

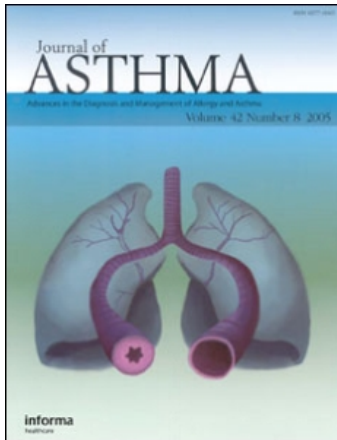
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A. J. Opat <sup>a</sup>; M. M. Cohen <sup>b</sup>; M. J. Bailey <sup>a</sup>; M. J. Abramson <sup>a</sup>

<sup>a</sup> Department of Epidemiology and Preventive, Medicine Monash Medical School Alfred Hospital Prahan, <sup>b</sup> Complementary Medicine Research Unit Monash Institute of Public Health Clayton Vic, Australia

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# A Clinical Trial of the Buteyko Breathing Technique in Asthma as Taught by a Video

A. J. Opat, B.Med.Sc.,<sup>1</sup> M. M. Cohen, Ph.D.,<sup>2</sup> M. J. Bailey, M.Sc.,<sup>1</sup>  
and M. J. Abramson, Ph.D.<sup>1</sup>

<sup>1</sup>*Department of Epidemiology and Preventive Medicine  
Monash Medical School  
Alfred Hospital  
Prahan*

<sup>2</sup>*Complementary Medicine Research Unit  
Monash Institute of Public Health  
Clayton Vic, Australia*

**Key words:** Asthma; Randomized controlled trial; Buteyko Breathing Technique; Quality of life

## ABSTRACT

The Buteyko Breathing Technique (BBT) is promoted as a drug-free asthma therapy. It is based on the premise that raising blood Pa<sub>CO</sub>, through hypoventilation can treat asthma. Our study was designed to examine whether the Buteyko Breathing Technique, as taught by a video, is an efficacious asthma therapy. Thirty-six adult subjects with mild to moderate asthma were randomized to receive either a BBT or placebo video to watch at home twice per day for 4 weeks. Asthma-related quality of life, peak expiratory flow (PEF), symptoms, and asthma medication intake were assessed both before and after intervention. Our results demonstrated a significant improvement in quality of life among those assigned to the BBT compared with placebo ( $p = 0.043$ ), as well as a significant reduction in inhaled bronchodilator intake ( $p = 0.008$ ). We con-

Address correspondence to: Associate Professor M. J. Abramson, Department of Epidemiology and Preventive Medicine, Monash Medical School, The Alfred Hospital, Prahan Vic 3181, Australia. Fax: +61-3-9903-0556.

clude that the BBT may be effective in improving the quality of life and reducing the intake of inhaled reliever medication in patients with asthma. These results warrant further investigation.

## INTRODUCTION

The Buteyko Breathing Technique (BBT) is promoted as a drug-free therapy for a number of medical disorders, including asthma. It is based on the premise that asthma is a disease of hypocapnia, caused by hyperventilation (1,2). The BBT involves shallow breathing exercises designed to increase the  $P_{aCO_2}$  of asthma patients. Although there have been very few clinically rigorous investigations into the technique itself, many studies have focused on some of the methods underlying the BBT. For example, it is widely accepted that due to the Bohr effect, tachypnea associated with asthma is linked to an increased hemoglobin affinity for oxygen (3), leading to reduced tissue perfusion (4). It is also been shown that  $CO_2$  is a powerful bronchodilator (5).

The only randomized controlled trial of the BBT of which we are aware reported significant decreases in asthma medication usage and improvements in quality of life among those using the BBT taught by Buteyko practitioners (2).

We report the results of a prospective, single-blind, randomized, placebo-controlled clinical trial of the BBT taught by video.

