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# Isometric Strength Training for Prevention and Treatment of Hypertension: Myth or Reality?

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**Abstract:**

*Hypertension is a worldwide prevalent disease, mostly manifested as it's primary ethiology, characterized by a chronic, multifactorial, asymptomatic, and usually incurable state. It is well established that physical training represents an important therapeutic strategy in the prevention and complementation of hypertension treatment. To this end, it's suggested that isometric training is capable of promoting greater reductions in blood pressure. Based on this evidence, the American Heart Association, recommended that isometric training, in particular handgrip exercise, be included as a non-pharmacological strategy for blood pressure reduction. Isometric exercise involves sustaining contraction against resistance without altering the length of the muscle. Recent studies confirm that isometric handgrip training is able to effectively reduce blood pressure with a large magnitude effect on systolic pressure, although more modest on diastolic and mean pressures. In conclusion, there is now sufficient evidence to indicate them as a coadjuvant in the treatment of hypertension. since, theoretically, there are also sufficient stimuli to promote morphological adaptations associated with angiogenesis and arteriogenesis.*

**Key words:** Blood Pressure; Exercise; Non-pharmacological treatment

## INTRODUTION

Hypertension is a worldwide prevalent disease, mostly manifested as it's primary ethiology, characterized by a chronic, multifactorial, asymptomatic, and usually incurable state. Due to the necessity of the cardiovascular system to manage chronically increased levels of blood pressure, hypertension causes severe alterations in multiple organs, as the heart, vessels, kidneys, eyes and brain, thus increasing the risk of health complications. Although some of the causes of hypertension are known, such as increased collagen deposition in the arterial wall, which reduces its elastance and elevates vascular stiffness or obstructive vascular processes such as atheroma plaque, both present during aging, most of them cases presents idiopathic origin and is often associated with sympathetic hyperactivity of unknown cause1.

In this context, it is well established that physical training represents an important therapeutic strategy in the prevention and complementation of hypertension treatment2. Although traditional aerobic training methodologies have been able to reduce both resting and ambulatory blood pressure, recent evidence confirms the hypotheses already formulated over the last four decades that isometric training would be capable of producing significant reductions of blood pressure in both normotensive and hypertensive populations3-5.

## ISOMETRIC TRAINING AND BLOOD PRESSURE

To this end, two recent meta-analyzes have suggested that isometric training is capable of promoting greater reductions in blood pressure than those observed in traditional protocols of aerobic exercise or dynamic force6,7. In fact, based on this evidence, the American Heart Association, in its last guideline, recommended that isometric training, in particular handgrip exercise, be included as a non-pharmacological strategy for

blood pressure reduction (class IIB, level of evidence C) in replacement or in complement to the 150 minutes of weekly physical activity previously proposed (class I, level of evidence B)8.

The fact that isometric exercises of low to moderate intensity, can be performed anywhere and require little time and almost no equipment, besides not imposing the same cardiovascular demand as do aerobic activities, may contribute to its greater adherence and maintenance of regularity training. In this sense, interestingly, it has been well known that there is a lower incidence of hypertension in individuals engaged in occupations with a high static or isometric effort component9.

Isometric exercise involves sustaining contraction against resistance without altering the length of the muscle. Recent studies confirm that isometric handgrip training is able to effectively reduce blood pressure with a large magnitude effect on systolic pressure, although more modest on diastolic and mean pressures. Likewise, the hypotensive efficacy of isometric training seems to be more strongly observed in hypertensive individuals over 45 years old who undergo training for more than 8 weeks. Inder et al.8 did meta-analysis of eleven studies, totaling 302 participants. Six studies used handgrip and five studies used leg exercise. None of the studies reported any adverse events from isometric exercise. Despite the multiple protocols used, those studies involving unilateral upper limb training and involving 4 sets of 2 min contraction at 30% of maximal voluntary contraction (MVC), separated by 4 minutes of rest, seem to obtain the best results8.

In this context isometric training produces, on average, after a period of 8 weeks with sessions performed 3 times a week, leads to consistent reductions of ~6 mmHg in systolic blood pressure, this is especially important when we consider that many pharmacological therapies fail to exert a hypotensive effect in 50% of hypertensive patients10. Interestingly, the

hypotensive effects of isometric training occur independently of the weight loss that are normally associated with aerobic training.

It is believed that intermittent occlusion and relaxation, associated with the isometric training method, is capable of promoting stimuli that improve macro- and micro-vascular reactivity, producing positive alterations both in endothelial function and in decreasing arterial stiffness11. Other proposed mechanisms include the regular increases in the concentration of metabolites such adenosine, capable of activating metabolic receptors associated with IV afferents that initiate a powerful reflex sympathetic activation pressor, but that over 8 weeks appear to have the magnitude of influenced attenuated.

In fact, the greater vascular blood flow is a result of isometric training and can reduce the concentration of metabolic products in effect capable of decreasing the activation of metaboloreceptors and that may cause lower blood pressure increases during the exercise that would later extend to the resting conditions12. In addition, increased blood flow at the end of each arterial occlusion can elevate arterial shear stress and positively regulate the mechanism of production of vasoactive molecules with a dilator action, such as nitric oxide whose bioavailability is greater when increases occur in the expression of the enzyme nitric oxide synthase and other anti-oxidant enzymes13,-15.

## CONCLUSION

In conclusion, although performing acute isometric contractions raise systolic and diastolic blood pressure sharply resulting in recommendations of them being and for a long time have been banned from the exercise programs of hypertensive individuals, there is now sufficient evidence to indicate them as a coadjuvant in the treatment of hypertension. since, theoretically, there are also sufficient stimuli to promote

morphological adaptations associated with angiogenesis and arteriogenesis16 that may be a determinant for reducing vascular resistance and improving the supply and distribution of oxygen and nutrients to tissues17.

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