

What is the relationship between inspiratory muscle training and performance and respiratory biomechanics in athletes?

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ABSTRACT: *Inspiratory muscle training has an important role in sports performance. Scientific evidence suggests the coadjuvation of sports performance competition training with association of training of the inspiratory muscles alongside the use of a threshold. The purpose of this review is to summarize and assess the scientific evidence about optimizing respiratory biomechanics in specific sports.*

1. INTRODUCTION

The respiratory system restricts exercise performance capacity due to increased ventilatory capacity, increasing respiratory muscle fatigue and the perception of shortness of breath [1].

Fatigue of the respiratory muscles inhibits elite performance athletes from reaching the maximum of their skills, activating the metaboreflex inducing the maximum inspiratory pressure (MIP).

As such, high performer athletes adopt strategies, in which training the inspiratory muscles (IMT) with threshold devices is important to increasing exercise tolerance.[4] Evidence suggests the association of these devices as elite performance training accessories in intervention protocols in high-competition athletes for their performance [4]. The articles [2] and [6] report a significant impact that the use of the threshold promotes the increase in the strength of the inspiratory muscles, which reflects positive effects on athletes during their sports performance.

However, scientific evidence indicates the need for further studies to understand the effects of IMT on athletes performance. Thus, the aim of this study is to systematize

the scientific evidence about the effects of IMT on performance and respiratory biomechanics in athletes.

2. Methods

This review was registered in the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42023385470) and developed according to the Preferred Reporting Items for Systematic Reviews (PRISMA) [7] and also with the PEDro scale [3].

Inclusion and exclusion criteria were defined according to PICO, Inclusion Criteria: elite-performance athletes and sportsmen with defined modality; threshold use; intervention with training of monitored muscles that assess lung function; PIM; Maximum expiratory pressure (MEP); spirometry, intervention in sports performance, strength training, controlled muscles and resistance and articles in English. Exclusion criteria: individuals with respiratory diseases or comorbidities or physically unfit, diagnosed with pulmonary or cardiac pathologies, articles with intravenous pharmacological therapy or interventions that associate or compare physiotherapy with pharmacological therapies.

The research followed Medical Subject Headings (MeSH) [4] with combination: (Respiratory Muscle Training OR breathing exercises) AND (Athletic Performance OR Sports) AND Muscle Strength AND endurance training AND Respiratory Function Tests, searching in Pubmed database in order to identify controlled randomized studies that referred to the effects of training the inspiratory muscles in high competition athletes.

3. Results

Six studies were found with eligibility criteria reporting the intervention of the inspiratory muscles with threshold support (POWERbreathe®). The intervention protocol in the studies reveals heterogeneity in relation to the elite competition modality and variability in the type of intervention (moderate to vigorous training or both). However, studies have shown results with a significant impact on the performance of athletes. The use of threshold had significant effects in lung function and respiratory muscle strength. There was a main effect of training for MVV resulting in higher values post training [9]. Similarly, there was a main effect of training for an increase in MIP. Furthermore, significant differences were found between groups for P_{Imax} and P_{E_{max}} after 8 weeks. Study reported there was a significant main effect for peak breathing frequency, tidal volume, minute ventilation, and peak VO₂, indicating a significant increase with training [8].

4. Discussion

The discussion and analysis of the outcomes found in the articles will be matter of study.

5. Conclusions

Scientific evidence suggests that the use of the threshold associated with IMT induces many benefits in terms of respiratory capacity and performance in athletes, optimizing respiratory biomechanics in specific sports.

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