The effect of exercise on patients with COPD
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Chronic Obstructive Pulmonary Disease (COPD) is a collective term for a variety of conditions caused by long term damage to the lungs. COPD is a major cause of morbidity and mortality worldwide, characterised by progressive airflow limitation that is partially reversible (Celli and MacNee 2004). Guidelines on the management of COPD, published by the National Institute for Health and Clinical Excellence and the British Thoracic Society, recommend that pulmonary rehabilitation should be made available to all appropriate patients (NICE 2004). Pulmonary rehabilitation aims to restore the patient to the highest level of function and reduce respiratory symptoms by increasing exercise levels of the patient.

Pulmonary rehabilitation is often delivered in hospital settings; however, due to the severity of COPD in some patients, rehabilitation is also being used in community and home settings. In order to determine the effectiveness of home-based rehabilitation for people with COPD, a review of the evidence is required. Medical databases were therefore searched (using the terms ‘COPD’ and ‘home-based exercise’), for randomised controlled trials in the last 10 years. However, due to the limited number of articles, this was subsequently expanded to the last 15 years. The overall search was limited to randomised controlled trials since, according to Philips et al. (2009), these present the highest level of evidence. The aim of this review in exploring the strengths and limitations of current research in relation to current physiotherapy practice, is to determine whether exercise is an effective treatment for COPD. Finally, a research question will be proposed, based on the current limitations of the research.

Fourteen studies have been published in the previous fifteen years that use exercise as part of a home rehabilitation programme. Some focused on comparing home rehabilitation with no intervention (Requeti et al. 2007; Guem 2003; Hernandez et al. 2000; Wijkstra et al. 1996; Wijkstra et al. 1994a & 1995). All of these studies show that home rehabilitation involving exercise results in improvements for patients with COPD when compared with a control group performing no exercise. In the light of these studies (showing that exercise is beneficial), others have focused on comparing home-based rehabilitation with hospital inpatient rehabilitation (Maltais et al. 2008; Guell et al. 2008; Strijbos et al. 1996). These studies concluded that a home-based rehabilitation programme is useful for patients with COPD. Two of these studies (Strijbos et al. 1996; Maltais et al. 2008), suggest that home-based rehabilitation is equal to a hospital-based programme, with the other (Guell et al.
2008), stating that the hospital-based programme afforded greater benefits, although the intensity of the hospital-based rehabilitation was higher.

Man et al. (2004), Behnke et al. (2002 & 2003) and Brooks et al. (2002) focused on home-based rehabilitation after patients had been admitted to hospital due to an exacerbation (deterioration in their condition), only commencing when patients had fully recovered. Patients in both of the studies conducted by Behnke (2000 & 2004) performed an initial ten day hospital training programme before being discharged to complete the home-based component. This enabled investigation to see if home-based rehabilitation is capable of preserving improvements gained during inpatient rehabilitation, concluding that hospital improvements can maintain in the long term. Wedzicha et al. (1998) classified patients according to severity of dyspnoea (breathlessness), with patients graded 5 on the Medical Research Council dyspnoea scale in a severe category and patients 3-4 in a moderate category. The severe patients were randomised into an education or home-based rehabilitation intervention. This paper concluded that home-based rehabilitation was more effective for the severe patients as they were too breathless to leave the house enabling exercise to be tailored to each patient’s needs. The progressive nature of COPD meant that control groups showed declines in quality of life and exercise capacity by the end of the studies (Behnke et al. 2003; Guem 2003; Wijkstra et al. 1994a, 1995 & 1996). The participants in the intervention group did not demonstrate decline but showed improvements.

It has become evident in the literature examined that the studies include far more male than female participants. Three studies did not disclose the ratio of male to female participants (Guell et al. 2008; Hernandez et al. 2000; Wedzicha et al. 1998). In the 11 studies that did there was a total of 663 participants of which 532 (80%) were male. The reason for this may be the availability of participants with COPD who consented to be involved. The results do not show a difference in the response to rehabilitation between women and men however this could be due to the underrepresentation of women in all of these studies. Women are far more susceptible to developing COPD, due to a rapid decline of lung function when compared to men (British Lung Foundation 2005). This underrepresentation of women means that the same rehabilitation may be delivered to both men and women, which may not be the best approach. Man et al. (2004) was the only study which included more female participants than male; this study did not show any differences between genders in the results. More research into the response of different genders to rehabilitation needs to be conducted.
The America Thoracic Society (1999) defined pulmonary rehabilitation as a programme of care that is tailored to optimise physical and social performance. All of the studies meet this definition as the rehabilitation has been tailored to maximise benefits of each individual, aided by measurements taken at baseline. All of the studies by Wijkstra et al. (1994a, 1995 & 1996) used a cycle ergometer for the aerobic component of the rehabilitation programme. The maximum workload (W max) was calculated at baseline using the cycle ergometer test. The training was then set at 60% of W max for 4 minutes, gradually increasing over the study period to 12 minutes at 75% W max. Relaxation, breathing retraining and inspiratory muscle training were also practised twice a day along with cycling for thirty minutes, with supervision from the Physiotherapist twice a week. Participants in two of the studies (Wijkstra et al. 1994a & 1995) showed significant improvement in quality of life measures and the other (Wijkstra et al. 1996) showed significant improvements in physiological measures. However, the rehabilitation was very intense and complex, leading to problems of compliance with participants requiring lots of supervision. Clinically supervision may not be possible so patients may stop rehabilitation completely and not experience the benefits shown in these studies.

