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Evaluation of a CrossFit® Session on Post-Exercise Blood Pressure

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ABSTRACT

Dantas TSP, Aidar FJ, de Souza RF, de Matos DG, Ferreira ARP, Barros NA, dos Santos MDM, Barros GO, Santos CRR, da Silva Júnior WM. Evaluation of a CrossFit® Session on Post-Exercise Blood Pressure. **JEPonline** 2018; 21(1):44-51. The aim of this study was to evaluate the effects of a CrossFit® session on hemodynamic indicators. Ten males between 18 and 35 yrs of age with at least 12 months of experience in CrossFit® participated in this study. The Treatment consisted of a single CrossFit® Session during which the subjects performed the EMOM (Every Minute On the Minute). The Control Session consisted of traditional bodybuilding (4 sets of 10 reps of leg press and 4 sets of 10 reps of bench press with rest between the 2 min series). Both Sessions were separated by 72 hrs of rest. Compared to the Control Session responses, the findings indicate significant differences in SBP soon after the CrossFit® intervention (P=0.002) and 40 min later (P=0.021), significant differences (P = 0.042) in DBP 40 min after the CrossFit® intervention, and significant difference in MAP 40 min after the Crossfit® intervention (P=0.004). The findings indicate that it is reasonable to conclude that the dose-response curve of the exercise in hypertensive patients may be decreased starting with the first session, which will empower the result of the current study in relation to the hypotensive effect of Crossfit® in a single session.

Key Words: Crossfit®, Exercise, Hypotension

INTRODUCTION

Systemic arterial hypertension (SAH) is considered a major risk factor for cardiovascular diseases (12), and it is highly prevalent in terms of mortality (10). As a way to avoid the use of several medications for SAH that often have side-effects, aerobic exercise is prescribed (3,6,15,19). Interestingly, several studies (18,21,25) also indicate that the prescription for an intense aerobic exercise training protocol is superior to a moderate intensity training program in decreasing cardiovascular risk factors (18,21,25).

On the other hand, research has shown that regular resistance exercise is also helping in controlling systemic arterial pressure in both normotensive and hypertensive individuals (1,7,24), especially in regards to hypertension (8). One of the beneficial effects of resistance training (RT) is post-exercise hypotension (PEH), which would help in decreasing blood pressure (BP) to levels lower than resting values. As such then, the use of RT would be considered as a non-pharmacological means of treating hypertension (2,14,16,23).

When combining several types of exercises for to help reduce SAH, CrossFit® is an alternative form of exercise that consists of different functional exercises that are varied in high intensity with lifting exercises, running and fitness (20). Also, the purpose of this study was to evaluate the effects of a Crossfit Session on hemodynamic indicators versus a Control Session.

METHODS

Subjects

Ten male subjects between 18 and 35 yrs (29 ± 6.32 yrs) with at least 12 months of experience in the Crossfit® modality participated in this study. The following exclusion criteria were used: (a) recent hospitalization; (b) symptomatic cardiorespiratory disease or cardiac abnormalities; (c) metabolic syndrome, renal or hepatic disease; (d) cognitive impairment; (e) progressive or debilitating condition; (f) marked obesity with inability to exercise; (g) muscle or tendon damage in the last months; (h) under treatment for infectious diseases; (i) using any type of medication that changes the cardiovascular, hormonal, and/or metabolic responses; (j) presently on a weight loss program; and/or (k) other medical contraindication to physical exercise.

All subjects were submitted to a familiarization/test session of the evaluation methods prior to the training session and submitted to a pre-training and post-training evaluation. The subjects were informed about the study, and each subject signed the authorization (Term of Free and Informed Consent) to participate in accordance with resolution 466/2012 of the National Commission of Ethics in Research - CONEP, National Health Council and the principles ethics expressed in the Declaration of Helsinki (1964, reformulated in 1975, 1983, 1989, 1996, 2000, 2008, and 2013) of the World Medical Association.

Procedures

The anthropometric evaluation was performed according to methodology of João (13) using a Cardiomed stadiometer WCS (Cardiomed, Brazil) with an accuracy of 115/220 cm. Body mass was measured on an electronic scale (Filizola Personal Line Model150I Filizola, Brazil) with a resolution of 100 g and a maximum capacity of 150 kg.

