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Immediate and late acute effect of moderate continuous and high intensity interval training on hypertension stage I: case report

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Abstract

Physical training is used in the control of arterial hypertension (AH), especially in patients with higher levels of blood pressure (BP). However, there are still few studies on the effects of physical training on AH in less advanced stages of the disease. The aim of the present study was to assess the immediate and late acute effects of continuous moderate physical training (CMT) and high intensity interval training (HIIT) in patients with mild AH, and to assess which training method induces a greater hypotensive effect. A female patient, 43 years old, sedentary, diagnosed with mild AH (stage 1), taking Losartana 50 mg twice a day was studied. She underwent one CMT and one HIIT session, one week apart. BP measurements were taken before and after each session, as well as 24 hours before and after the sessions. After the physical training sessions, we observed a drop in the patient's BP that lasted up to 60 minutes, and a reduction in blood pressure levels on the day after the training. We conclude that both training modalities were efficient in reducing the BP of the patient with mild acute immediate and delayed hypertension.

Keywords: Moderate-continuous training; High-intensity interval training; Hypertension; Adaptations.

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Introduction

The treatment of arterial hypertension (AH) aims at changing lifestyles, in order to reduce pressure levels and consequently provide protection to target organs. The main focus of treatment is the use of drug therapy, which by means of recommended goals, makes use of the association of several classes of drugs with hypotensive effects [1]. In association with pharmacological therapy, regular physical exercise has proven to be an efficient adjunctive treatment for blood pressure (BP) control [2].

The exercise recommendations for hypertensive patients taking hypotensive medications bring guidelines based on the prescription of individualized exercise, in a prudent way, but still not well defined in terms of frequency, intensity and time, with an apparent gap regarding the type of exercise [3], being the continuous moderate intensity training (CMT) and high intensity interval training (HIIT) [4-5], the most studied currently.

The motivations that lead to the study of the acute post-exercise hypotensive effect (PEH) are directly related to the relevant clinical implications that help in the treatment and prevention of cardiovascular dysfunctions, with emphasis on AH [6]. It is already known the PEH effect in patients with severe AH [7-8], however, we have not yet described in the literature which training modalities may bring greater benefit for mild hypertensive patients.

Thus, the aim is to assess the immediate and late acute PEH effect of moderate-continuous and high-intensity interval training in a patient with mild hypertension taking medication, and to compare which training method may induce a greater hypotensive effect.

Case report

Female patient, Caucasian, 43 years old, body mass index of 25.6 kg/m2, sedentary, denies smoking and alcoholism. She has a clinical diagnosis of mild AH (stage I) in clinical follow-up by the Hiperdia group in the Basic Health Unit (BHU) of her city, using losartan (50mg; 2x a day).

The patient initially underwent a baseline assessment of BP by means of home blood pressure monitoring (HBPM), where she was instructed to go to the BHU nearest her home, one day before the beginning of each training protocol, three times a day, in the morning, afternoon, and early evening, to have her BP measured by a qualified professional.

Then, the patient performed a six-minute walk test (6MWT). Finally, she underwent two physical training sessions, with a one-week interval between sessions, where she had one session of continuous moderate training (CMT) and one of high intensity interval training (HIIT). After 24 hours of each training session the patient was instructed to perform the HBPM again,

following the same methodology of the pre-training phase.

The study was approved by the Research Ethics Committee of our institution (no. 0039/2016) and the Informed Consent Form signed by the volunteer.

Physical training sessions

Each training session lasted 50 minutes, with 5 minutes of warm-up, 30 minutes of conditioning, 5 minutes of cool-down, and 10 minutes of relaxation. The session was performed in a controlled laboratory environment, on a treadmill, where the patient was instructed about the type of effort to be performed on the two days of training, besides the maintenance of the correct use of medication.

The CMT was performed at an intensity of 70% of peak heart rate, reached in the 6' 6MWT, and the HIIT was performed at an alternating intensity between 60% and 90% of peak heart rate, with the patient staying 4 minutes at high intensity (90%) and 2 minutes at moderate intensity (60%), alternating during the 30 minutes of the conditioning phase.

