www.powerbreathe.com

Information for Healthcare professionals

Introduction

The main debilitating symptom of cardio respiratory disease is dyspnoea (breathlessness), but dyspnoea is also a common symptom in other conditions, and in all cases, it has a profoundly impairing influence upon quality of life and independence.

Dyspnoea is a complex phenomenon with a multifactoral origin that incorporates inputs from chemoreceptors and the cortical areas of the brain. Although the aetiology of dyspnoea may differ widely between pathologies, there is one common input to all forms of dyspnoea, including that associated with the healthy perception of breathing during exercise. This input arises from the sense of effort associated with the action of the inspiratory muscles (McConnell & Romer, 2004a).

The magnitude of the breathing effort and dyspnoea is proportional to the magnitude of the motor drive to the inspiratory muscles. The weaker a muscle is, or the greater the impedance it must overcome, the higher is the motor drive required to bring about a given action, and vice versa. Accordingly, strengthening the inspiratory muscles has a universally beneficial effect upon motor drive and dyspnoea. Thus, irrespective of its pathophysiological origin, dyspnoea can be ameliorated by specific strength training of the inspiratory muscles. Interestingly, the presence of weakness is not a pre-requisite for this effect, as inspiratory muscle training has been shown to reduce breathing effort in healthy young athletes (McConnell & Romer, 2004b), as well as patients.

How POWERbreathe works

POWERbreathe applies the tried and trusted principles of resistance (weight) training to the inspiratory muscles, and can be thought of as 'dumbbells for the diaphragm'. When muscles are overloaded regularly for a period of a few weeks, they adapt, becoming stronger and more resistant to fatigue. Activating stronger inspiratory muscles requires less effort during a given task, hence dyspnoea is reduced (McConnell & Romer, 2004a).

Quick and Easy

One of POWERbreathe's greatest strengths is that it is so easy and quick to use, with a training regimen that has been validated in a large number of RCTs (McConnell et al., 2005). Most patients can use POWERbreathe straight out of the box, but even those needing a little more support can become competent in just a few minutes.

Because everyone is different, POWERbreathe's loading mechanism has a wide range of settings and has provision for training to progress as the inspiratory muscles become stronger.

Exploded view of POWERbreathe Medic

POWERbreathe is supplied with a simple, but comprehensive user manual and online support (http://www.powerbreathe.com/pdf/medical/medicusermanual.pdf).

As with any intervention, patients will only be motivated to adhere if it doesn't require a lot of time, and they perceive benefits quickly.
POWERbreathe training requires just 15 minutes, twice daily for the first 12 weeks; thereafter, maintenance training is just three times per week (McConnell et al., 2005).

POWERbreathe training yields improvements in dyspnoea within the first few days of use, and measurable improvements in exercise tolerance in just three weeks (McConnell et al., 1998).

IMT in COPD

Inspiratory muscle training has been most widely used in patients with COPD. The rationale is particularly strong in this patient group, as they have primary weakness of their inspiratory muscles (Levine et al., 2003), mechanical abnormalities of their chest wall (hyperinflation due to expiratory flow limitation), and a disproportionately high demand for ventilation during exertion (Casaburi et al., 1991).
A meta-analysis undertaken in 2002 concluded that "Both IMT alone and IMT as an adjunct to general exercise reconditioning significantly increased inspiratory muscle strength and endurance. A significant effect was found for dyspnoea at rest and during exercise" (Lotters et al., 2002). Further, the authors also concluded that "inspiratory muscle training is an important addition to a pulmonary rehabilitation programme directed at chronic obstructive pulmonary disease patients".

Thanks to this analysis, and subsequent randomised controlled trials reporting improvements following IMT, current guidelines such as those issued in 2004 by NICE for the management of COPD, as well as the recent Clinical Evidence Review on the management of COPD from the BMJ (Kerstjens et al., 2005), acknowledge the that IMT has a part to play in the management of COPD.

