26 - CARDIOVASCULAR RESPONSES IN ACUTE LEG-PRESS EXERCISE IN YOUNG PEOPLE USING DIFFERENT TRAINING PROTOCOLS

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INTRODUCTION

The practice of resistance exercises emphasizing strength training consists of a key part in prescribing exercise programs (Polito et al., 2004 a). This is justified because the increased force is crucial to the development of physical fitness, athletic and functional activities (Pond et al., 2004), at all stages of life (Barelli et al., 2004), regardless of state of health or prevention (Amorim et al., 2004) and rehabilitation of diseases.

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It should be noted that the exercise prescription must be based on effective control of some variables, such as heart rate (HR), blood pressure (BP) and double product (DP), since they have direct relation to cardiovascular health (Fleck, 2002), minimizing the risk in people with potential for the development of coronary artery disease (Rebelo et al., 2001). This really is necessary because exercise promotes changes in the mechanisms that regulate and determine the cardiovascular responses, particularly BP (Werneck and Ribeiro, 2004).

The control of cardiovascular responses depends on several factors, such as the choice of exercise and its intensity (ASEAN et al., 2004), and be influenced by variables such as speed of movement, number of sets, repetitions, type of muscle contraction, mass muscular, respiratory pattern, training status and the recovery interval, implying that the duration of the activity may be one factor also by changes in the hemodynamic responses to strength training (Polito etal.,2004b).

Obeying the ACSM guidelines, should be prescribed full range of multi-joint exercises, as they will facilitate the development of functional strength, knowing that the multi-joint exercises are more DP in relation to the single joint (ACSM, 2003). However, the study of cardiovascular control during exercise of power is scarce in younger age groups. This gap needs to better understanding, aimed at developing appropriate exercise programs for young people who initiate or participate in sports training aimed at performance, for example.

In this context this study aimed at assessing the acute cardiovascular responses during and after the execution of the leg-press in young soccer players.

MATERIALS AND METHODS

The sample consisted of 10 male subjects (16 ± 1 years, 58.9 ± 7.3 kg, 1.7 ± 0.1 m), soccer players CR Vasco da Gama - Core Resende, training for the at least 1 year with no experience in strength training on specific equipment. All were volunteers, signing a consent form, according to Resolution 196/96 of the National Health for human experiments.

Data collection began with the measure of morphological components and the test of 10RM leg press (Righetto). All procedures were performed at the same time (about 15h) and without any previous effort. The strength test was performed with the sample sitting, kneeling in the initial position of 90 th and final position with a total length of knees. It was determined a time of 2 seconds for each stage of concentric and eccentric contraction, regulated by a metronome (Vox). Were allowed up to three attempts to obtain the load, with an interval of 2 min recovery between them. We established a 72 h period of rest for the post-test assessed return to the implementation of procedures for testing of different methods of strength training. The subjects sat at rest for a period of 10 minutes to measure HR and BP. After this phase, led to a warming of 5 minutes on a cycle ergometer at a speed of 50 rpm and no load, and then again measured cardiovascular variables. After the warm-up period, three were executed in the leg-press series with loads of 50, 75 and 90% of 10RM, Methods of Lorme, 1948 (cited COSSENZA, 1995) respectively, at intervals of 2 min between sets. After 48 hours, a new collection was carried out following the same procedures above, and the execution of the three series in the leg-press occurred, respectively, with loads of 90, 75 and 50% of 10 RM, Method Oxford (cited COSSENZA, 1995).

The HR measurement was performed using electronic frequency meter Polar, model A1. The BP was measured according to the procedures proposed by Polito et al. (2004), by auscultation using a mercury sphygmomanometer (Missouri) and stethoscope (Pressure). An appraiser with experience in the measurement of BP performed all measures, both at rest and under stress. The fixation of the cuff followed the established criteria, such as distance of approximately 2.5 cm from the bottom of the left arm and antecubital fossa, this member being fixed in position to shoulder height, a flat surface. The emptying of the cuff inflated after it occurred at a rate of 2.5 mmHg per second to distinguish between the 1st and 5th Korotkoff sounds corresponding to the values of systolic blood pressure (SBP) and diastolic (DBP). The procedure for emptying the cuff coincided with the start of the penultimate repeat, allowing the registration of the SBP simultaneously finish the last repetition, while the DBP was measured up to approximately five seconds after the end of the repetitions. The HR record is simultaneous to the extent of SBP in order to observe the actual value of the product (RPP). To see if there was also a significant difference in post-exercise measurements recorded at intervals of 5 minutes to complete 20 minutes of rest, with subjects seated in a comfortable position.

