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Editorial

Respiratory Muscle Training in COPD

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Chronic obstructive pulmonary disease is most often, but not always, attributed to long-term exposure to cigarette smoke, first or second-hand. Some of the anatomic changes associated with COPD include peripheral airway destruction leading to airflow limitation, hyperinflation resulting in a mechanical disadvantage of the diaphragm, and skeletal muscle weakness. Recommendations for the management of COPD include pulmonary rehabilitation (PR) thus offering patient's education, exercise and psychosocial support [5]. Another component that may or may not be included in the exercise program of PR is respiratory muscle testing and training. In addition to limb muscle weakness, COPD patients demonstrate a reduction in respiratory muscle strength and endurance. As with all signs and symptoms associated with COPD, respiratory muscle weakness tends to worsen as the disease progresses. Testing of respiratory muscle strength is easily accomplished using either a basic aneroid manometer or more sophisticated digital components. The American Thoracic Society developed a position statement on respiratory muscle testing in which specifications for the basic and advanced apparatus were provided [1]. Equally important, prediction equations are available for respiratory muscle determinants i.e. maximum inspiratory pressure and maximum expiratory pressure; although, these equations have not been specifically created for the COPD population [3]. Once respiratory muscle weakness has been established the clinician must decide if respiratory muscle training should occur. The available literature implies RMT can offer benefits to the COPD population by improving strength, endurance, and perceived dyspnea [4]. In general, there are two types of resistive training devices, pressure resistance using a spring-loaded valve or flow resistance using an adjustable orifice. Resistance can be provided on inspiratory only, on expiration only or concurrently on inspiration and expiration.

In 2015 completed an interesting study in which inspiratory muscle training (IMT) was used for COPD patients devoid of respiratory muscle weakness [2]. Specifically, all patients were able to produce P_{Imax} values > 60 cm H_2O prior to beginning the study. The authors compared the impact of IMT versus no IMT on dyspnea using both the Borg scale and the multidimensional dyspnea profile (MDP) questionnaire at the end of a 6-minute walk test. On initial analysis the authors found no significant difference between the IMT and the control groups for the Borg or the MDP. However, upon further analysis the data demonstrated a significant interaction between FEV1 (i.e. COPD severity) and IMT for several items of the MDP. The authors adjusted data analysis based on whether the FEV1 was above or below 50% of predicted. Secondary analysis demonstrated a significant improvement in some items of the MDP for the more severe (FEV1 less than 50% of predicted) COPD patients. There were no significant differences between the IMT and control groups for the functional parameters, regardless if the data was adjusted or unadjusted. There are a couple of possibilities for the lack of significance in functional parameters and the authors identified these as well. The study protocol required data collection and analysis after only 3 weeks of training. This time period is shorter than a typical IMT program of 6-8 weeks. The training protocol set the IMT threshold at 40% of the achieved PImax value and this threshold level was not changed for the duration of the study. IMT should be treated like any other muscle training program, e.g. periodically increase the resistance as the training effect becomes less difficult. It's not uncommon to seeIMT training begin at 50-80% of the P_{Imax} value [4] and escalate upward once the resistance becomes too easy. Also, we must remember that these patients were able to generate P_{Imax} values greater than 60 cm H_2O at the start of the program [2]. Functional gains in respiratory muscle strength will more than likely be limited due to the starting P_{Imax} values, the length of the training program and the training protocol used. Regardless of the above, the authors found very interesting improvements in MDP dyspnea components after only 3 weeks of training. Also, the idea that different COPD severity populations may receive greater benefit from our pulmonary rehabilitation programs is important to appreciate. The inclusion of RMT in these programs and having a protocol that fits the patient hopefully will receive greater consideration in the future.

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