The most recent randomised controlled trial of IMT encapsulates the already well-established benefits of the treatment (reduces dyspnoea, improves exercise tolerance, and enhances quality of life), as well as adding new evidence that the use of healthcare resources is reduced by around 25% after IMT (see figures 1 to 3) (Beckerman et al., 2005).

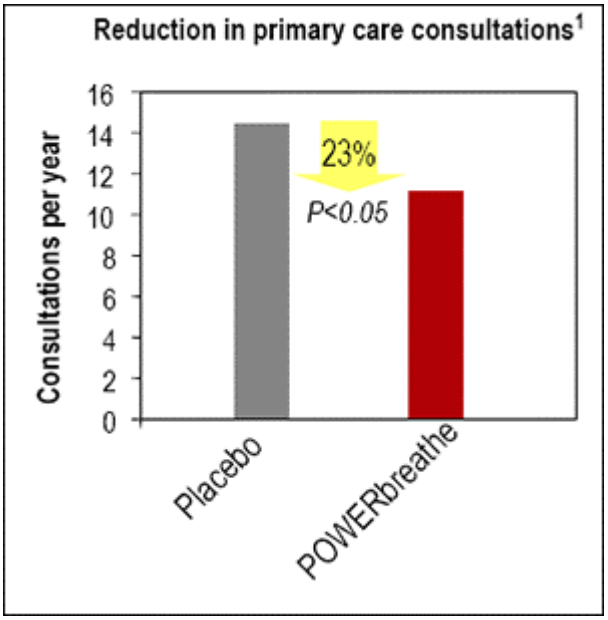

Fig.1 Reduction in primary care consultations

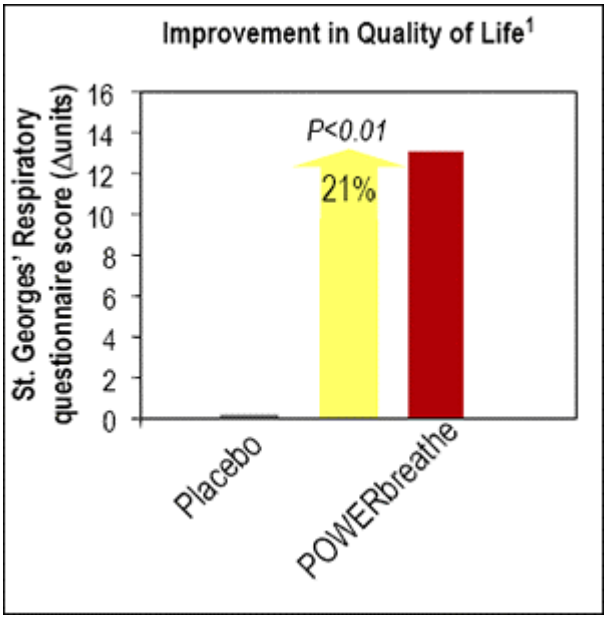

Fig.2 Improvement in Quality of Life

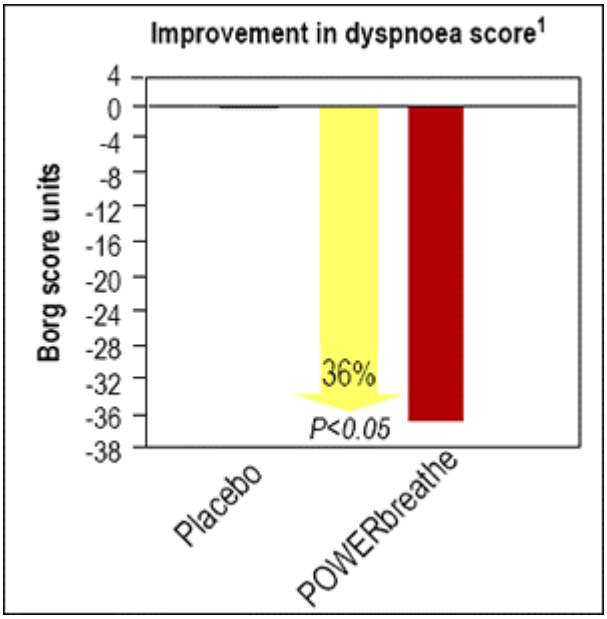

Fig.3 Improvement in dyspnoea score

POWERbreathe training is 10 times more effective than oxitropium bromide for improving exercise tolerance and quality of life in patients with COPD (Oga et al., 2000; Beckerman et al., 2005).

