Integrated breathing and relaxation training (the Papworth method) for adults with asthma in primary care: a randomised controlled trial

Elizabeth A Holloway, Robert J West

**Background:** An integrated breathing and relaxation technique known as the Papworth method has been implemented by physiotherapists since the 1960s for patients with asthma and dysfunctional breathing, but no controlled trials have been reported. This study evaluated the effectiveness of the Papworth method in a randomised controlled trial.

**Methods:** Eighty-five patients (36 men) were individually randomised to the control group (n = 46) or to the intervention group receiving five sessions of treatment by the Papworth method (n = 39). Both groups received usual medical care. Assessments were undertaken at baseline, post-treatment (6 months after baseline) and at 12 months. The primary outcome measure was the St George’s Respiratory Symptoms Questionnaire (SGRQ). Secondary outcome measures included the Hospital Anxiety and Depression Scale (HADS), the Nijmegen dysfunctional breathing questionnaire and objective measures of respiratory function.

**Results:** Post-treatment and 12 month data were available for 78 and 72 patients, respectively. At post-treatment assessment the mean (SD) score on the SGRQ Symptom subscale was 21.8 (18.1) in the intervention group and 32.8 (20.1) in the control group (p = 0.001 for the difference). At the 12 month follow-up the corresponding figures were 24.9 (17.9) and 33.5 (15.9) (p = 0.007 for the difference). SGRQ Total scores and HADS and Nijmegen scores were similarly significantly lower in the intervention group than in the control group. The groups did not differ significantly following the treatment on objective measures of respiratory function except for relaxed breathing rate.

**Conclusions:** The Papworth method appears to ameliorate respiratory symptoms, dysfunctional breathing and adverse mood compared with usual care. Further controlled trials are warranted to confirm this finding, assess the effect in other patient groups and determine whether there is some effect on objective measures of respiratory function.

**METHODS**

**Participants and setting**
The study was undertaken in a semi-rural GP practice in Welwyn, Hertfordshire with eight partners and 16,500 patients; 612 (4%) patients aged ≥16 years are registered on the practice asthma database. The study took place between October 2004 and January 2006.

All 612 adult patients on the asthma register of the practice were initially approached to complete a postal survey about their condition; 359 patients responded. At the conclusion of the survey, respondents were invited to attend a physiotherapy-orientated asthma assessment. A total of 142 patients responded positively and 109 actually attended the assessment, 85 of whom met the inclusion criteria for the trial (fig 1; consort flowchart of patient withdrawals is available online at http://thorax.bmj.com/supplemental). Patients included in the study had to be aged 16–70 years, able to understand, read and write English, with a commitment to participate for possibly eight attendances, willing to give written informed consent and with no serious co-morbidity. The intention was that as few patients as possible would be excluded so that the sample would be maximally representative of a general practice asthma caseload. One patient in the control group requested withdrawal from the study to be able to receive treatment with the Papworth method.

**Abbreviations:** HADS, Hospital Anxiety and Depression Scale; SGRQ, St George’s Respiratory Questionnaire

There are currently an estimated 5.2 million people with asthma in the UK and 300 million worldwide. Management is primarily through medication, although it is recognised that non-pharmacological approaches to reducing symptoms and improving health-related quality of life merit attention. A sequence of integrated breathing and relaxation exercises known as the Papworth method was developed in the 1960s (box 1). This method focuses on problems of dysfunctional breathing including hyperventilation and hyperinflation that are often found in asthma sufferers. The cycle of breathlessness and wheezing is frequently accompanied by anxiety and compounded by complex physiological mechanisms. It is believed that the Papworth method leads to reduced asthma symptoms, anxiety and symptoms arising from hypocapnia. The present study was designed to investigate this hypothesis.

A Cochrane review on breathing exercises for asthma found seven small-scale randomised controlled trials satisfying its inclusion criteria. Trends towards improvement were found but no reliable conclusions could be drawn concerning the effectiveness of breathing training for asthma, and it was recommended that further trials be undertaken (see also Thomas et al). The interventions included in the review were predominantly based on either ancient yoga practices or “Buteyko techniques”, where emphasis is placed on hyperventilation and a reduction in β₂ agonist use. To our knowledge, no randomised controlled trials of the Papworth method exist, despite the fact that it is in quite widespread clinical use.
Study design and procedures

This was a two-arm randomised controlled trial comparing an intervention group receiving five treatments by the Papworth method with a control group receiving no additional treatment. Both groups continued to receive usual asthma care including medication and routine asthma education from a practice nurse. The usual care did not include advice about breathing exercises.

