



Arden-Close, E., Kirby, S. E., Yardley, L., Bruton, A., Ainsworth, B., & Thomas, D. M. (2019). Evaluation of a breathing retraining intervention to improve quality of life in asthma: quantitative process analysis of the BREATHE randomized controlled trial. *Clinical Rehabilitation*, 33(7), 1139-1149.
<https://doi.org/10.1177/0269215519832942>

Peer reviewed version

Link to published version (if available):
[10.1177/0269215519832942](https://doi.org/10.1177/0269215519832942)

[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Sage at <https://journals.sagepub.com/doi/10.1177/0269215519832942> . Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:
<http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>

**Evaluation of a breathing retraining intervention to improve quality of life
in asthma: quantitative process analysis of the BREATHE randomised
controlled trial**

Arden-Close, Emily.¹, Kirby, Sarah E.,² Yardley, Lucy ^{2,3}, Bruton, Anne⁴,

Ainsworth, B.^{2,5,6}, Thomas, D.M.⁵

1 Department of Psychology, Bournemouth University, UK

2 Academic Unit of Psychology, University of Southampton, UK

3 School of Experimental Psychology, University of Bristol, UK

4 Faculty of Health Sciences, University of Southampton, UK

5 Primary Care and Population Sciences, University of Southampton, UK

6 Department of Psychology, University of Bath, UK

Correspondence should be addressed to Dr Emily Arden-Close, Department of
Psychology, Bournemouth University, Talbot Campus, Fern Barrow, Poole,

Dorset, BH12 5BB, UK. Email: eardenclose@bournemouth.ac.uk Tel: + 44 (0)

1202 965529

Abstract

Objective: Explore group differences between interventions (DVD and booklet (DVDB) versus face-to-face and booklet (F2FB), versus usual care) in the BREATHE trial of breathing retraining for asthma.

Design: Quantitative process analysis exploring group expectancy, experience and practice before and after intervention delivery for the main trial.

Setting: Primary care

Subjects: Adults with asthma (DVDB n = 261; F2FB n = 132).

Main measures: Baseline - expectancy about breathing retraining; Follow-up 3, 6 and 12 months - self-efficacy, treatment experience (enjoyment of treatment, perceptions of physiotherapist, perceptions of barriers), amount of practice (weeks, days/week, times/day), continued practice; All time points - anxiety (Hospital Anxiety and Depression Scale), asthma QoL (Asthma Quality of Life Questionnaire).

Results: No group differences in baseline expectancy. Statistically significant results ($p < 0.05$) indicated that: At follow-up F2FB participants perceived greater need for a physiotherapist than DVDB participants (3.43 (0.87) versus 2.15 (1.26)). F2FB participants reported greater enjoyment of core techniques (such as stomach breathing 7.42(1.67) versus 6.13 (1.99) (DVDB)). Fewer F2FB participants reported problems due to doubts (24 (22.9%) versus 90 (54.2%)). F2FB participants completed more practice sessions (75.01 (46.38) versus 48.56 (44.71)). Amount of practice was not significantly related to QoL. In the DVDB arm, greater confidence in breathing retraining ability explained 3.9% of variance in QoL at 12 months.

Conclusions: Adults with asthma receiving breathing retraining face-to-face report greater enjoyment and undertaking more practice than those receiving a DVD and booklet, but practice is not related to QoL. Greater confidence in ability to do breathing retraining is associated with improved QoL.

Introduction

The Breathing Retraining for Asthma Trial of Home Exercises (BREATHE) trial¹ compared physiotherapy breathing retraining for inadequately controlled asthma patients (teaching breathing techniques such as nose breathing, stomach breathing and slow breathing to modify breathing patterns and improve breathing efficiency) delivered by DVD plus booklet versus face-to-face sessions plus booklet, versus usual care. Delivery via DVD plus booklet was found to be equivalent to face-to-face sessions plus booklet in improving asthma-related quality of life, and both were superior to usual care. This equivalence was unexpected because qualitative process analysis had revealed that participants would have preferred to be assigned to face-to-face physiotherapy and this group reported it to be more beneficial.²

Recent calls by the European Asthma Research and Innovation Partnership have highlighted the need to understand behavioural mechanisms impacting asthma outcomes³ to enhance our understanding of how to maximise benefits for patients. This quantitative process study, which assessed patient-reported anxiety, expectations of treatment, treatment experience and engagement, had three main aims:

- 1) Explore whether there was a difference between the DVD plus booklet and face-to-face plus booklet groups on measures of expectancy, experience, and amount of practice.
- 2) Assess whether these factors were associated with amount of practice at 3, 6 and 12 months.