IMT in Asthma

The role of IMT in the management of asthma has been less widely studied than in COPD, but the data that exists from five randomised controlled trials are unanimously supportive (Weiner et al., 1992; McConnell et al., 1998; Weiner et al., 2000; Weiner et al., 2002a; Weiner et al., 2002b). Patients experience a reduction in dyspnoea, as well as improvements in quality of life. Most striking are the observations that IMT reduces absence from school/work (by ~95%), use of healthcare resources (by ~75%), and the consumption of medication (by ~79%, see figure 4)(Weiner et al., 1992).

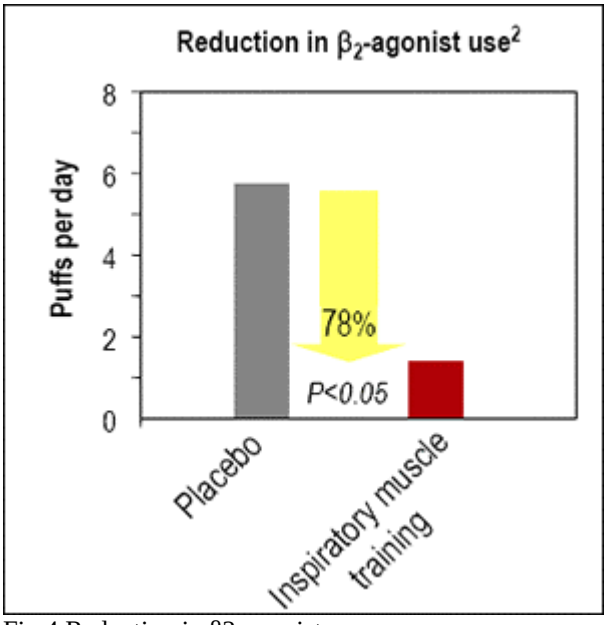

Fig.4 Reduction in ß2-agonist use

IMT in chronic heart failure

Patients with chronic heart failure (CHF) have a restrictive pattern of lung function due to the presence of pulmonary hypertension. This lung 'stiffness' increases the load on the inspiratory muscles and makes a significant contribution to their dyspnoea. In addition, there is evidence of inspiratory muscle weakness that emerges as an independent predictor of prognosis in this group of patients (Meyer et al., 2001). The two most recent randomised controlled trials of IMT both reported significant improvements in dyspnoea, exercise tolerance (see figure 5), quality of life (Laoutaris et al., 2004; Dall'Ago et al., 2006).

