

Development and evaluation of a pressure threshold inspiratory muscle trainer for use in the context of sports performance

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Abstract

Inspiratory muscle training (IMT) became widespread, particularly in a clinical context, following the work of Delhez *et al.* [(1966) Modifications du diagramme pression-Volume maximum de l'appareil thoraco-pulmonaire après entraînement des muscles respiratoires par des exercices statiques. *Arch. Internat. De Physiol. Et de Biochimie.*, 74, 335–336], who demonstrated that the breathing muscles could be strengthened by specific training. Numerous technologies have been described since then; however, to date, pressure threshold loading has proved to be the most effective technology, offering a versatile yet robust means of improving the strength, power and endurance of the inspiratory muscles in clinical populations. Unfortunately, at present, a pressure threshold training device suitable for training the inspiratory muscles of healthy humans does not exist. Thus, the potential for widespread implementation of IMT in athletic populations is severely constrained. The purpose of the present paper is to document the design and development of such a device.

The device described provides true threshold, near flow-independent, loading between -5 and -150 cm H₂O. Whilst flow-independent loading was not accomplished, the degree of flow dependency achieved was substantially lower than that reported for previous (clinical) devices. Furthermore, the degree of flow dependency observed at anything other than low loads is of limited functional relevance.

The device is now commercially available and has been shown to increase exercise capacity in a number of intervention studies. The product is registered with the Medical Devices Agency as a class I medical device. In complying with the Medical Devices Regulations, 1994, the product is authorised to carry the CE mark. It is covered by an active patent no. 2278545 and is trademarked Powerbreathe[®] (IMT Technologies Ltd. Birmingham, UK).

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