## METHODOLOGY

### Study Subjects

Subjects with asthma were recruited through media advertisements in Melbourne, Australia. Subjects were eligible for inclusion in the study if they were aged between 18 and 50 years of age, had previously been diagnosed with asthma by a medical practitioner (self-reported), and had ready access to a video cassette recorder throughout the trial period. Subjects were ineligible if they had previously learned the BBT, or if they were

regularly taking oral corticosteroids or more than 1600  $\mu\text{g}$  of inhaled steroid per day. Subjects were also excluded if they were taking less than three doses of inhaled bronchodilator medication per week, or if they had experienced a severe asthma exacerbation within 6 weeks of trial commencement. The study was approved by the Standing Committee on Ethics in Research on Humans at Monash University.

### Study Design

#### THE INTERVENTION

The intervention being tested was a 67-min video entitled "Buteyko Breathing Method" (Buteyko Pty Ltd., Brisbane, Australia). The video included an explanation of the theory behind the method, as well as a 20-min self-guided BBT session, involving short periods of shallow breathing, which were interspersed with periods of breath holding. Subjects were requested to watch this portion of the video twice each day for a period of 4 weeks. The subjects were also given a copy of the accompanying manual. The study was designed only to measure the effects of the breathing exercises on the subjects, and subjects were not required to alter their prescribed medication, alter their diet, or tape up their mouths while sleeping (to reduce the theoretical risk of nocturnal aspiration).

#### CONTROL

The 60-min control video was entitled "Nature's Landscapes" (ABC Video, Melbourne), which showed images from nature along with classical music and natural sound effects. Patients were asked to watch a portion of this video of their choosing for 20 min, twice per day. The control video was chosen because it simulated the portion of the BBT video that subjects were instructed to watch twice daily,

however it did not instruct patients to alter their breathing.

Alterations to the drug regimes of patients in the trial were left to the discretion of the individual patients, in conjunction with their medical practitioners. None of the investigators provided encouragement or guidance for patients to reduce their asthma medication.

#### RANDOMIZATION AND BLINDING

Subjects were randomly allocated to either the treatment or control group, using a computer-generated list. Subjects were unaware whether they were in the treatment or control group, as they were only informed that they were taking part in a "drug-free asthma therapy," and did not know the exact details of what their treatment involved.

#### OUTCOMES

Each subject received an asthma diary. Participants recorded daytime symptoms, nighttime symptoms (on an ordinal scale from 0 to 3), asthma medication intake, peak flow readings (using a mini-Wright peak flow meter), as well as other comments. Subjects recorded these data for 2 weeks before the intervention (run-in period), and for 4 weeks afterward. In addition, each patient was asked to complete the Asthma Quality of Life Questionnaire (6) before and 4 weeks post-intervention. The 20 items made up one total quality of life scale, and the four subscales of breathlessness, mood disturbance, social disruption, and concern for health. This particular questionnaire has been demonstrated to be both reliable and valid against the criterion of bronchial hyperreactivity (7).

#### Statistical Analysis

Sample size calculations were based on changes in the Quality of Life Questionnaire (scored on a 10-point scale). Past studies (2) have shown that the standard deviation is about 1.6. Eighteen subjects per group were required to detect a clinically significant difference of 1.5 between two groups with a power of 80% and a statistical significance of 0.05.

Statistical analysis was performed using the SAS (SAS Institute, Cary, NC), and SPSS (SPSS Inc., Chicago IL) statistical packages. The data were analyzed by intention to treat to compare both groups after viewing their allocated videos. Peak expiratory flow (PEF), symptom scores, and medication intake were analyzed using repeated measures analysis of variance (RM-ANOVA). The differences pre-intervention and post-intervention were normally distributed for all of these variables, thus satisfying the assumptions underlying ANOVA. The data for the Quality of Life Questionnaires were also normally distributed, thus paired *t*-tests were utilized. Equality of variance was demonstrated using Levene's Test. Calculations of mean peak flow variability were performed according to the method outlined in the Australian Asthma Management Handbook (8). Differences between the groups were not normally distributed, thus requiring the use of a Wilcoxon two-sample test. Two-tailed  $p < 0.05$  was accepted as statistically significant.

