The Effect of Resistance Training on Asthma

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Key points:

- Defining Asthma
- Defining Resistance Training
- The impact of Resistance Training on Asthma
- Pulmonary Rehabilitation

Introduction

Asthma can be defined as a chronic inflammatory airway disease that affects more than 360 million people globally. [1] Symptoms of chest pain, shortness of breath, bronchoconstriction, coughing and wheezing are commonly associated with this syndrome. [1]

Asthma is characterized by reversible airway narrowing and increased airway sensitivity. [2] Asthma exacerbation consists of two phases. The early phase involves an IgE-mediated immune response to certain triggers present in the environment. [2] The IgE antibodies bind to mast cells and basophils, releasing cytokines, histamine and leukotrienes that stimulate the contraction of smooth muscle, and result in airway tightening. [2] The late phase involves the activation of cells such as eosinophils and T-lymphocytes, which sustain inflammation. Interleukins from Th2 cells further promote this response and contribute to long term structural changes in the airways. [2] Over time, persistent and sustained inflammation leads to a buildup of mucus, the thickening of smooth muscles, and the narrowing of airways, increasing the resistance to airflow and thus increasing the work of breathing. [2]

Resistance Training

Very simply resistance training can be described as having three components. The first being the performance of muscle contractions against some form of resistance. The resistance may be external, provided by weights or by water, or internal provided by a person's own bodyweight. [3] The second being the input of sufficient effort, force, and intensity. The muscle needs to be adequately challenged in order to drive growth in muscle size and strength. [3] Lastly ensuring that the muscle remains under tension for an adequate amount of time in order to provide effective overload stimulus that would in turn provide the necessary neuromuscular adaptations required for increase in muscle strength and size. [3]

Link Between Resistance Training and Asthma

As we have established previously, asthma causes bronchoconstriction, due to the weakening of breathing muscles, which in turn causes dyspnea, or simply "shortness of breath or breathlessness". This results in a need for pulmonary rehabilitation. [4]

We can describe pulmonary rehabilitation as interventions performed on individuals with chronic respiratory conditions such as asthma in order to improve the functional capacity of their respiratory system, and alleviate symptoms such as dyspnea. [4] One of the methods we can use to achieve this is resistance training.

Role of Resistance Training in Pulmonary Rehabilitation

Resistance training has been shown to enhance the overall physiological function of the body. [5] This includes stronger respiratory and cardiovascular systems. Thus stronger diaphragm, intercostal muscles and improved oxygen delivery all result in less effort during breathing. [6]

This is very important, as during asthma the airways constrict. [1] This results in harder breathing, and hence the faster fatiguing of the accessory muscles, i.e. the respiratory and cardiovascular muscles. Thus strengthening them reduces the effort expended towards breathing, hence increasing the overall body efficiency. [6]

Furthermore, it has also been shown that resistance training has led to an increase in the exercise capacity of persons with chronic respiratory conditions. This can be considered as the most effective among lung function tests as it shows real life change. [5]

A key measure of exercise capacity is the 6 minute walk distance (6MWD). People taking part in exercise based pulmonary rehabilitation, including resistance training, were shown to have increased their 6MWD by 52.91 m, exceeding the minimal clinically important difference. [5]

Furthermore, exercise based pulmonary rehabilitation has been shown to cause improvement in psychological symptoms including depression and anxiety in persons with chronic respiratory diseases such as asthma. [7]

This is due to factors such as the reduction of chronic inflammation, which positively affects neurotransmitter balance leading to overall psychological improvement.[7]

There is also an increase in oxygen intake and cardiovascular efficiency. This reduces hypoxia, hence improving brain function. Thus reducing the effect of psychological dysfunction due to lack of oxygen. [7]

Conclusion

In conclusion, in this paper we have discussed the correlation between resistance training and asthma, emphasizing its potential as a complementary intervention in the management of the disease. Research on pulmonary rehabilitation based on physical exercise has provided significant evidence on the positive effects of resistance training on the improvement of exercise capacity, the alleviation of dyspnea, and the enhancement of quality of life. Moreover, the physiological and neurochemical changes induced by physical exercise may be related to the improvement in psychological outcomes, including anxiety and depression.

However, the multifactorial approach to pulmonary rehabilitation programs makes it difficult to determine the independent effects of resistance training. In fact, the inconsistency in the results reported in the literature is related to the heterogeneity in the study design, the intensity of the intervention, and the population sample.

The use of resistance training is a safe and effective complementary approach to the conventional management of asthma. Further research is recommended on the effects of resistance training on asthma patients using a large sample population and a randomized controlled trial design.

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