SUBACUTE BLOOD PRESSURE RESPONSES IN STREET RUNNERS AFTER CONTINUOUS AND HIGH-INTENSITY INTERVAL TRAINING SESSIONS

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Abstract: Street (or road) running is relatively understudied due to limitations of field-based measurements and the diverse heterogeneity of its practitioners. With regard to blood pressure, there are no published field-based studies comparing different training methodologies. The objective of this study is to evaluate subacute blood pressure (BP) responses in healthy young adults who practice street running after a high-intensity interval running session, a moderate-intensity continuous running session, and a control session. This is a cross-sectional study conducted with 10 street runners who underwent three protocols: Continuous Aerobic Protocol (CAP), High-Intensity Interval Training (HIIT), and Control Protocol (CP). Hemodynamic measurements were taken pre-exercise, immediately post-exercise, and every 10 minutes up to 40 minutes after each protocol. Results: Significant elevation of SBP immediately after the running session, in both CAP and HIIT versus the pre-exercise, however, it was observed a significant increase in the HIIT group. These responses were not excessive, returning to baseline values in the subsequent moments (without significant differences in intra- or inter-group analyses). Diastolic BP (DBP) increased significantly immediately post-exercise and at 20 minutes in both exercise protocols, immediately after exercising and 20 minutes later, but to the same extent, showing similar magnitude. At 40 minutes, the HIIT group maintained a significantly higher DBP than the CAP group. Conclusion: Runners exhibited higher BP (blood pressure) values immediately after both exercise sessions, with similar magnitude, but did not demonstrate post-exercise hypotension in either protocol.
Keywords: Blood pressure; road running; continuous training; continuous aerobic training; interval training; high-intensity interval training.

INTRODUCTION

Street running has increased significantly in recent years[1]. This type of exercise is characterized by the *outdoor* practice in the environments of city parks and streets, under variable environmental conditions, and differs from treadmill running, in addition to the fact that most practitioners are amateurs. Regardless of the environment, endurance-type aerobic continuous long-distance running has been an effective strategy for improving cardiorespiratory fitness (2) and biochemical parameters. (3) ·Continuous aerobic exercise has been recommended by several national and international guidelines[4,5] as a strategy for prevention and treatment of cardiovascular disease and for improving fitness. However, high-intensity, anaerobic interval running is not consistently addressed in these documents, there is promising evidence in both healthy individuals and cardiac patients[6] [(,)] [(7,)] [(8)] .

In this context, high-intensity interval training provides numerous benefits to practitioners[9,10] and gains appear to be more effective compared to continuous low-to-

moderate-intensity exercise, including in terms of individuals' adherence to exercise[11]. However, there are gaps in the literature regarding the hemodynamic response. Thus, this study aimed to evaluate subacute blood pressure (BP) responses in healthy young adult road runners after a high-intensity interval running session, a moderate-intensity continuous running session, and a control session..

MATERIALS AND METHODS

[1] This cross-sectional, controlled, crossover study included 10 runners recruited from a public park commonly used for road running. To evaluate the sample characteristics, body mass, height, and body mass index (BMI) were measured. After pre-participation assessments composed by semi-structured medical history, physical examination, BMI[12] ·blood pressure (BP) measurement, and heart rate (HR), the individuals underwent the study protocols, whose order was randomized by lot drawing.

Control Protocol (CP) – Participants remained for a duration similar to the experimental protocols, but without performing any type of physical exercise. They were allowed to stand, sit, talk, and move around freely. Continuous Aerobic Protocol (CAP) – Consisting of a 3,000-meter run at 75% of HRreserve [13]·High-Intensity Interval Protocol (PIAI) – Consisting of 8 stimuli of 300m of running performed at maximal attainable speed, followed by 100m of active recovery, with slow walking. The protocols were separated by an interval of 72 hours.

BP and HR measurements were taken before the protocols (Pre); immediately after (minute 0); 10 minutes (minute 10); 20 minutes (minute 20); 30 minutes (minute 30); and 40 minutes after (minute 40). Each measurement was repeated after 2 minutes, and the mean was calculated for analysis purposes[2] .