STATISTICAL ANALYSIS

Data were analyzed using ANOVA with repeated measures two entries followed by post-hoc test of Fisher and a significance of $p < 0.05$. We used the program Statistica 5.5 (Statsoft, USA) in the treatment of the data presented in Table1.

RESULTS

The results obtained and analyzed using descriptive statistics for mean and standard deviation are presented in Tables I and II, according to the methods of training Lorme (increasing loads) and Oxford (decreasing load), respectively. For FC,

no difference was found between methods (F = 0.16, p = 0.70). However, there was a significant increase in the Heat FC, FC, S1, S2 FC and FC S3 in relation to levels of Rep and Rec 5, Rec 10, Rec 15 and Rec 20 (F = 116.8, p <0.001). In the method of Oxford, was greater than Heat FC FC FC S2 and S3 (p <0.01) and HR was higher than S1 S3 FC (p <0.001). As to the method of De Lorme, Heat FC FC was higher than S1 and S3 lower than FC (p <0.05), HR was lower than the S1 S2 FC and FC S3 (p <0.05) and lower HR S2 FC to S3 (p <0.01). There was a significant interaction effect between methods (F = 5.38, p <0.01), indicating an increasing behavior of the FC to the method of De Lorme and decreasing to Oxford, where he notes that the HR at the end recovery returned to baseline values, resting heart rate, while the method of Lorme, the final HR recovery did not get the same result, remaining a value above the resting HR.

Similar behavior was observed for SBP, no difference was observed between the methods (F = 0.24, p = 0.63). However, there was a significant increase in SBP Heat, SBP S1, S2 and SBP S3 in relation to levels of Rep and Rec 5, Rec 10, Rec 15 and Rec 20 (F = 80.15, p <0.001). Within each method, De Lorme, Heat SBP SBP was less than S2 and S3 SBP (p <0.001), SBP was less than S1 S2 and S3 SBP (p <0.01), no different SBP and S2 S3 SBP (p = 0.34). In Oxford, only SBP was higher than S1 Heat SBP (p <0.001). There was also a significant interaction between methods (F = 3.75, p <0.02), indicating an increasing behavior of the SBP to the method of De Lorme and decreasing to Oxford, with the nuance that, even without statistically significant differences in the method of increasing load the final values of SBP remained above resting values, whereas the method decreasing the final values of SBP were below resting values, indicating a higher likelihood of post-exercise hypotension in this method.

With regard to DP, there was no difference between methods (F = 0.0003, p = 0.99), with higher DP Heater, DP S1, S2 and DP DP S3 in relation to levels of 5 and Rec Rep , Rec 10, Rec 15 and Rec 20 (F = 86.2, p <0.001). With regard to the method of De Lorme, SD Heat was less than DP and DP S3 S2 (p <0.05), SD was smaller than DP S1 S2 S3 and SD (p <0.01), and S2 was DP DP lower than S3 (p <0.05). As for Oxford, PA was higher than S1 Heat SD, SD SD S2 and S3 (p <0.05). Equally significant interaction was observed between the methods (F = 5.31, p = 0.02). Did not hold a significant difference between methods, the final values of DP as a factor have a greater interest in the DP method of decreasing load (Oxford), by virtue of a greater ultimate recovery of CF, since there was not difference between the values PAS in both methods, but that does not indicate a greater effect on the myocardium, because the values achieved in reality represent the initial values of DP on this test.

TABLE 1 - Mean values with standard deviation of HR, SBP, DBP, SD and% of load by the method of Lorme

	Rep	Aqu	S1	S2	S3	P1	P2	P3	P4
FC	71,8 ± 8,74	114,1 ± 13,14	103,6 ± 17,02	112,7 ± 18,09	123,1 ± 22,83	74,8 ± 10,53	73,7 ± 9,07	74,2 ± 8,35	73 ± 8,31
PAS	108 ± 6,32	140 ± 12,47	148 ± 14,76	164 ± 19,55	169 ± 19,69	109 ± 7,38	106 ± 8,43	107 ± 8,23	110 ± 6,67
PAD	77 ± 8,23	67 ± 9,49	69 ± 12,87	77 ± 29,08	71 ± 20,25	72 ± 6,32	72 ± 9,19	74 ± 6,99	75 ± 5,27
DP	7764 ± 1127,4	15986 ± 2454,04	15451 ± 3690,70	18617 ± 4614,35	21068 ± 6139,39	8151 ± 259,97	7811 ± 1124,8	7925 ± 936,22	8033 ± 1065,5