- 3) Assess whether psychological factors (anxiety, self-efficacy, expectancy) and engagement factors (experience and amount of practice) were associated with asthma-related quality of life at 3, 6 and 12 months.

Methods

This was a quantitative process study nested within a 3-arm randomised controlled trial comparing breathing training delivered by DVD versus face-to-face physiotherapy versus usual care¹. The trial was registered at www.ISRCTN.org, trial registration number 88318003, and recruitment took place from Nov 5 2012 - Jan 28 2014.

Ethical approval for this project was given by NHS Health Research Authority South-Central - Hampshire B Research Ethics Committee (12/SC/0353). All participants provided written informed consent. Information regarding all details of recruitment, selection and assessment of patients are presented in the main trial paper and the BREATHE protocol paper.^{1, 4}

Participants randomised to either of the active intervention arms of the study were shown the trial booklet (called Breathing Freely) and asked to complete a questionnaire assessing expectancy (their beliefs about asthma and first impressions of their allocated treatment), then followed up at 3, 6 and 12 months. At 3-month follow-up, intervention participants completed brief questionnaires around experiences of, engagement with, and perceived barriers to carrying out, treatment, including their amount of practice. Questions

assessing continued use of the treatments were included at 6 and 12-month follow-ups.

Patients randomised to face-to-face sessions were provided with the Breathing Freely booklet and treated by a single respiratory physiotherapist over three sessions. A physiotherapist-developed intervention protocol was given to the physiotherapist during pre-trial training workshops. Fidelity of intervention delivery was determined by 1) the physiotherapist completing a form specifically designed to assess techniques taught, at the end of each session and 2) AB, an experienced respiratory physiotherapist, observing delivery of sessions with approximately 5% of participants. Protocol adherence by the physiotherapist was 100%. The content of the DVD and the supporting booklet are freely available through the Breathe Study [website](#), where a PDF of the booklet can also be found.

Patients randomised to the DVD arm were provided with a DVD and the same Breathing Freely booklet. The content of the DVD and booklet were based on programmes of breathing retraining taught by clinical physiotherapists. Both the DVD and booklet were created by a multi-disciplinary team of health psychologists, physiotherapists, clinical experts in asthma and expert patients, and modified iteratively based on patient input. The DVD included both detailed explanation and illustration of how to master breathing retraining, and motivational components, explaining the rationale for breathing retraining and addressing common difficulties and barriers. The final part encouraged users to use their new breathing skills to engage more in daily activities. The Breathing

Freely booklet, designed to complement the DVD, included charts to plan when to do breathing exercises and physical activity and log progress. The DVD and booklet were produced professionally and reviewed by patients.

Measures

Asthma Quality of Life

The Asthma Quality of Life Questionnaire (AQLQ)⁵ was used to assess asthma-related quality of life, which was the primary outcome for BREATHE. It contains four main domains: symptoms, activity limitation, emotional function and environmental stimuli. AQLQ data is reported in the main trial paper.¹

Anxiety

The Hospital Anxiety and Depression Scale (HADS)⁶ measures anxiety and depression; anxiety is measured using a seven question subscale in which participants note the degree to which they agree with statements on a scale of 0-3 that describe their feelings over the last week. Higher scores indicate greater anxiety. The HADS has been used extensively in primary care.^{6,7} HADS data are reported in the main trial paper.¹

First impressions of treatment measures

Expectancy (improvements a person believes they can achieve during treatment) was measured using the three expectancy items from the Credibility/Expectancy questionnaire.⁸ Self-efficacy was measured using Lorig's 3 item exercise regularly scale, created to assess self-efficacy to perform self-management behaviours in people with chronic disease correctly, every day and without

making symptoms worse.⁹ These items are rated on a scale of confidence from 1-10. A single item assessed how important participants in both intervention groups felt it would be to receive physiotherapist support.