Systolic blood pressure (SBP), diastolic blood pressure (BPD), mean arterial pressure (MAP = DBP + [SBP - DBP] ÷ 3) and HR were measured before and immediately after the training session using the Microlife 3AC1-1PC automated non-invasive monitor (Microlife, China) (22). Rate pressure product (RPP) was evaluated according to the following equation: RPP = HR X SBP, where HR = Heart rate. All BP measurements were taken on the left arm and the cuff attachment on the arm was ~2.5 cm from the forearm. The pre-exercise blood pressure did not exceed 160 and 100 mmHg for SBP and DBP, respectively. Initially, the subjects remained comfortably seated for 10 min in a calm and mild environment. They were instructed to avoid the Valsalva maneuver throughout the movement, which is in agreement with the guidelines of the Brazilian Society of Hypertension (17).

In order to evaluate the occurrence of post-exercise hypotension, BP and HR were also measured at rest, at the peak exercise (i.e., immediately in the final session of exercise), and in the sitting position (at rest) at 5, 10, 20, 30, 40, 50, and 60 min after the exercise session (17). To determine the subjects' myocardial oxygen consumption (MVO_2), the following regression equation was used: MVO_2 ($mL \cdot 100\ g\ LV \cdot min^{-1}$) = [double product (DP) x 0.0014] – 6.37. The subjects' HR was monitored along with blood pressure by means of a heart rate monitor (Polar RS 800CX, Kempele, Finland).

The subjects were submitted to a familiarization session before the test to be accustomed to the evaluation method. The subjects were evaluated before and after the intervention. The test (Treatment) consisted of a single Crossfit® Session, performing the EMOM (Every Minute On the Minute) workout (i.e., every minute you start a new task, and as soon as you finish, you rest the rest of the minute). The following repetitions and exercises were used during the Crossfit Session: (a) 20 kettlebell reps; (b) 15 wallballs; and (c) 50 doubleunders for 1 min each set of exercises and repeated in 7 rounds. The Control Session consisted of a traditional bodybuilding session composed of 4 sets of 10 reps of leg press and 4 sets of 10 reps of bench press with rest between the 2 min series, being the interventions separated by 72 hrs of rest between them.

It is important to mention that prior to both training sessions a 10-min warm-up was performed in which the subjects performed the same exercises with less intensity and number of repetitions. The execution of the exercises was standardized according to the methodology of Crossfit® Inc. (9). All tests were performed with the same examiner present and on the same equipment. All subjects were instructed not to perform any other exercise 24 hrs before the day the experiment occurred.

Statistical Analyses

All statistical analyses were performed using the SPSS 22.0 software (IBM, USA). The variables were presented through the central tendency measures (mean ± standard deviation). For the verification of normality the Shapiro Wilk test was used, considering the sample size. Analysis of the comparison between the groups over the periods was performed with Analysis of Variance – Two Way ANOVA (Group X Moment), and *post hoc* Bonferroni. In order to verify the size of the effect, the Cohen f2 test was used, in addition to the cut points 0.02 to 0.15 with small effect, from 0.15 to 0.35 as medium and greater than 0 (11). Statistical significance was set at P<0.05.

RESULTS

Figure 1 shows the kinetics of the systolic blood pressure (SBP), Figure 2 shows the diastolic blood pressure (DBP). Figure 3 shows the mean arterial pressure (MAP), and Figure 4 shows the Heart Rate (HR). In Figure 5 double product (DP) is presented, and in Figure 6 MVO_2 is indicated for both the Crossfit® Session and the Control Session.

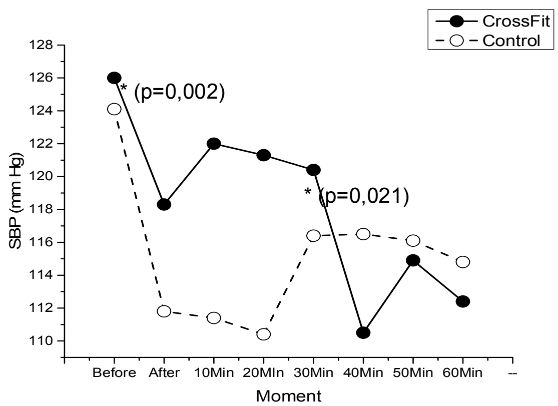

Figure 1. Systolic Blood Pressure Before, After Exercise up to 60 Min After the Crossfit Session and Control Session.