Drug data were adjusted for age, gender, and positive smoking history. Dosages were expressed in micrograms as equivalent doses of either salbutamol (albuterol) or beclomethasone. These were calculated according to the following formulae: 100  $\mu\text{g}$  of salbutamol was considered equivalent to 100  $\mu\text{g}$  of terbutaline and 25  $\mu\text{g}$  of salmeterol, whereas 100  $\mu\text{g}$  of beclomethasone was considered equivalent to 100  $\mu\text{g}$  of budesonide or 50  $\mu\text{g}$  of fluticasone.

## RESULTS

### Subjects

One hundred and eight people responded to the advertisements promoting the study. Of these, 36 people were eligible and willing to take part in the study. They were randomly allocated to either a Buteyko group or a control group.

Table 1 demonstrates the key baseline characteristics of study participants. There were no significant differences between the two groups. All subjects demonstrated at least 6% diurnal variability in PEF. This was consistent

**Table 1.** Details of Participants at Baseline

	BUTEYKO (n = 18)	PLACEBO (n = 18)
Gender (% females)	50%	67%
Age: mean (standard deviation) years	31.6 (9.5)	32.7 (11.4)
Previous usage of complementary therapies	1 (Homeopathy)	3 (Yoga, breathing, naturopathy, deep breathing)
Total QOL: mean (95% CI)	2.72 (1.97–3.47)	2.70 (1.93–3.46)
PEF (L/min): mean (95% CI)	406 (344–467)	390 (334–452)
Nighttime symptoms: mean (95% CI)	0.55 (0.29–1.81)	0.30 (0.06–0.54)
Daytime symptoms: mean (95% CI)	0.82 (0.50–1.04)	0.79 (0.54–1.06)
Mean (95% CI) daily dosage of inhaled bronchodilator medication ( $\mu\text{g}$ )	350 (164–536)	459 (217–701)
Mean (95% CI) daily dosage of inhaled steroid medication ( $\mu\text{g}$ )	364 (155–573)	495 (219–771)
Asthma severity of subjects		
No asthma (PEF variability 0–5%)	0	0
Mild asthma (PEF variability 6%–10%)	7	11
Moderate asthma (PEF variability 11%–25%)	8	5
Severe asthma (PEF variability >25%)	1	1
Unknown	2	1

with a diagnosis of at least mild asthma (8), and demonstrated that it was most likely that all subjects did indeed have asthma. The peak flow diurnal variability showed no significant differences in asthma severity between the two groups ( $p = 0.53$ ).

### Drop Outs

Four subjects dropped out of the trial: one subject dropped out during the run-in period, due to extenuating personal circumstances; one subject was lost to follow-up during the run-in period; one subject dropped out subsequent to her video session, because she did not believe that the video she received could provide benefit to her asthma; and one subject was lost to follow-up during the trial period.

Note that four people did not submit symptom diaries. One subject from the control

group watched the video without recording any data, while two subjects from the Buteyko group claimed that they did not watch the video at all following the initial screening. Data from one other subject in the Buteyko group was lost in transit.

There were no significant differences found between the baseline data of the subjects who dropped out, and of those who remained in the trial.

### Adverse Events

We became aware of only one adverse event. This occurred in a control subject approximately 10 days after commencement of the trial period. She was admitted to hospital with a severe exacerbation of her asthma and managed initially in intensive care with mechanical ventilation. It was concluded that this

exacerbation did not result from the asthma treatment she had received as part of this trial. This subject's symptom diary data was incomplete.

### Compliance

The maximum possible number of viewings was 56 occasions. Patients in the treatment group reported watching their video an average of 36.7 (65.5%) occasions. This was 5.2 occasions less than subjects in the control group ( $p = 0.46$ ).

### Quality of Life

The Asthma Quality of Life Questionnaire was completed by 34 subjects before the trial commenced (17 per group) and 32 people at the conclusion of the trial (16 per group). The two unpaired data sets were not included in the analysis. The results were calculated on a 10-point scale (0 = no impact of asthma; 10 = most severe impact). The mean differences between groups are displayed in Table 2. A negative value indicates an overall improvement in the BBT group.