The sessions were supervised and the heart rate values were monitored by a Polar® FT1 cardiofrequency meter. The measurement of BP by auscultatory method was performed pre-training, during exercise, 10, 30, and 60 minutes after the end of the sessions. Thus, after the training period, the patient was kept in the laboratory with no circulation of people, seated, and was instructed not to talk or perform any other activity for a period of 60 minutes, so that the BP measurements could be taken.

Case Outcome

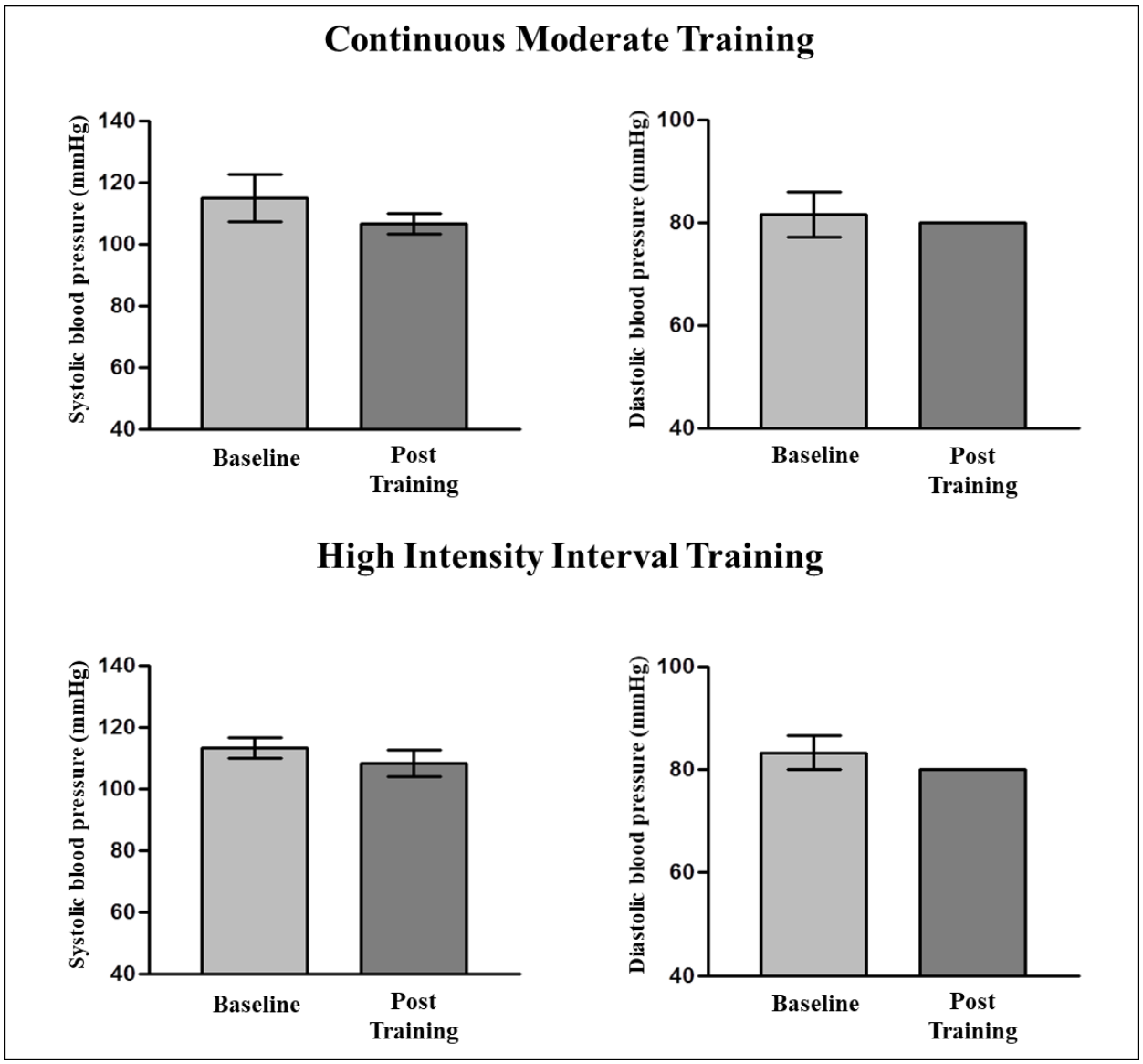
It was observed that in both CMT and HIIT, SBP increased during exercise and subsequently reduced to below baseline levels in the immediate acute phase. In both situations, the SBP reduction was similar and lasted for up to 60 minutes after training.