Treatment experience measures

Enjoyment of treatment was assessed on a 10-item scale from extremely enjoyable to not at all enjoyable, for all the techniques learned (stomach breathing, nose breathing, slow breathing, relaxation training) and appointments with the physiotherapist (face-to-face group only). As some participants were expected to find the controlled breath holding aversive, this was assessed on a scale from extremely enjoyable to extremely unpleasant. A single item assessed perceived importance of physiotherapist support, for all participants.

The Treatment Appraisal Questionnaire¹⁰ assessed perceptions of the physiotherapist. This contains five single items (rated on a 7-point scale), regarding degree of trust in the physiotherapist, confidence in the physiotherapist's qualifications and competence, extent to which the participant felt comfortable talking to the physiotherapist, and belief the physiotherapist wanted to help them.

Perceptions of problems with adherence were assessed using the Problematic Experiences of Therapy Scale¹¹, which was designed to measure patient perceptions of barriers to home-based rehabilitation. This included four validated subscales (Problems due to symptoms – 3 items, Problems due to uncertainty about the therapy – 3 items, Problems due to doubts – 3 items, and

Practical problems – 5 items), plus a new theoretically derived subscale (Problems due to lack of support – 3 items).

Amount of practice

Amount of practice was assessed at 3-month follow-up. It was assessed by three self-report questions regarding number of weeks (assessed on a 0-10 scale with 6 responses from ‘never started’ - ‘9 weeks or more’), days per week (assessed on a 0-7 scale with 5 responses from ‘never started’ to ‘most days’, and times per day on average (assessed on a scale from 0 (never) to 2 (at least twice a day)) breathing retraining was carried out. These three variables were then multiplied to determine amount of practice. Total time spent on each technique was also assessed (number of weeks/ hours per day for stomach and nose breathing, and number of weeks/ minutes per day for slow breathing, controlled breath holding and relaxation training).

Engagement was defined as giving any response above ‘never started’ to these questions, with participants being defined as non-engaged if they did not start breathing retraining. Reasons for stopping regular breathing retraining were also assessed, as was continuation with occasional breathing retraining.

Continued practice

Five questions assessed whether participants had continued breathing retraining at 6 and 12 months, with one question to find out how often they had carried out each technique, on a 5-point scale ranging from never to regularly (most days).

Data Analysis

T-tests and chi-square tests explored whether the treatment groups differed on measures of expectancy, and perceived need for physiotherapist support.

Analyses were carried out to assess whether anxiety, expectancy, and experience were associated with amount of practice at 3m, 6m and 12m, and whether the above factors plus amount of practice were associated with asthma-related quality of life (AQLQ score) at 3, 6 and 12 months. For the continuous outcomes, point-biserial (for binary expectancy variables), and bivariate correlations (for continuous expectancy variables, treatment experience and practical barriers) were used to identify significant variables to be entered into multiple linear regressions for each outcome. In multiple regressions assessing predictors of asthma-related quality of life, baseline AQLQ score was entered on the first step. All statistics for the follow-up results (B, SE(B), β , and 95%CI) are presented in supplementary tables.

Partial correlations (controlling for baseline AQLQ) were carried out to assess the relation between amount of practice at 3 months, and AQLQ scores at 3, 6 and 12 months.

Results

A total of 393 participants were recruited to the intervention arms of the trial (261 DVD plus booklet, 132 face-to-face sessions plus booklet). Demographic details of the participants are reported in the main trial paper.¹

After being given the booklet to look through and being informed of allocation, there were no differences in expectancy between groups, but those assigned to the DVD group felt significantly less need for physiotherapist support than those randomised to the face-to-face group (see Table 1).