Statistically significant improvement was demonstrated by the Buteyko group compared to the control group in the breathlessness and mood disturbance subscales, as well as total quality of life. Improvements were also noted in the social disruption and concern for health subscales, although these did not achieve statistical significance. Multivariate analysis was performed to take into account minor, between-group differences in age, gender, and baseline reliever medication

on the quality of life results. This analysis (not shown) demonstrated no significant impact of any of these factors on the results.

### PEF

PEF measurements were compared between the treatment and placebo groups. Data were provided through the asthma diaries, which were completed by 13 subjects in the intervention group, and 15 subjects in the placebo group. The average weekly PEF measurements for the 2-week run-in period were contrasted with the average weekly measurements for the 4-week trial period. An overall improvement of 16.7 L/min was found in the BBT group when compared to the control group, but this was not statistically significant ( $F = 0.62$ ; degrees of freedom [df] = 1,26;  $p = 0.44$ ).

### Asthma Symptoms

Symptoms were recorded twice daily for the 2-week run-in period and for the 4-week trial period using the symptom diaries. A mean overall improvement of 0.21 in nighttime symptoms was demonstrated in the Buteyko group when compared with the control group ( $F = 1.42$ ; df = 1,26;  $p = 0.24$ ).

The daytime symptoms in the control group increased marginally, and there was a much larger decrease in the symptoms in the Buteyko group, which approached statistical significance ( $t = 2.09$ ;  $p = 0.06$ ). The difference between the two groups was calculated as being a decrease of 0.31 ( $F = 2.99$ ; df = 1,26;  $p = 0.10$ ) in favor of the BBT.

**Table 2.** Differences Between Groups in Quality of Life Before and After Treatment

	MEAN (95% CI) DIFFERENCE BETWEEN GROUPS	t VALUE	p VALUE
Total quality of life	-1.29 (-2.53 to -0.05)	-2.12	0.043
Subscale 1: Breathlessness	-1.53 (-3.06 to 0.00)	-2.04	0.050
Subscale 2: Mood disturbance	-1.59 (-3.04 to -0.15)	-2.25	0.032
Subscale 3: Social disruption	-1.16 (-2.54 to 0.22)	-1.72	0.096
Subscale 4: Concern for health	-0.87 (-2.18 to 0.44)	-1.36	0.185

**Table 3.** Inhaled Bronchodilator Medication Intake (Salbutamol Equivalents)

	TOTAL BRONCHODILATOR ( $\mu\text{g}$ ) USED PER DAY PREINTERVENTION (95% CI)	TOTAL BRONCHODILATOR ( $\mu\text{g}$ ) PER DAY POST-INTERVENTION (95% CI)	MEAN DIFFERENCE OBSERVED	<i>t</i> VALUE	<i>p</i> VALUE
Buteyko group ( <i>n</i> = 13)	350 (164–536)	130 (0–319)	–220	–3.81	0.008
Placebo group ( <i>n</i> = 15)	459 (217–701)	449 (205–692)	–10	–0.18	0.87

### Medication Intake

The amount of medication taken by patients was also recorded on the symptom diaries. Each subject was required to enter the total number of inhalations/puffs/tablets taken per day. These data were completed and submitted by 13 subjects in the treatment group, and 15 in the control group.

Analysis was only performed on inhaled bronchodilator and inhaled steroid medication. No subjects reported using oral theophyllines or oral steroids at baseline. The subject with the hospital admission was taking oral steroids, but her data for this period were unavailable. One subject in the Buteyko group was prescribed four inhalations of cromoglycate for the entire 6 weeks. The majority of patients (27) were using 100  $\mu\text{g}$  puffs of salbutamol.

The inhaled bronchodilator data are shown in Table 3. The Buteyko group on average reduced their reliever intake by more than 60% during the 4-week intervention period. This decrease was both statistically and clinically significant. The control group's reliever intake remained almost unchanged. The mean overall decrease was 210  $\mu\text{g}$  of inhaled bronchodilator per day in the Buteyko group ( $F = 6.84$ ,  $df = 1,25.5$ ;  $p = 0.008$ ).