The BP values at rest, during and right after the physical training sessions are presented in table 1.

Similarly, in the assessment of BP in the late acute phase, 24 hours after the training sessions, both the CMT (HBPM = baseline SBP of 115±13.2 mmHg to 106.7±5.8 mmHg after 24 hours and baseline DBP of 81.7±7, 6 mmHg to 80±0 mmHg after 24 hours) and HIIT (HBPM = baseline SBP from 113.3±5.8 mmHg to 108.3±7.6 mmHg after 24 hours and baseline DBP from 83±5.8 mmHg to 80±0 mmHg after 24 hours) caused a hypotensive effect that lasted for 24 hours after the training sessions.

The averages of the values obtained by the BP measurements through the HBPM, before (baseline) and after (24 hours) the training sessions, are presented in figure 1.

Figure 1: SBP and DBP values at baseline and after 24 hours of training sessions.



Comparison of the average values obtained during the HBPM before training (baseline) and post-training (24 hours after each session).

Table 1. Immediate acute effect of SBP and DBP after the training sessions.

Blood Pressure (mmHg)	Continuous Training		Interval Training	
	SBP	DBP	SBP	DBP
Rest	120	80	120	90
Exercise	140	80	140	80
Post-training 10'	110	80	100	80
Post-training 30'	100	80	100	80
Post-training 60'	100	80	100	80

SBP = systolic blood pressure; DBP = diastolic blood pressure.

Discussion and Conclusion

Our main findings documented that moderate continuous and high intensity interval exercise training induced a reduction in blood pressure levels in a patient with stage I hypertension on medication after a single session, provoking a PEH effect both in the immediate acute phase and in the late acute phase of exercise.

Hypotensive response by different modalities of exercise training has been frequently reported in the literature. However, this antihypertensive effect triggered by exercise training is mostly described only in studies that evaluated patients over a longer period of time and also, with more evident improvement when BP levels are higher [9-11].

Investigations that focused on the analysis of the magnitude of the hypotensive effect in mild hypertensive or mild hypertensive and medicated patients after 24 hours of training are rare. In this sense, in order to compare the immediate effect of continuous and interval training after 24 hours, Ciolac and collaborators [12] evaluated 52 medicated hypertensive individuals. They reported that CT was efficient in reducing both SBP (±2.6 mmHg) and DBP (±2.3 mmHg) and IT promoted improvements only in SBP (±2.8 mmHg) [12].

In another study, both training modalities promoted hypotensive response in individuals with AH treated with drug therapy. In this case, there was a reduction in systolic and diastolic blood pressure levels, and the PEH effect was more pronounced after HT [13].

Costa and collaborators [14] also analyzed the acute effect of a single session of CT and IT in hypertensive patients at time evaluations 30', 60', 90 and 120'. Only SBP reduction was observed in both continuous and interval modality, with the PEH effect being greater in IT [14].

In our investigation, we found a greater magnitude of SBP reduction than DBP reduction after physical training in both investigated modalities. In relation to continuous training, the reduction was, on average, 8.3 mmHg, while in the interval training modality, the reduction was 3.0 mmHg.

In summary, CT and IT were equally effective in promoting PEH, being more evident in SBP, persisting at least in the first 24 hours after exercise training, indicating that the two modalities may be important therapeutic strategies in the treatment of patients with arterial hypertension stage I. It is plausible to consider that the results of this study serve as a hypothesis for the design of new randomized and controlled studies with

a significant sample of mild hypertensive patients who undergo a long-term supervised exercise program with different training modalities.

Moderate continuous and high-intensity interval training modalities promoted immediate and delayed post-stress hypotensive effect in a patient with mild arterial hypertension (stage I) and taking antihypertensive medication. Moderate continuous training induced greater reductions in systolic blood pressure levels.

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