Randomisation was undertaken by a computer-generated number sequence assigning consecutive subject ID numbers either a 1 or 2 to denote intervention or control condition. Masking/blinding of patients and therapist was obviously not possible; patients had to sign an informed consent and it is obvious whether they were receiving the treatment or not. Whereas it might in principle have been possible for the follow-up assessments to have been undertaken by an assessor blind to the randomisation, resources did not permit this.

The primary outcome measure was the St George’s Respiratory Questionnaire (SGRQ). This assesses impaired respiratory symptoms and quality of life relating to these. It has good repeatability and is sensitive to changes in disease activity. A change in SGRQ Total score of 4 points is regarded as clinically significant. The questionnaire yields three subscale scores relating to (1) experience of symptoms, (2) their impact and (3) impairment in levels of activity. It also yields a total score. Secondary self-report measures were the Hospital Anxiety and Depression Scale (HADS) yielding separate scores for anxiety and depression, and the Nijmengeen questionnaire to assess hypoxic symptoms (breathlessness accompanied by dysfunctional breathing in the form of hyperventilation). A portable capnograph (Better Physiology) was used to measure end-tidal carbon dioxide and relaxed breathing rate over a 10 min period and standard spirometric parameters were also assessed (Micromedical Microloop). Each assessment session took approximately 1 hour. Assessments took place at baseline, post-treatment (approximately 6 months after baseline) and at 12 months. Ethical approval was obtained from the local research ethics committee.

Intervention: the Papworth method

Between the baseline and post-treatment assessment, the intervention group received five 60 min individual treatments with the Papworth method from a respiratory physiotherapist, as summarised in box 1. Ideally, the Papworth method is taught to patients in periods of remission in order that the techniques may be integrated into daily life activities and implemented at the first sign of symptoms.

Sample size and power calculation

The sample size was calculated on the basis of a difference between intervention and control groups in the primary outcome measure (SGRQ Total score) of 12 units at post-treatment assessments, as found in a pilot study, and a standard deviation of the difference between baseline and post-treatment assessment of 14 units. With these parameters, 23 patients in each group would yield 80% power at the alpha = 0.05 level (two-tailed). To take account of attrition rates of the order found in similar interventions (eg, Thomas et al19), we initially aimed to recruit 28 patients to each arm of the trial. In the event, a larger number of volunteers came forward from the recruitment process and, to avoid wasting the opportunity, these were included. The original randomisation process had generated sufficient numbers to include the extra participants.

Data analysis

Analyses were undertaken with SPSS V.11.5. Analysis of covariance (ANCOVA) was used to compare the control and intervention groups on primary and secondary outcomes at post-treatment and 12 month assessments, controlling for baseline scores. The outcome variables were normally distributed apart from two SGRQ domain scores (“activities” and “impact”) which had a positive skew which was not judged to be so great as to invalidate the use of an analysis of covariance with this sample size.

Analysis was undertaken on a “per protocol” basis rather than “intention to treat”. Intention to treat analysis is more common in randomised controlled trials but, in this case, it was expected that loss to follow-up would not have been correlated with lack of improvement but was more likely to be due to practical or logistic issues, nor would it differ between the intervention and control conditions. Moreover, no satisfactory method could be found for imputing a value for patients lost to follow-up. If it turned out that loss to follow-up was high or different in the two study groups, this would undermine the interpretability of the findings.

RESULTS

No significant differences were found between the groups at baseline (tables 1–3). SGRQ Symptom mean scores were lower in the PM group than in the control group after treatment and...
Breathing and relaxation exercises for asthma

DISCUSSION

These results support the hypothesis that the Papworth method ameliorates respiratory symptoms and improves quality of life in a general practice population of patients diagnosed with asthma. The effect was observed with reported symptoms and mood but no significant effect was observed on objective measures of lung function. To our knowledge, this is the first evidence from a controlled trial to demonstrate the effectiveness of the Papworth method.

The effect sizes on symptoms were clinically significant. A reduction of ≥7 points in SGRQ domains in the intervention group is approximately double the change considered to be clinically relevant. Anxiety and depression scores were also reduced to a clinically meaningful degree. Significant reductions in Nijmegen scores together with a reduction in breathing rate in the intervention group suggested an improved ability to control the breathing rate consistent with metabolic requirements.

The fact that no significant change was observed in objective measures of lung function suggests that the Papworth method does not improve the chronic underlying physiological causes of asthma, but rather their manifestation.

There was no observable effect on patients’ reports of the extent to which their activities were affected by their condition. However, in such a group with mild to moderate asthma, the level of impairment at baseline was small and there was limited scope for differential improvement in the intervention and control conditions.