RESULTS AND DISCUSSION

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[1]The project was submitted to and approved by the Ethics Committee of the Goiás Emergency Hospital (HUGO), under opinion number 050/11. All participants were informed about the research and signed a free and informed consent form (FICF).
[2]The data were analyzed using descriptive statistics (SPSS, v 22.0, IBM) using the mean and standard deviation (±SD). Normality was tested using the Shapiro Wilk test with Lilliefors correction. Variables that did not show normal distributions were normalized using the natural logarithm (Ln). For comparison between moments, the Student's t-test was used, and effect size (ES) was applied to measure the size of the effect. A p-value of <0.05 was adopted as the level of significance.

Table 1. Systolic blood pressure behavior before the running session, immediately after, and every 20 minutes until minute 40.

	SBP		
TIME	PC n=10	PAC n=10	PIAI n=10
PRE	122.14±11.74	117.28±15.33	124.75±6.33
Min	115.78±12.79 &#	147.21±11.40 *&$	160.75±12.57 *#$
Min	117.35±11.15	122.57±8.26	122.66±10.55
Min	116.57±9.51	117±7.14	120.41±9.45

Source: Own elaboration. Legends: * = Intragroup comparison p<0.05; & = Intergroup comparison with Interval p<0.05; # Intergroup comparison with Continuous p<0.05;$ = Intergroup comparison with Control p<0.05

Table 2. Diastolic blood pressure behavior before the running session, immediately after, and every 20 minutes until the 40th minute

	PAD		
TIME	PC n=10	PAC n=10	PIAI n=10
PRE	67.57	70.21±6.99	81.11±11.58
Min	66.64±7.91	76.92±12.47 $	85.41±12.86 $
Min 20	67.5±6.91 &#	74.92±4.54 $	80.05±10.49 $
Min 40	68.07±5.49	71±5.98 &	79.41±10.58 #

Source: Own elaboration. Legends: * = Intragroup comparison p<0.05; & = Intergroup comparison with Interval p<0.05; # Intergroup comparison with Continuous p<0.05; $ = Intergroup comparison with Control p<0.05

The runners showed a significant increase in SBP immediately after the running session, both in CAP and HIIT, when compared to the pre-exercise moment, however, it was significantly higher in the HIIT group. However, these responses were not exaggerated and returned to baseline at subsequent time points (no significant differences in intra- or inter-group analyses). Similarly, DBP showed a significant increase in both exercise protocols immediately after exercise and 20 minutes later, but to the same extent. At 40 minutes, the HIIT group maintained a significantly higher DBP than the CAP group. These SBP and DBP increases can be attributed to cardiovascular adaptations to exercise, that generate an increase in BP, , including rises in heart rate (HR) and stroke (ejection) volume, [14], which together increase cardiac output (CO), impacting the increase in BP [14] [,] [15].

In the subsequent moments of this study, it was observed that SBP stabilized quickly in both groups, with no difference between the exercise protocols, but it was higher than BP; with values remaining higher than pre-exercise. DBP remained significantly elevated at 20 minutes in both protocols, with similar magnitude. At 40 minutes, the HIIT group showed a significantly higher DBP response than the PAC group. The stabilization of SBP can be explained by acute post-exercise adaptations,

which cause a decrease in peripheral vascular resistance (PVR) due to reductions in HR, LV, and DC upon exercise interruption[16] [.]Vasodilator mediator substances, such as nitric oxide, also contribute to post-exercise BP reduction[17] [.][18] .

CONCLUSION

The present study identified that normotensive runners undergoing road running training in two protocols had higher blood pressure values immediately after both exercise sessions in a similar magnitude, but did not demonstrate post-exercise hypotension in either protocol. However, a tendency toward rapid normalization of SBP was observed, whereas DBP response was significantly higher than in the continuous protocol, at 40 minutes post-exercise.

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