[INSERT TABLE 1 ABOUT HERE]

Table 2 presents the findings regarding experience of carrying out breathing retraining in the trial arms. Most participants in the face-to-face group found physiotherapist appointments to be extremely enjoyable (96 (93%) rated them 8 or above out of 10), and the Treatment Appraisal Questionnaire showed 79 (77%) had the best possible perceptions of their physiotherapist. They also reported significantly more positive experience of stomach breathing, nose breathing, and relaxation training, and fewer problems due to symptoms, uncertainty, doubt and lack of support. Those in the DVD group continued to perceive less need for physiotherapist support than those in the face-to-face sessions group. There were no group differences regarding experience of controlled breath holding or practical problems.

[INSERT TABLE 2 ABOUT HERE]

Engagement with breathing retraining was extremely high – 388 (98.1% of responders) reported attempting at least one technique. Only five participants (1.9%; all in DVD group) reported not attempting any breathing retraining at all. Regular practice was stopped due to no asthma symptoms by 14 (8.6%) of participants in the DVD group, and 5 (4.8%) of participants in the face-to-face group. It was stopped for other reasons including other illnesses, bereavement

and being too busy by 61 (38.1%) of participants in the face-to-face group, and 27 (26.7%) of participants in the DVD group.

Table 3 reports findings regarding number of practice sessions completed in the trial arms. Participants in the face-to-face group were significantly more likely to have carried out breathing retraining for more times per day, more days per week, and more weeks, and to have completed more practice sessions than those in the DVD group. They also spent significantly more time practicing the individual breathing retraining techniques, in terms of both number of weeks and amount of time per day. This particularly applied to the stomach breathing and nose breathing. Among those who stopped regular practice (n=96), those in the face-to-face group were significantly more likely to continue with occasional practice of the nose breathing.

[INSERT TABLE 3 ABOUT HERE]

Table 4 presents findings regarding continued practice. Participants in the face-to-face group continued to practice the stomach breathing and nose breathing significantly more often than the DVD group at 6- and 12-month follow ups.

[INSERT TABLE 4 ABOUT HERE]

Predictors of amount of practice

DVD plus booklet group

Participants who reported greater self-efficacy for breathing retraining at baseline also reported more practice at three months. See Supplementary Table 1.

Greater self-efficacy for breathing retraining at baseline, fewer doubts and fewer practical problems at 3 months were associated with more practice at 6 months.

See Supplementary Table 2.

Participants who reported fewer practical problems and enjoying nose breathing more also reported practising more at 12 months. See Supplementary Table 3.

Face-to-face sessions plus booklet group

No predictors of amount of practice at three months were identified.

Participants who reported greater enjoyment of relaxation training at 3 months also reported practising more at 6 months. See Supplementary Table 4.

Participants who reported greater enjoyment of relaxation training and greater perceived need for the physiotherapist at 3 months also reported practising more at 12 months. See Supplementary Table 5.

Predictors of quality of life at 3, 6 and 12 months, by group

Generally, amount of practice was not significantly associated with asthma-related quality of life. The only exception was a correlation of 0.27 between amount of practice and asthma-related quality of life score at 6 months, for the face-to-face plus booklet group.

DVD plus booklet group

At three months, after controlling for baseline asthma-related quality of life, participants who reported greater perceived need for physiotherapist support also reported poorer quality of life. See Supplementary Table 6.

At 6 months, after controlling for baseline asthma-related quality of life, participants who reported less anxiety at three months also reported better quality of life at 6 months. In a further model explaining more variance in quality of life, those who reported enjoying nose breathing more also reported better quality of life at 6 months, but anxiety no longer significantly influenced quality of life. See Supplementary Table 7.

At 12 months, after controlling for baseline asthma-related quality of life, participants who reported less anxiety at 3 months and greater confidence in their ability to do breathing retraining experienced better quality of life at 12 months. See Supplementary Table 8.

Face-to-face plus booklet group

At 3 months, after controlling for baseline asthma-related quality of life (28.6% of variance), participants who reported less anxiety also reported better quality of life. See Supplementary Table 9.

At 6 months, after controlling for baseline asthma-related quality of life, participants who reported practising more and having fewer doubts about breathing retraining also reported better quality of life. See Supplementary Table 10.

At 12 months, after controlling for baseline asthma-related quality of life, participants who reported less anxiety at 3 months and fewer doubts about

ability to carry out breathing retraining also reported better quality of life.

Anxiety, although contributing to the model, was not significant as a stand-alone variable in the follow-up analyses. See Supplementary Table 11.