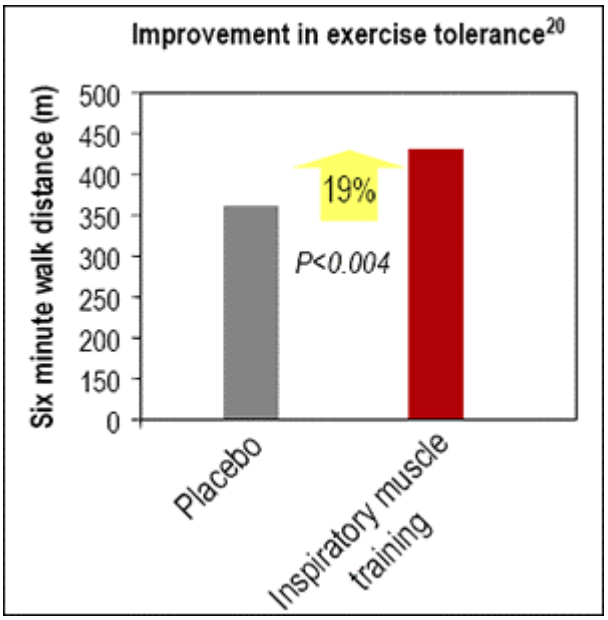

Fig.5 Improvement in exercise tolerance

Because the cardiovascular strain of POWERbreathe training is very low, it is suitable for even the most physically compromised patients, and is particularly helpful in patients who are too ill for rehabilitation.

IMT in other conditions

Because IMT influences dyspnoea directly at a cortical level, it is also helpful for managing other conditions where dyspnoea is present. These include: Elderly people with non-specific dyspnoea (Copestake & McConnell, 1995)

Cancer (Dudgeon et al., 2001)
Cystic fibrosis (Enright et al., 2004)
Neuromuscular disease (Koessler et al., 2001)
Parkinson's disease (Inzelberg et al., 2005)
Prior-polio (Klefbeck et al., 2000)
Spinal cord injury (Liaw et al., 2000)
Sleep apnoea and snoring (Heijdra et al., 1996)

Contraindications

POWERbreathe training is completely safe for the vast majority of patients. IMT has no known side effects, no interactions with existing treatments, and no adverse events have been reported. However, there are some small theoretical risks associated with the following conditions: Inspiratory muscle training is NOT recommended for patients with a history of spontaneous pneumothorax.

Inspiratory muscle training is only recommended for patients with a history of traumatic pneumothorax after complete recovery.

Inspiratory muscle training is NOT suitable for asthma patients who have low symptom perception and who suffer from frequent, severe exacerbations.

Inspiratory muscle training is NOT suitable for anyone who has recently experienced a perforated ear drum.

Anyone who is under the age of 16 should only use POWERbreathe with supervision from an adult.

Download a copy of our medical information leaflet on our website:
www.powerbreathe.com/pdf/medicalleaflet.pdf

POWERbreathe Medic Model is approved by the NHS's PPA and is available on prescription in the UK.

References

Beckerman M, Magadle R, Weiner M & Weiner P. (2005). The effects of 1 year of specific inspiratory muscle training in patients with COPD. Chest 128, 3177-3182.

Casaburi R, Patessio A, Ioli F, Zanaboni S, Donner CF & Wasserman K. (1991). Reductions in exercise lactic acidosis and ventilation as a result of exercise training in patients with obstructive lung disease. Am Rev Respir Dis 143, 9-18.

Copestake AJ & McConnell AK. (1995). Inspiratory muscle training reduces exertional breathlessness in healthy elderly men and women. In Proceedings of the EGREPA International Conference on Physical Activity & Health in the Elderly, pp. 150.

Dall'Ago P, Chiappa GR, Guths H, Stein R & Ribeiro JP. (2006). Inspiratory muscle training in patients with heart failure and inspiratory muscle weakness: a randomized trial. J Am Coll Cardiol 47, 757-763.

Dudgeon DJ, Lertzman M & Askew GR. (2001). Physiological changes and clinical correlations of dyspnea in cancer outpatients. J Pain Symptom Manage 21, 373-379.

Enright S, Chatham K, Ionescu AA, Unnithan VB & Shale DJ. (2004). Inspiratory muscle training improves lung function and exercise capacity in adults with cystic fibrosis. Chest 126, 405-411.

Heijdra YF, Dekhuijzen PN, van Herwaarden CL & Folgering HT. (1996). Nocturnal saturation improves by target-flow inspiratory muscle training in patients with COPD. Am J Respir Crit Care Med 153, 260-265.

Inzelberg R, Peleg N, Nisipeanu P, Magadle R, Carasso RL & Weiner P. (2005). Inspiratory muscle training and the perception of dyspnea in Parkinson's disease. Can J Neurol Sci 32, 213-217.