TABLE 2 - Mean values with standard deviation of HR, SBP, DBP, SD and% of load by the method of Oxford

	Rep	Aqu	S1	S2	S3	P1	P2	P3	P4
FC	75,7± 7,92	122,7± 18,55	119,3± 23,82	112,6± 22,15	105,3± 19,20	79,3± 9,64	75,2± 8,36	74,7± 6,82	75,7± 9,65
PAS	112± 9,19	140± 11,55	160± 23,09	150± 25,39	147± 22,63	107± 6,75	110± 6,67	110± 7,89	110± 9,43
PAD	74± 5,16	68± 6,32	80± 15,63	78± 7,89	73± 10,59	71± 5,68	73± 4,83	70± 8,76	70± 4,71
DP	8472± 1069,4	17155± 2622,93	19397± 5991,47	17091± 5667,29	15694± 4715,70	8492± 1254,47	8263± 935,64	8072± 962,40	8317± 1231,9

DISCUSSION

The results indicate an expected behavior since acute increase and reduction of hemodynamic parameters in relation to the method to be applied, according to the literature. In the implementation of dynamic exercises observed an increase in sympathetic nerve activity, triggered by activation of central command, muscle mechanoreceptors, and depending on the intensity of muscle metaborreceptores (Forjaz and TINUCI, 2000) and then as a response to this increased activity sympathetic increase in HR, stroke volume (SV) and DC, with an increase in SBP and DBP reduction or maintenance, due to vasodilation in active muscles, the production of muscle metabolites (Forjaz et al., 1998). Depending on the load intensity are observed in the implementation of high-intensity resistance exercises, static and dynamic components, so that the cardiovascular response to these exercises depends on the contribution of each of these components (Forjaz et al., 2003), and also a factor in determining the magnitude of hemodynamic responses.

With respect to the FC results are consistent with the literature regarding the increase in HR and resistance exercise, according to studies by Efron (cited in Leite and Farinatti, 2002), not exceeding 70% of maximal HR (204 bpm) because the subjects reached in the implementation effort with 90% of maximum load, the values of 60% (De Lorme) and 58% (Oxford) HR max. These values showed no statistically significant difference.

Strength training tends to give as answer, with continued exposure to stress, influence the hemodynamic performance and exercise at home, tending to decrease in the DP (McCartney et al. Farinatti apud, 2002). The DP is a considered a good parameter indicative of cardiac overload associated with resistance exercise, strength training, (Leite and Farinatti, 2002), which is derived from the SBP and HR, and this parameter, especially , was responsible for the higher values in the execution of the method of decreasing load (Oxford), where individuals started with a HR greater than when performed Lorme In the method, which corroborates the various studies, since they are related to young athletes find answers to the increase in CO by increasing HR and not due to the increase of the VS, as compared to the PA, the different responses also depend on factors such as age and size of the young, which may lead to differences when compared with adults, there was also a dissociation of metabolic demand and BP, when the performance of resistance exercises, and both SBP and DBP increase than expected and take longer to return to resting values after performing this type of exercise (Ghorayeb and DioGuardi , 2007).

By analyzing the behavior of SBP did not find statistically significant differences between the methods, but with the observation that the Oxford method to reduce this parameter is given below resting values, while the method of Lorme the same

behavior was not observed, which could lead to discuss the possibility that this method to post-exercise hypotension may be an important factor in determining the method for exercise prescription for hypertensive patients.

With regard to the behavior of the cardiovascular responses after resistance exercise, there has been growth, maintenance, and even decreased SBP and maintenance or decrease in DBP after exercise, according to studies Forjaz et al (in NEGRÃO and Barreto, 2005). More recent studies point to the duration of this effect, called post-exercise hypotension, different responses were found with the methods employed, which consisted of different types of exercise, time of contraction, recovery interval, number of repetitions, intensity and duration of exercise. Since this last item we find studies Forjaz et al (1998), where it was determined that the response of postexercise blood pressure drop is directly related to the duration of the exercise, this response is due to a reduction in CO, caused by the decrease in VS , Forjaz et al (in NEGRÃO and Barreto, 2005), since the reduction of CF depends on different factors, such as vagal and sympathetic activity (Araujo and Almeida, 2003). In studies of Brum et al (2004), the effect of resistance exercise on the BP fall is similar to that found in aerobic exercise, but more studies are needed for the duration of this effect, and also that the mechanisms responsible for the hypotensive response vary with the type of exercise and the population studied, and also an important factor the ability to relax after running the year in question.