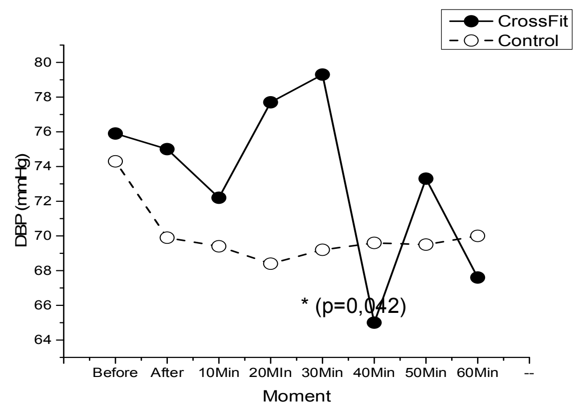

Figure 2. Diastolic Blood Pressure Before, After Exercise up to 60 Min After the Crossfit Session and Control Session.

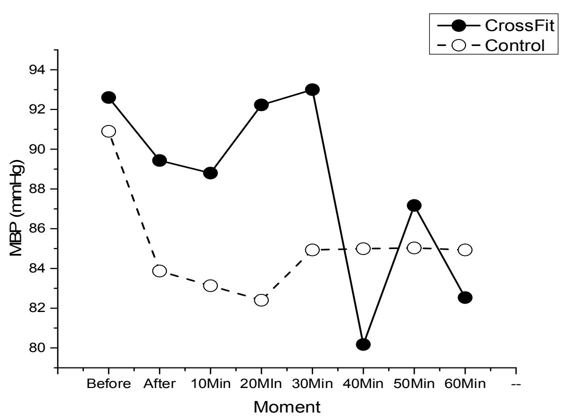

Figure 3. Average Blood Pressure Before, After Exercise up to 60 Min After the Crossfit Session and Control Session.

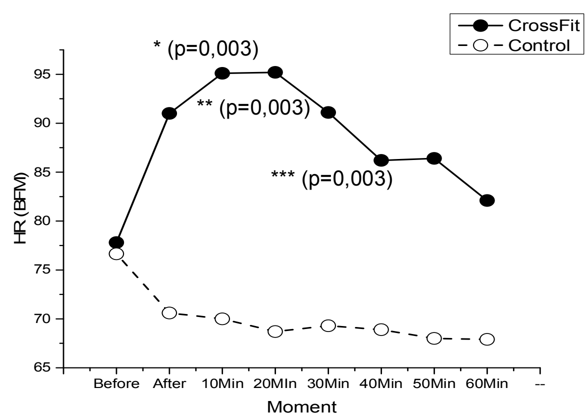

Figure 4. Heart Rate Before, After Exercise up to 60 Min After the Crossfit Session and Control Session.

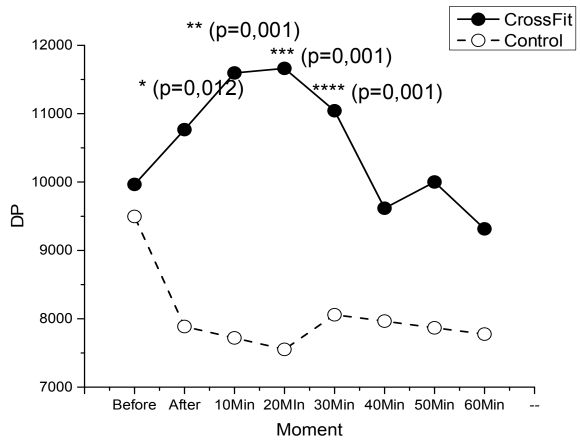

Figure 5. Double Product Before, After Exercise up to 60 Min After the Crossfit Session and Control Session.