Maltais et al. (2008) had the lowest intensity rehabilitation programme to follow, comprising of aerobic exercise on an ergocycle for 40 minutes and strength training for 30 minutes, 3 times a week. Patients were not supervised; telephone calls were used to reinforce the importance of exercise. The aerobic component of the hospital-based programme was of higher intensity but only lasting 30 minutes, ensuring the participants safety at home, since they were not supervised. The results of this study were similar to those by Wijstra (1994a & 1995), although it is difficult to conclude how the difference in exercise intensity and difficulty relates to the improvements seen. Different exercises and intensities have been used, all of which have been shown to have positive effects on participants; however, the minimal level of exercise to show benefits has not been identified.

The only study not to use cycling was Hernandez et al. (2000), who used walking as the main exercise for patients. This is more relevant in a clinical situation, since it requires no equipment, as it may not be possible to supply all patients with a cycle ergometer. Patient’s ability to walk in severe COPD is greatly reduced, so encouraging patients to perform a functional task may raise confidence and quality of life. The results of this study show that walking can increase exercise tolerance and quality of life, whilst reducing dyspnoea.
COPD affects people physically by reducing exercise capacity and also decreases quality of life. This is reflected by the outcome measures that have been used in the literature. The Chronic Respiratory Questionnaire (CRQ) was the primary outcome measure in twelve of the fourteen studies in this review (Guell et al. 2008; Maltais et al. 2008; Resqueti et al. 2007; Brooks et al. 2002; Behnke et al. 2003; Guem 2003; Man et al. 2004; Behnke et al. 2000; Hernandez et al. 2000; Wedzicha et al. 1998; Wijkstra et al. 1995 & 1996). The CRQ is a valid and reliable measure (Wijkstra et al. 1994b), which can be divided to assess the impact of an intervention on dyspnoea, fatigue, emotion and mastery. This measure takes very little time to complete, so these studies can be applied to the clinical setting. However, it is difficult to recognise when an increase in a measure of this nature demonstrates clinical benefit rather than just a significant difference. Guyatt et al. (1987) state that scores of the CRQ must improve by four points for patients to demonstrate improvement in quality of life. The study by Brooks et al. (2002) found no significant difference of the CRQ scores but both groups improved by more than four points, suggesting a clinical improvement as a result of the interventions.

The only studies that do not use the CRQ, focus on physiological measures (Strijbos et al. 1996; Wijkstra et al. 1996) These studies used the Cycle Ergometer test and Six Minute Walking Distance test (6MWD). The cycle ergometer test is capable of showing exercise capacity, although it is not a functional test. The 6MWD is a more functional measure as it involves walking the maximum distance in six minutes; however, six minutes is a long time for a participant with severe COPD to walk. Resqueti et al. (2007) used a short three minute walk distance test, which participants were able to complete making the results more significant.

Home-based exercise is supported by all of the studies included in this review; however, this could be misleading. All of the studies have used exercise as an intervention, although input from other professionals, such as doctors and nurses, was not prohibited. It would not be possible to exclude input from all other professionals, due to the severity of COPD of participants. Behnke et al. (2003) attempted to minimise any effect by both groups receiving the same frequency of education and doctor visits. This should not be a criticism as it reflects the situation clinically; the American Thoracic Society and European Respiratory Society (1999) recommend that rehabilitation should be delivered as a multidisciplinary intervention.

Application of this research into practice should mean that patients with COPD are encouraged by Physiotherapists to exercise at home. Home-based rehabilitation is often more suited to severely
disabled people who cannot leave home because of breathlessness, avoiding unnecessary travel to outpatient units. The problem that faces Physiotherapists is keeping patients active after rehabilitation is finished. Strijbos et al. (1996) concluded that the long term effects seen in the home-rehabilitation group when compared to the hospital-based group may be because they had become accustomed to exercising in the home environment, meaning it was easier to continue exercising in the long term after rehabilitation had finished.

In conclusion, it has been found that home-based rehabilitation is a beneficial form of treatment for patients with COPD. Home-based rehabilitation has been shown to be an effective intervention; however, it is important to remember that it is not a replacement for hospital-based rehabilitation as this is as effective. Due to the current lack of research into this area, many gaps in the literature have been identified such as the high proportion of males and lack of functional outcome measures.

One area that seems to have been neglected is the comparison of different intensities and types of home-based rehabilitation. Ten studies used a cycle ergometer and only one study used walking as an intervention. A comparison between two different types of home-based rehabilitation, with one utilising walking as an intervention and another using cycling, could be conducted. The proposed research question would be to compare the effect of walking-based home-rehabilitation with cycling-based home-rehabilitation in terms of exercise capacity and quality of life in patients with COPD. Compliance should also be explored as a secondary measure relevant to Physiotherapists.

References