Discussion

In a quantitative process evaluation of a randomised controlled trial of physiotherapy breathing retraining delivered by DVD and booklet versus face-to-face with a physiotherapist plus booklet, those assigned to face-to-face physiotherapy had more positive perceptions of breathing retraining, perceived greater need for physiotherapy and spent slightly more time practising.

However, these factors were not associated with improvements in the primary outcome, asthma-related quality of life. In the DVD group, those with greater belief in their ability to carry out breathing retraining reported practising more at 3 and 6 months, and those who experienced fewer practical problems carrying it out practised more at follow-up, but again these factors were not associated with improvements in asthma-related quality of life score.

After being informed of group allocation, there were no group differences regarding baseline expectancy. This was expected, as both groups were offered exactly the same treatment. However, there were some baseline differences in beliefs about ease of use, the time commitment required, and the need for support. Since greater perceived need for support in the DVD group was associated with poorer quality of life at 3 months, such differences may need to be taken into account when considering patient expectation management.

The face-to-face group found the appointments with the physiotherapist extremely enjoyable, and reported slightly greater enjoyment of the core techniques than the DVD group. They also experienced significantly fewer problems due to symptoms, uncertainty, doubt and lack of support. It is possible that the physiotherapist may have facilitated initial motivation. However, this greater enjoyment did not translate into better outcomes. Further, as a single physiotherapist provided the face-to-face physiotherapy, it is unclear whether these findings were due to physiotherapist-specific factors, or the act of seeing a physiotherapist.

Enjoyment of the core technique of nose breathing was related to improved QoL at 6 and 12 months in the DVD plus booklet group, though. A certain level of enjoyment may have facilitated sufficient practice initially. Interestingly, although engagement with breathing retraining was extremely high across both groups, there was limited evidence that more practice resulted in improved quality of life. Providing engaging and acceptable intervention materials may facilitate 'effective engagement'¹² - sufficient mastery of the target behaviour that no longer requires further engagement with the intervention.

The face-to-face group spent significantly more time practising breathing retraining than the DVD group, and were more likely to continue to practice the stomach and nose breathing at follow-up. However, time spent practicing was not associated with benefit. It is likely participants in both groups carried out sufficient practice for stomach and nose breathing to become new habits, in line with research that habit formation is an effective behaviour change strategy.¹³ In

the face-to-face group, more practice at 3 months led to greater improvements in asthma-related quality of life at 6 months. However, more time spent practising did not translate into greater improvements overall, relative to the DVD group. Similarly, in a trial of vestibular rehabilitation, telephone support was associated with greater time spent practising than a booklet alone, but not with greater improvements.¹⁴

In the face-to-face group, those with more doubts about their ability to carry out breathing retraining experienced poorer asthma-related quality of life at 6 and 12 months. This suggests that people with asthma who are not confident about breathing retraining and do not feel supported in carrying it out, may experience problems in engaging with it, potentially affecting the level of benefit obtained from breathing retraining.

This study had several limitations. The main one was that data regarding practice was self-reported and therefore subject to recall bias. This has implications for the results regarding practice. Also, approximately 25-30% of participants had dropped out by 3-month follow-up, meaning the results may not reflect those that would be obtained in clinical practice.

Implications for research and clinical practice

In order to help manage expectations in clinical practice, and promote the value of breathing retraining for asthma delivered by digital formats, healthcare professionals should inform patients that outcomes are equivalent to face-to-face physiotherapy sessions. Such information is likely to enhance patient confidence

in the value of digital formats, leading ultimately to greater improvements in quality of life following breathing retraining.

Research should examine whether a 'minimum threshold of engagement' regarding practice can be recommended to optimise breathing retraining interventions. Given the significant time commitment required for mastery of the techniques, this information could be provided in clinical practice in order to provide patients with realistic expectations about the level of commitment required.

Future research could examine whether lack of confidence with breathing retraining (related to poorer asthma-related quality of life) might be addressed by providing some access to physiotherapist support (e.g. telephone or online). This could help determine the optimum level of support required to enable mastery of the techniques, and whether it differs depending on levels of previous experience with the techniques.