A limitation of the study is a lack of detailed information on pharmacological treatment and changes in this over time during the trial. It would in principle be worthwhile examining how far, if at all, the intervention led to a reduction in medication usage or better adherence to medication regimens, but this would have been complicated by changes in prescribing practices while the study was going on and would have been difficult to interpret.

The Papworth method is a multi-component programme and we could not determine what element or elements contributed to its effect or even whether the elements combined synergistically. Because the comparison condition was usual care, we could not determine whether the Papworth method is more effective than usual care alone.

Table 1 Baseline demographic and clinical data

<table>
<thead>
<tr>
<th></th>
<th>Control group (n = 46)</th>
<th>Intervention group (n = 39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%) male</td>
<td>18 (39)</td>
<td>18 (46)</td>
</tr>
<tr>
<td>Mean (SD) age (years)</td>
<td>49.3 (14.2)</td>
<td>50.2 (14.0)</td>
</tr>
<tr>
<td>N (%) married/cohabiting</td>
<td>36 (78)</td>
<td>34 (87)</td>
</tr>
<tr>
<td>N (%) Employment status</td>
<td>20 (44)</td>
<td>16 (41)</td>
</tr>
<tr>
<td>N (%) full time</td>
<td>10 (22)</td>
<td>11 (28)</td>
</tr>
<tr>
<td>N (%) retired</td>
<td>27 (17.7)</td>
<td>23 (15.2)</td>
</tr>
<tr>
<td>Asthma impact factors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) years since asthma diagnosed</td>
<td>20 (13.6)</td>
<td>17 (13.0)</td>
</tr>
</tbody>
</table>

FEV₁ forced expiratory volume in 1 s; FVC, forced vital capacity; PEF, peak expiratory flow.

Table 2 Effects on symptoms of five Papworth method (PM) treatments compared with usual asthma care only

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-treatment (6 months post baseline)</th>
<th>12 months post-baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control (n = 46)</td>
<td>PM (n = 39)</td>
<td>Control (n = 45)</td>
</tr>
<tr>
<td>SGRQ Symptoms</td>
<td>35.1 (12.9)</td>
<td>42.9 (21.3)</td>
<td>32.0 (20.1)</td>
</tr>
<tr>
<td>SGRQ Activities</td>
<td>20.2 (17.4)</td>
<td>27.9 (21.3)</td>
<td>17.0 (17.5)</td>
</tr>
<tr>
<td>SGRQ Impacts</td>
<td>14.7 (11.5)</td>
<td>18.2 (14.8)</td>
<td>10.8 (11.0)</td>
</tr>
<tr>
<td>SGRQ Total</td>
<td>19.7 (11.3)</td>
<td>25.2 (16.1)</td>
<td>16.3 (12.2)</td>
</tr>
<tr>
<td>Nijmegen Total score</td>
<td>17.8 (9.1)</td>
<td>19.2 (11.0)</td>
<td>15.0 (9.5)</td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>6.2 (3.8)</td>
<td>6.3 (3.9)</td>
<td>6.2 (3.7)</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>2.2 (1.8)</td>
<td>3.3 (2.5)</td>
<td>2.4 (2.4)</td>
</tr>
<tr>
<td>ETCO₂ (mm Hg)</td>
<td>39.0 (3.7)</td>
<td>38.3 (5.5)</td>
<td>39.4 (4.4)</td>
</tr>
</tbody>
</table>

Values presented as mean (SD).
SGRQ, St George’s Respiratory Questionnaire scores: range 0–100 (best—worst).
Nijmegen scores: higher scores indicate increased severity in symptoms from hypocapnia: range 0–64 (best—worst); HADS, Hospital Anxiety and Depression Scale: range 0–21 (best—worst); ETCO₂, end tidal carbon dioxide.

*From analysis of covariance comparing PM and control groups controlling for baseline scores.
effective than other active treatment options that might be adopted over and above usual care. It may be noted, however, that patients in the control group received considerably more attention than would have been the case in usual care because of the repeated assessments. It seems unlikely, therefore, that the effects observed were simply due to increased attention.

The majority of patients had either mild asthma or symptoms well controlled with medication. It remains to be seen whether the Papworth method would benefit patients with more severe asthma. Asthma and chronic obstructive pulmonary disease are part of the same family of disorders, often co-exist, and are difficult to differentiate. It would therefore be of interest to determine whether the Papworth method could help patients diagnosed predominantly with the latter condition.