Kerstjens H, Posta D & ten Hacken N. (2005). Chronic obstructive pulmonary disease. Clinical Evidence 14, 1-5.

Klefbeck B, Lagerstrand L & Mattsson E. (2000). Inspiratory muscle training in patients with prior polio who use part- time assisted ventilation. Arch Phys Med Rehabil 81, 1065-1071.

Koessler W, Wanke T, Winkler G, Nader A, Toifl K, Kurz H & Zwick H. (2001). 2 Years' experience with inspiratory muscle training in patients with neuromuscular disorders. Chest 120, 765-769.

Laoutaris I, Dritsas A, Brown MD, Manginas A, Alivizatos PA & Cokkinos DV. (2004). Inspiratory muscle training using an incremental endurance test alleviates dyspnea and improves functional status in patients with chronic heart failure. Eur J Cardiovasc Prev Rehabil 11, 489-496.

Levine S, Nguyen T, Kaiser LR, Rubinstein NA, Maislin G, Gregory C, Rome LC, Dudley GA, Sieck GC & Shrager JB. (2003). Human diaphragm remodeling associated with chronic obstructive pulmonary disease: clinical implications. Am J Respir Crit Care Med 168, 706-713.

Liaw MY, Lin MC, Cheng PT, Wong MK & Tang FT. (2000). Resistive inspiratory muscle training: its effectiveness in patients with acute complete cervical cord injury. Arch Phys Med Rehabil 81, 752-756.

Lotters F, van Tol B, Kwakkel G & Gosselink R. (2002). Effects of controlled inspiratory muscle training in patients with COPD: a meta-analysis. European Respiratory Journal 20, 570-577.

McConnell AK, Caine MP, Donovan KJ, Toogood AK & Miller MR. (1998). Inspiratory muscle training improves lung function and reduces exertional dyspnoea in mild/moderate asthmatics. Clinical Science 95, 4P.

McConnell AK & Romer LM. (2004a). Dyspnoea in health and obstructive pulmonary disease : the role of respiratory muscle function and training. Sports Med 34, 117-132.

McConnell AK & Romer LM. (2004b). Respiratory muscle training in healthy humans: resolving the controversy. Int J Sports Med 25, 284-293.

McConnell AK, Romer LM & Weiner P. (2005). Inspiratory muscle training in obstructive lung disease; how to implement and what to expect. Breathe 2, 38-49.

Meyer FJ, Borst MM, Zugck C, Kirschke A, Schellberg D, Kubler W & Haass M. (2001). Respiratory muscle dysfunction in congestive heart failure: clinical correlation and prognostic significance. Circulation 103, 2153-2158.

Oga T, Nishimura K, Tsukino M, Hajiro T, Ikeda A & Izumi T. (2000). The effects of oxitropium bromide on exercise performance in patients with stable chronic obstructive pulmonary disease. A comparison of three different exercise tests. Am J Respir Crit Care Med 161, 1897-1901.

Weiner P, Azgad Y, Ganam R & Weiner M. (1992). Inspiratory muscle training in patients with bronchial asthma. Chest 102, 1357-1361.

Weiner P, Berar-Yanay N, Davidovich A, Magadle R & Weiner M. (2000). Specific inspiratory muscle training in patients with mild asthma with high consumption of inhaled beta(2)-agonists. Chest 117, 722-727.

Weiner P, Magadle R, Beckerman M & Berar-Yanay N. (2002a). The relationship among inspiratory muscle strength, the perception of dyspnea and inhaled beta2-agonist use in patients with asthma. Can Respir J 9, 307-312.

Weiner P, Magadle R, Massarwa F, Beckerman M & Berar-Yanay N. (2002b). Influence of gender and inspiratory muscle training on the perception of dyspnea in patients with asthma. Chest 122, 197-201.

For more information go to www.powerbreathe.com