CONCLUSION

This study aimed to evaluate the acute responses of the leg-press exercise hemodynamic responses in the two methods of strength training, with equal intensities and different order of execution, no significant differences between them, both for HR, SBP and DP. Minor changes were noted in the final stages of recovery for HR and SBP, where the method of decreasing load (Oxford) presented values close to those at rest, while the method of increasing load (De Lorme) did not repeat the initial results from home.

Several factors may influence the hemodynamic responses to exercise in both resistance exercise and the aerobic, and our study sought to control some of these factors, such as contraction time, intensity, duration and recovery, we can infer that in future studies on the subject proposal provides much information about the execution order and intensity of exercise on the applicability to individuals housed in a physical activity program.

We suggest that further studies can be performed with different samples, both in numbers and in training status, age, and lifestyle, so that the prescription of resistance exercise may be grounded in scientifically proven reasons.

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CARDIOVASCULAR RESPONSES IN ACUTE LEG-PRESS EXERCISE IN YOUNG PEOPLE USING DIFFERENT TRAINING PROTOCOLS

ABSTRACT

The purpose of this study was to determine the acute cardiovascular responses to blood pressure (BP), heart rate (HR) and double product (DP) in young, measures taken before, during and after the leg-press exercise performed in different protocols training. The sample consisted of 10 young (16 ± 1 years), body mass (58.9 ± 7.3 kg) and height (1.7 ± 0.1 m), soccer players CR Vasco da Gama-Core Resende without experience in strength training. The data were collected on alternate days.

The first day we tested the 10RM load in leg-press exercise. On the second day, there were three sets of 10 repetitions with loads of 50, 75 and 90% of 10RM, Methods of Lorme. On the last day, there were also three sets of 10 repetitions, with loads of 90, 75 and 50% of 10RM, Oxford Method. To measure a frequency FC was used, BP was measured by auscultation. The measurements were performed at rest at the end of heating and of each series and for 20 min (in periods of 5 min post-exercise). ANOVA was used for two entries with repeated measures followed by post-hoc test of Fisher and a significance of p <0.05. There were no differences between the methods for HR (F = 0.16, p = 0.70), SBP (F = 0.24, p = 0.63) and SD (F = 0.0003, p = 0 , 99). However, there was a significant interaction effect between the methods for HR (F = 5.38, p <0.01), SBP (F = 3.75, p <0.02) and SD (F = 5.31 p = 0.02), indicating an increasing trend in all the variables for the method of De Lorme and decreasing to Oxford. We conclude that, according to the data found in this sample, the relationship between exercise with a method of increasing or decreasing load does not change sharply SBP, HR and DP does not result in significant changes in these parameters.

KEYWORDS: BloodPressure, Heart Rate, Double Product

LES RÉPONSES CARDIOVASCULAIRES À LA PHASE AIGUË LEG-PRESS EXERCICE DANS JEUNES EN UTILISANT DES PROTOCOLES DE FORMATION DIFFÉRENTES