The most important limitation of the present study was that the same individual delivered the intervention and undertook the assessments. Although this is commonplace in studies of clinical/behavioural interventions, there is always the risk of patients responding to what they perceive as the expectations of the researcher. Such a bias may be expected to influence self-report measures across the board, so the fact that there was a marked improvement particularly in symptom scores suggests specific efficacy of the intervention. However, having obtained this positive finding, better funded studies are warranted that would enable independent assessments to be carried out.

ACKNOWLEDGEMENTS

The authors are grateful to the patients for their participation in the trial. Micromedical Ltd kindly calibrated and supplied the spirometer; Dr Roger Aubrey and a local charity funded the recording of CDs and tapes; and Professor Paul Jones gave permission for use of the SGRQ. The authors acknowledge the support of Dr Royce Abrahams, Dr Anthony Reed, Lesley Als and staff of the Welwyn practice. The advice and guidance of Claire Foley, PCT administrator, is appreciated. Thanks to Dr Mike Morgan for commenting on the draft and to Dr Claude Lum, Beverly Timmons, Dr Mike Thomas, Dr Ann Bruton, Dr David Beales, Dr Jenny Head, Diana Innocenti, Rosemary Cluff, Gill Watkin, Jenny Fidler and student colleagues for their interest and discussions.

Table 3 Effects on spirometric parameters of five Papworth method (PM) treatments compared with usual asthma care only

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n = 42)</th>
<th>PM (n = 38)</th>
<th>Control (n = 41)</th>
<th>PM (n = 32)</th>
<th>p Value*</th>
<th>Control (n = 37)</th>
<th>PM (n = 30)</th>
<th>p Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC (l)</td>
<td>3.6 (1.0)</td>
<td>3.4 (1.0)</td>
<td>3.6 (1.0)</td>
<td>3.6 (0.9)</td>
<td>0.687</td>
<td>3.6 (1.0)</td>
<td>3.6 (0.8)</td>
<td>0.804</td>
</tr>
<tr>
<td>FEV₁ (l)</td>
<td>2.8 (0.9)</td>
<td>2.7 (0.9)</td>
<td>2.8 (0.9)</td>
<td>2.9 (0.8)</td>
<td>0.974</td>
<td>2.7 (0.8)</td>
<td>2.8 (0.7)</td>
<td>0.583</td>
</tr>
<tr>
<td>FVC (l)</td>
<td>3.5 (1.0)</td>
<td>3.4 (1.1)</td>
<td>3.5 (0.9)</td>
<td>3.6 (0.9)</td>
<td>0.151</td>
<td>3.4 (0.9)</td>
<td>3.6 (0.9)</td>
<td>0.345</td>
</tr>
<tr>
<td>PEF (l/s)</td>
<td>413.4 (130.1)</td>
<td>408.5 (141.7)</td>
<td>425.9 (120.0)</td>
<td>439.5 (113.2)</td>
<td>0.745</td>
<td>407.9 (119.4)</td>
<td>439.3 (109.1)</td>
<td>0.375</td>
</tr>
</tbody>
</table>

Values presented as mean (SD).

SGRQ, St George’s Respiratory Questionnaire scores: range 0–100 (best–worst); VC, vital capacity; FEV₁, forced expiratory flow in 1s; FVC, forced vital capacity; PEF, peak expiratory flow.

*From analysis of covariance comparing PM and control groups controlling for baseline scores.

REFERENCES

Assessed for eligibility \(n=109\)

Enrolment

Excluded \(n=24\)
- Not meeting inclusion criteria \(n=20\)
- Refused to participate \(n=0\)
- Unable to attend in office hours \(n=4\)

Randomised \(n=85\)

Allocated to intervention \(n=39\)
- Received allocated intervention/post-treatment assessment \(n=33\)
- Did not receive allocated intervention \(n=6\)
  - Reasons:
    - No transport \(n=1\)
    - Family/work commitments \(n=4\)
    - Additional health problem \(n=1\)

Lost to follow-up at 12-month post-baseline assessment \(n=1\)
- Reasons:
  - Completed 5 treatments then changed job/unable to come \(n=1\)

Allocated to control (usual care) \(n=46\)
- Received assessment 6 months post baseline \(n=45\)
- Did not receive allocated intervention \(n=1\)
  - Reasons:
    - Additional work commitments \(n=1\)

Lost to follow-up at 12-month assessment \(n=5\)
- Reasons:
  - Did not attend \(n=1\)
  - Moved away \(n=2\)
  - Changed job, unable to come \(n=1\)
  - Requested treatment and withdrew from trial \(n=1\)

Analyzed \(n=32\)
- Excluded from analysis \(n=0\)

Allocated \(n=40\)
- Excluded from analysis \(n=0\)