Clinical Messages:

- Breathing retraining delivered face-to-face leads to greater enjoyment and more practice relative to a DVD and booklet.
- Practising breathing retraining is unrelated to quality of life.
- Asthma patients given breathing retraining delivered by DVD who report greater confidence in ability to carry out techniques also report better quality of life.

Supplementary Information

Further information about the BREATHE study (for which this is the quantitative process analysis) can be accessed at

<http://www.breathestudy.co.uk/>

References

1. Bruton A, Lee A, Yardley L, et al. Physiotherapy breathing retraining for asthma: a randomised controlled trial. *Lancet Respir Med* 2018; 6(1): 19-28.
2. Arden-Close E, Yardley L, Kirby S, Thomas M, Bruton A. Patients' experiences of breathing retraining for asthma: a qualitative process analysis of participants in the intervention arms of the BREATHE trial. *NPJ Primary Care Respiratory Medicine* 2017; 27(1): 56.
3. Edwards MR, Saglani S, Schwarze J, et al. Addressing unmet needs in understanding asthma mechanisms: From the European Asthma Research and Innovation Partnership (EARIP) Work Package (WP) 2 collaborators. *Eur Respir J* 2017; 49 (5). pii: 1602448. (now 2)
4. Bruton A, Kirby S, Arden-Close E, et al. The BREATHE study: Breathing REtraining for Asthma – Trial of Home Exercises. A protocol summary of a randomised controlled trial. *Prim Care Respir J* 2013; 22: PS1-7.
5. Juniper EF, Guyatt CH, Epstein RS, et al. Evaluation of impairment of health-related quality of life in asthma: development of a questionnaire for use in clinical trials. *Thorax* 1992; 47: 76-83.
6. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983; 67(6): 361-70
7. Wilkinson MJ, Barczak P. Psychiatric screening in general practice: comparison of the general health questionnaire and the hospital anxiety and depression scale. *J R Coll Gen Pract* 1998; 38(312): 311-3.

8. Devilly GJ, Borkovec TD. Psychometric properties of the credibility/expectancy questionnaire. *J Behav Ther Exp Psychiatry* 2000; 31(2): 73-86.
9. Lorig K, Stewart A, Ritter P, et al. *Outcome Measures for Health Education and other Health Care Interventions*. Thousand Oaks, CA: Sage Publications, 1996: 25, 37-38.
10. Bishop FL, Yardley L, Lewith GT. Treatment appraisals and beliefs predict adherence to complementary therapies: a prospective study using a dynamic extended self-regulation model. *Br J Health Psychol* 2008; 13(Pt 4): 701-18.
11. Kirby SE, Donovan-Hall M, Yardley L. Measuring barriers to adherence: validation of the Problematic Experiences of Therapy Scale. *Disabil Rehabil* 2014; 36(22): 1924-9.
12. Yardley L, Spring BJ, Riper H, et al. Understanding and promoting effective engagement with digital behaviour change interventions. *Am J Prevent Med* 2016; 51(5): 833-42.
13. Lally P, Chipperfield A, Wardle J. Healthy habits: efficacy of simple advice on weight control based on a habit –formation model. *Int J Obes (Lond)* 2008; 32: 700-7.
14. Yardley L, Barker F, Muller I, et al. Clinical and cost effectiveness of booklet based vestibular rehabilitation for chronic dizziness in primary care: single blind, parallel group, pragmatic, randomised controlled trial. *BMJ* 2012; 344: e2237.

Table 1: First impressions of the treatment in the physiotherapy and DVD arms

	Baseline		Group difference ¹	<i>p</i>
	DVD plus booklet	Face-to-face physiotherapy plus booklet		
First impressions of treatment:	-	-	-	-
Expectancy (n=243, n=124)	-0.11 (2.74)	0.24 (2.66)	-1.20 (-0.95, 0.23)	.233
Self-efficacy (n=252, n=129) ^a	7.70 (1.62)	8.01 (1.48)	-1.84 (-0.62, 0.05)	.067
Perceived need for physiotherapist support - baseline (n=250, n=127) ^a	2.15 (1.26)	3.43 (0.87)	-11.48 (-1.49, -1.06)	.001***

For all variables, baseline scores presented as mean (SD)) parametric t-test statistics and 95% CI are presented (bootstrapped where specified).

