randomised studies of active music therapy including music-assisted breathing exercises, singing and/or playing wind instruments generally included small numbers of participants, did not include blinded assessment and did not describe the intention-to-treat analysis. Some decrease in symptoms was reported following active music therapy, but the methodological limitations of the studies allowed only weak recommendations for music therapy in asthma.

Manual therapy

Various forms of manual therapy have been used to try to alleviate symptoms of asthma, including chiropractic and osteopathic techniques.²⁴ These techniques aim to increase the movement of the ribcage and spine to improve lung function.

Evidence

A systematic review found insufficient evidence to show whether any of these therapies can improve asthma symptoms, and concluded that more research is needed.

Targeting treatment

There is some data to suggest that those who would benefit most from breathing exercises are those with impaired quality of life (as assessed using a validated questionnaire e.g. AQLQ) despite optimal use of medication.⁴ Although it might be anticipated that those with symptoms of hyperventilation would be more likely to benefit, a randomised controlled trial found that a Nijmegen questionnaire score suggestive of symptomatic

hyperventilation had no influence on the response to breathing exercise training.²⁵ Similarly, the responses of people with and without hypocapnia or anxiety and depression were not significantly different.

Breathing exercises require considerable commitment of time and effort from the patient. It is likely to be more effective in those who are motivated to practise the techniques regularly than in those who are less willing to be involved with their own management.⁴

Access to therapists who can provide breathing exercise training programmes may be a problem.^{2,4} The cost-effectiveness of providing such training has not been determined. Some alternatives to individual therapy sessions that could allow greater access and a lower cost for larger numbers of people include the use of small group sessions and providing distance learning programmes.

What the guidelines say

The non-pharmacological management section of the the British Thoracic Society (BTS)/Scottish Intercollegiate Guidelines Network (SIGN) guideline for the treatment of asthma states that "Breathing exercise programmes (including physiotherapist-taught methods) can be offered to people with asthma as an adjuvant to pharmacological treatment to improve quality of life and to reduce symptoms" (Grade of recommendation A, indicating the highest strength of evidence).⁵ It concludes that there is currently insufficient evidence relating to other breathing exercise methods, such as yoga breathing techniques and IMT, on which to base a recommendation.

The Global Initiative for Asthma (GINA) strategy for the treatment of asthma in adults states that "Breathing exercises may be a useful supplement to asthma pharmacotherapy" (Evidence level B, indicating a limited body of data).^{6,26} This downgrades advice given in previous editions following a review of the quality of the evidence. The guideline's authors note that for studies of breathing interventions to be considered high-quality, control groups should be matched for level of contact with a health professional and for asthma education.²⁶ Citing a trial of different breathing techniques in which groups were matched for contact with healthcare professionals and instructions about the use of rescue inhaler,²⁷ the authors concluded that the results suggested that perceived improvement with breathing exercises may be largely due to factors such as relaxation, voluntary reduction in the use of rescue medication, or engagement of the patient with their care.²⁶ Thus, these interventions may be considered in anxious patients or those who habitually over-use rescue medication.

Conclusion

Asthma is a complex condition that remains poorly controlled in many patients despite pharmacological management. There is some evidence that supports the use of certain breathing exercises as adjunctive therapy for the management of asthma for selected patients, provided it is delivered by a trained professional within the context of optimal medical care. Patients should be advised that it should not be used as an alternative to drug treatment. There is no evidence that breathing exercises will affect lung function, although they have been shown to reduce symptoms and improve quality of life, and reduce rescue bronchodilator use. For motivated patients who are not achieving adequate control despite appropriate use of pharmacological treatment, referral for breathing exercise programmes may be appropriate. There is no compelling evidence to support other forms of breathing exercises including inspiratory muscle training, yoga and the Alexander Technique. Access to trained therapists is an ongoing issue that limits widespread uptake of breathing exercise programmes.

[R=randomised controlled trial; M=meta-analysis]

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