Results for inhaled steroid intake are demonstrated in Table 4. There was little decrease in the amount of inhaled steroid used per day in the treatment group, whereas there was a slight increase in the inhalations of steroid in the control group. Neither of these changes was statistically significant. The mean difference in inhaled steroid intake between groups was a nonsignificant decrease of 84  $\mu\text{g}$  per day of inhaled steroid in favor of the BBT ( $F = 2.20$ ;  $df = 1,26$ ;  $p = 0.15$ ).

### DISCUSSION

This study has shown that the BBT as taught by a video can provide significant benefits in the management of mild to moderate asthma. Benefits were demonstrated with regard to quality of life and bronchodilator medication requirements in those using the method, compared to those using a placebo. These findings are consistent with the only previously published BBT trial, which demonstrated significant quality of life improvement (by a mean of 1.6 out of 10) in the BBT group with respect to the control group after 8 months (2). The present study demonstrated that the BBT led to an increase in quality of life twice as great as that achieved by asthma

**Table 4.** Inhaled Steroid Medication Intake (Beclomethasone Equivalents)

	TOTAL STEROID ( $\mu\text{g}$ ) USED PER DAY PREINTERVENTION (95% CI)	TOTAL STEROID ( $\mu\text{g}$ ) PER DAY POST-INTERVENTION (95% CI)	MEAN DIFFERENCE OBSERVED	<i>t</i> VALUE	<i>p</i> VALUE
Buteyko group ( <i>n</i> = 13)	364 (155–573)	343 (136–550)	–21	0.5	0.62
Placebo group ( <i>n</i> = 15)	496 (219–771)	560 (314–806)	64	1.64	0.11

education (9), suggesting that BBT was more effective at improving patients' quality of life than asthma education alone.

Although our final sample size was smaller than expected, there was sufficient power to detect improvement in quality of life and reduction in bronchodilator medication. However, achieving significant results for some other outcomes would have been exceedingly difficult. Indeed, to detect a statistically significant improvement in daytime symptoms with 80% power would have required 76 subjects; well beyond the financial constraints of this study.

The methodology underlying this study, which involved using a self-administered video to teach the technique, was different to that employed in the previous BBT trial, which involved BBT practitioners (2). In the previous trial, there was a concern that the practitioners may have provided a higher level of encouragement for the patients in the Buteyko group to reduce their medication intake. In the present study, this possibility was eliminated by using a video without any direct practitioner intervention, which could have biased the results. Furthermore, a number of aspects of the BBT that are taught by Buteyko practitioners were not emphasized in the present trial. Practitioners usually provide advice on dietary changes, medication usage, and how to control allergic responses. Although much of this was mentioned by the video, subjects were neither encouraged nor discouraged from changing their diets or taping up their mouths at night. It is possible that changes to PEF, quality of life, drug intake, and symptoms (particularly nocturnal symptoms) may have been greater had patients been required to comply with such measures.

Despite little change in symptoms, there was a marked and significant decrease in the use of inhaled bronchodilator medication in the BBT group. This indicates that patients obtained better asthma control, and such a reduction confirms the observations reported by Bowler et al. (2). It is possible that the reduction in inhaled bronchodilator usage by itself led to an improvement in quality of life. It has been claimed that regular use of inhaled  $\beta_2$ -agonists can result in an increased number of

asthma attacks, and that they are deleterious in long term asthma management (10). This was supported by a controlled-controlled trial of fenoterol, which demonstrated that regular  $\beta_2$ -agonist therapy for asthma was deleterious to the control of asthma, and could increase asthma morbidity (11).

No change in PEF was noted in this study, which is consistent with the findings of Bowler et al. (2). It has been suggested by Buteyko proponents that this may be due to reflex bronchoconstriction resulting from the deep inspiratory maneuver required to obtain a peak flow measurement (12).

## CONCLUSIONS

Together with the findings of Bowler et al. (2), our study suggests that the BBT may be a useful adjunct to pharmacological therapy in the treatment of asthma. In this study, the BBT as presented by a video was shown to improve the quality of life and reduce reliance on bronchodilator medication. Although the theory behind the BBT differs from conventional wisdom on the pathophysiology of asthma, the condition is still not completely understood. Investigating this technique further, with more subjects, may shed light on our understanding of asthma as well as establish a possible role for a safe and effective nonpharmacological asthma treatment.

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