*** $p \leq 0.001$

Table 2: Perceived experience of carrying out breathing retraining in the physiotherapy and DVD arms

	3 month follow up		Group difference ¹	P
	DVD plus booklet	Face-to-face physiotherapy plus booklet		
Treatment experience:				
Enjoyment of treatment: ²				
Stomach breathing (n=159, n=104)	6.13 (1.99)	7.42 (1.67)	-5.71 (-1.75, -0.85)	< .001***
Nose breathing (n=160, n=104)	6.06 (2.18)	7.52 (1.78)	-5.96 (-1.95, -0.98)	< .001***
Slow breathing (n=159, n=103)	6.22 (2.01)	6.69 (2.12)	-1.81 (-0.98, 0.04)	.072
Controlled breath holding (n=158, n=103)	5.54 (2.29)	5.43 (2.18)	0.41 (-0.44, 0.68)	.681
Relaxation training (n=155, n=102)	6.97 (1.80)	7.62 (2.38)	-2.32 (-1.19, -0.10)	.022*
Appointments with physiotherapist (Physio group Only) (n=103) (Median [IQR] [min, max])	-	9 (9-10) [1, 10]	-	-
Perceived need for physiotherapist support (3 months) (n=158, n=101)	1.85 (1.38)	3.64 (0.72)	-13.73 (-2.05, -1.54)	< .001***
Problematic experiences of therapy (PETS):				
Problems due to symptoms (n=155, n=103)	49 (31.6%)	21 (20.4%)	3.94	.047*
Problems due to uncertainty (n=156, n=101)	75 (48.1%)	14 (13.9%)	31.71	< .001***
Problems due to doubts (n=166, n=105)	90 (54.2%)	24 (22.9%)	25.95	< .001***
Practical problems (n=166, n=105)	141 (84.9%)	84 (80.0%)	1.11	.291
Problems due to lack of support (n=166, n=105)	74 (44.6%)	17 (16.2%)	23.24	< .001***

¹ Unless specified otherwise, for categorical variables (baseline scores presented as n (%)) chi-square test statistics are presented; for continuous variables (baseline scores presented as mean (SD)) parametric t-test statistics and 95% CI are presented.

*p ≤ 0.05 ** p ≤ 0.01, *** p ≤ 0.001

²A higher score indicates greater enjoyment

³A higher score indicates more problems

B

Table 3: Amount of practice in the physiotherapy and DVD arms

	3 month follow up		Group difference ¹	P
	DVD plus booklet	Face-to-face physiotherapy plus booklet		
Carrying out the breathing retraining:				
No of weeks ^{a, b} (n=165, n=103)	3.68 (1.38)	4.32 (0.87)	-4.67 (-0.92, -0.38)	.001***
Days per week ^{a, g} (n=165, n=103)	2.52 (1.20)	3.08 (1.02)	4.07 (-0.83, -0.28)	.001***
At least twice/day (n=269) (n (%))	46 (28.0%)	58 (55.2%)	19.96	.001***
Practice sessions completed (overall) ^a (n=164, n=102)	48.56 (44.71)	75.01 (46.38)	-26.45 (-37.68, -14.97)	.001***
Total time spent on breathing techniques:				
Stomach breathing:				
No of weeks ^b (n=159, n=100)	3.53 (1.56)	4.35 (1.05)	-5.03 (-1.16, -0.49)	.001***
Hours per day ^c (n=157, n=99)	1.39 (0.99)	2.11 (1.20)	-5.00 (-1.01, -0.42)	.001***
Nose breathing:				
No of weeks ^b (n=159, n=101)	3.52 (1.66)	4.33 (1.03)	-4.81 (-1.14, -0.47)	.001***
Hours per day ^c (n=157, n=101)	1.81 (1.27)	2.45 (1.34)	-3.81 (-0.97, -0.34)	.001***
Slow breathing:				
No of weeks ^b (n=160, n=101)	3.44 (1.53)	3.89 (1.27)	-2.55 (-0.80, -0.11)	.012*
Minutes per day ^d (n=159, n=101)	2.10 (1.35)	2.45 (1.28)	-2.05 (-0.68, -0.02)	.039*
Controlled breath holding:				
No of weeks ^b (n=160, n=101)	2.88 (1.76)	3.32 (1.57)	-2.08 (-0.79, -0.07)	.020*
Minutes per day ^e (n=159, n=101)	1.74 (1.09)	1.83 (1.11)	-0.69 (-0.37, 0.19)	.497
Relaxation training:				
No of weeks ^b (n=160, n=101)	3.01 (1.86)	3.29 (1.66)	-1.27 (-0.70, 0.16)	.217
Minutes per day ^f (n=160, n=101)	1.86 (1.24)	1.64 (1.20)	1.41 (-0.10, 0.50)	.159