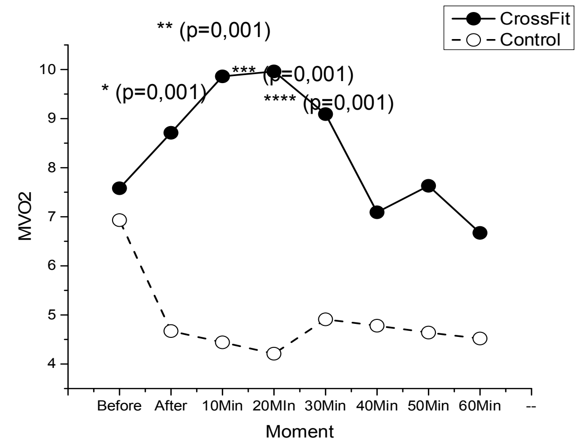

Figure 6. MVO_2 Before, After Exercise up to 60 Min After the Crossfit Session and Control Session.

Figure 1 shows significant differences in SBP soon after Crossfit Session (P=0.002) and 40 min later (P=0.021) in relation to the Control Session. In Figure 2, DBP showed significant differences (P = 0.042) at 40 min after the Crossfit Session in relation to the Control Session. In Figure 3, MBP at 40 min showed significant differences (P = 0.004) in Crossfit Session compared to Control Session. Figure 4 shows the Crossfit Session resulted in significant differences in HR at 10, 20, 30, and 40 min (P=0.003) versus the Control Session. In Figure 5, DP is significantly different after the Crossfit Session versus the Control Session (P=0.012), and at 10, 20, 30, and 40 min (P=0.001). In Figure 6, the Crossfit Session showed significant differences in MVO_2 after 10, 20, 30, and 40 min (P=0.001) versus the Control Session. The effect size was small for SBP (0.142), DBP (0.128), and MBP (0.148), and was large for HR (0.590), DP, and MVO_2 (0.410).

DISCUSSION

This study demonstrated that a Crossfit® session reduced SBP by 14 ± 1.92 mmHg and DBP by 5 ± 1.47 mmHg. The findings indicate the effectiveness of the training methodology in relation to the hypotensive effect generated in the evaluated sample. Thus, the present study demonstrates an interaction with the other training techniques previously studied, where there was no difference in relation to the Control Session, a considerable drop in SBP, DBP, and MBP was observed at 40 min post-training.

Cunha et al. (4), when studying post-exercise hypotension in hypertensive subjects submitted to aerobic exercise of varying intensities (EVI) and constant intensity exercise (CIE), found a significant difference in SBP in both exercise sessions and in DBP only after CIE. Thus, with MBP that presented a decrease after CIE, that is, because Crossfit® is a varied exercise activity, it seems apparent that only the SBP presented similar behavior among the studies in relation to the effect, differentiating only as to the moments.

The heart rate presented significant differences in relation to the previous one at the time after, 10 and 20 min. Cunha et al. (4), mainly in relation to EVI and the same behavior can also be found in João et al. (13). They investigated behavior (50% or 75% of VO_2 peak), where HR was higher post-exercise with greater intensity, and the most significant elevation was in the 15 min post, which was very close to our study that showed a higher elevation at 20 min after.

Damorim et al. (5) evaluated hypotensive kinetics during 50 strength and aerobic training sessions in hypertensive patients in a randomized clinical trial. They found an interaction between the methods that indicated a hypotensive effect for both, but was slightly higher for the aerobic exercises in relation to strength training. Although there is a difference in the methodology of the studies, we can verify that the present study presented the same response in relation to SBP, because Damorim et al. (5) reported that there was a stabilization of SBP until the 20th session for both groups and of the PAD until the 20th session for strength training and until the 10th session for aerobic training. Thus, we can verify the effectiveness of the study when analyzing the hypotensive effect in a single session, but in the case of hypertensive individuals the ideal would be the continuation of the training for more sessions.

Even more clearly, the efficacy of the Crossfit® session was observed when compared to the study by Viecili et al. (23). They analyzed the dose-response curve of exercise in hypertensive subjects and observed that there were no significant changes from the 5th session to the 12, thus maintaining the same levels of the maximal hypotensive effect expressed as percentage (EHM%).

CONCLUSION

It is reasonable to conclude that the dose-response curve of the exercise in hypertensive subjects may be decreased starting with the first session, which will empower the result of the current study in relation to the hypotensive effect of Crossfit® in a single session.

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