¹ For categorical variables (baseline scores presented as n (%)) chi-square test statistics are presented; for continuous variables (baseline scores presented as mean (SD)) parametric t-test statistics and 95% CI are presented (bootstrapped where specified).

^a bootstrapped 95% CI and p-values reported

^b Coding: 0 = did not use, 1 = one week, 2 = 1-2 weeks, 3 = 3-5 weeks, 4 = 6-8 weeks, 5 = \geq 9 weeks

^c Coding: 0 = did not use, 1 = \leq 1 hour, 2 = \leq half a day, 3 = $>$ half a day, 4 = most of the day

^d Coding: 0 = did not use, 1 = up to 5 mins, 2 = 6-10 mins, 3 = 11-20 mins, 4 = 21-30 mins, 5 = \geq 30 mins

^e Coding: 0 = did not use, 1 = up to 2 mins, 2 = 3-5 mins, 3 = 6-8 mins, 4 = \geq 8 mins

^f Coding: 0 = did not use, 1 = up to 5 mins, 2 = 6-10 mins, 3 = 11-15 mins, 4 = \geq 15 mins

^g Coding: 0 = did not use, 1 = 1-2 days, 2 = 3-4 days, 3 = 5-6 days, 4 = most days

* $p \leq 0.05$ ** $p \leq 0.01$, *** $p \leq 0.001$

Table 4: Continued engagement at 6 and 12 months in the physiotherapy and DVD arms

	DVD plus booklet	Face-to-face physiotherapy plus booklet	Group difference ¹	<i>p</i>
Continued engagement: ^b				
6-month follow-up: (n=156, n=96)				
Stomach breathing	2.18 (1.24)	2.94 (1.02)	-5.04 (-1.05, -0.46)	< .001***
Nose breathing	2.43 (1.31)	2.83 (1.19)	-2.46 (-0.73, -0.08)	.014*
Slow breathing	2.22 (1.20)	2.48 (1.11)	-1.73 (-0.56, 0.36)	.085
Controlled breath holding	1.92 (1.26)	1.81 (1.16)	0.70 (-0.20, 0.42)	.512
Relaxation training	1.83 (1.24)	2.01 (1.30)	-1.12 (-0.51, 0.14)	.264
12-month follow-up: (n=153, n=96)				
Stomach breathing	2.18 (1.18)	2.72 (1.12)	-3.59 (-0.84, -0.25)	< .001***
Nose breathing	2.31 (1.25)	2.66 (1.26)	-2.09 (-0.67, -0.02)	.037*
Slow breathing	2.20 (1.17)	2.38 (1.07)	-1.21 (-0.47, 0.11)	.226
Controlled breath holding	1.84 (1.20)	1.66 (1.03)	1.22 (-0.11, 0.47)	.225
Relaxation training	1.75 (1.22)	1.93 (1.19)	-1.16 (-0.49, 0.13)	.249

¹ For categorical variables (baseline scores presented as n (%)) chi-square test statistics are presented; for continuous variables (baseline scores presented as mean (SD)) parametric t-test statistics and 95% CI are presented (bootstrapped where specified).

^a bootstrapped 95% CI and *p*-values reported

^b Coding: 0 = never, 1 = once or twice, 2 = sometimes, 3 = often, 4 = regularly (most days)

p* ≤ 0.05 ** *p* < 0.01, * *p* < 0.001