RÉSUMÉ

L'objectif de cette étude était de déterminer les réponses cardiovasculaires aiguës à la pression artérielle (PA), fréquence cardiaque (FC) et double produit (DP) chez les jeunes, les mesures prises avant, pendant et après l'exercice leg-press effectuées dans les différents protocoles de formation. L'échantillon se composait de 10 jeunes (16 ± 1 ans) de masse corporelle, (58,9 ± 7,3 kg) et la hauteur (1,7 ± 0,1 m), le football joueurs CR Vasco da Gama-Core Resende sans expérience dans l'entraînement en force. Les données ont été collectées sur deux jours. Le premier jour nous avons testé la charge dans la jambe 10RM-presse de l'exercice. Le deuxième jour, il y avait trois séries de 10 répétitions avec des charges de 50, 75 et 90% de 10RM, Méthodes de Lorme. Le dernier jour, il y avait également trois séries de 10 répétitions, avec des charges de 90, 75 et 50% de 10RM, Méthode d'Oxford. Pour mesurer une fréquence FC a été utilisé, BP a été mesuré à l'auscultation. Les mesures ont été effectuées au repos à la fin du chauffage et de chaque série et pour 20 min (dans les périodes de 5 minutes post-exercice). ANOVA a été utilisée pour deux entrées avec des mesures répétées suivie par test post-hoc de Fisher et une signification de p <0,05. Il n'y avait pas de différences entre les méthodes pour les RH (F = 0,16, p = 0,70), SBP (F = 0,24, p = 0,63) et SD (F = 0,0003, p = 0 , 99). Cependant, il y avait un effet d'interaction significative entre les méthodes pour les RH (F = 5,38, p <0,01), SBP (F = 3,75, p <0,02) et SD (F = 5,31 p = 0,02), indiquant une tendance croissante dans toutes les variables pour la méthode de De Lorme et diminuant à Oxford. Nous concluons que, selon les données trouvées dans cet échantillon, la relation entre l'exercice d'une méthode d'augmenter ou de diminuer la charge ne change pas brutalement SBP, RH et DP ne résulte pas en des changements significatifs dans ces paramètres.

MOTS-CLÉS: Pression artérielle, fréquence cardiaque, de produits à double

LAS RESPUESTAS CARDIOVASCULARES AGUDA EN EL EJERCICIO DE LA PIERNA DE PRENSA EN LOS JÓVENES UTILIZANDO DIFERENTES PROTOCOLOS DE ENTRENAMIENTO

ABSTRACTO

El objetivo de este estudio fue determinar la respuesta cardiovascular aguda de la presión arterial (PA), frecuencia cardíaca (FC) y el doble producto (DP) en las medidas de los jóvenes, antes, durante y después del ejercicio de la pierna de prensa realizada en los diferentes protocolos entrenamiento. La muestra estuvo conformada por 10 jóvenes (16 ± 1 años) de masa corporal (58,9 ± 7,3 kg) y altura (1,7 ± 0,1 m), los jugadores de fútbol CR Vasco da Gama-Core Resende sin experiencia en el entrenamiento de fuerza. Los datos fueron recolectados en días alternos. El primer día hemos probado la carga de 10RM en el ejercicio de la pierna-prensa. En el segundo día, hubo tres series de 10 repeticiones con cargas de 50, 75 y 90% de 10RM, los métodos de Delorme. En el último día, también hubo tres series de 10 repeticiones, con cargas de 90, 75 y 50% de 10RM, Método de Oxford. Para medir la frecuencia FC fue utilizada, PA se midió por auscultación. Las mediciones se realizaron en reposo al final del calentamiento y de cada serie y durante 20 minutos (en períodos de 5 min después del ejercicio). ANOVA de dos entradas con medidas repetidas seguido por test post-hoc de Fisher y una significación de p <0,05. No hubo diferencias entre los métodos de FC (F = 0,16, p = 0,70), presión arterial sistólica (F = 0,24, p = 0,63) y DP (F = 0,0003, p = 0 , 99). Sin embargo, hubo una interacción significativa entre los métodos de FC (F = 5,38, p <0,01), presión arterial sistólica (F = 3,75, p <0,02) y SD (F = 5,31 p = 0,02), lo que indica una tendencia creciente en todas las variables por el método de Lorme y la disminución de Oxford. Llegamos a la conclusión de que, de acuerdo con los datos encontrados en esta muestra, la relación entre el ejercicio con un método de aumentar o disminuir la carga no cambia drásticamente la PAS, FC y DP no da lugar a cambios significativos en estos parámetros.

PALABRAS CLAVE: Presión arterial, frecuencia cardíaca, el doble producto

RESPOSTAS CARDIOVASCULARES AGUDAS NO EXERCÍCIO LEGPRESS EM JOVENS UTILIZANDO DIFERENTES PROTOCOLOS DE TREINAMENTO

RESUMO

O objetivo do presente estudo foi verificar as respostas agudas cardiovasculares de pressão arterial (PA), freqüência cardíaca (FC) e duplo-produto (DP) em jovens, medidas realizadas antes, durante e após o exercício leg-press realizado em diferentes protocolos de treinamento. A amostra foi composta por 10 jovens (16 ± 1 ano), massa corporal (58,9 ±7,3 kg) e estatura (1,7 ± 0,1 m), jogadores de futebol do C.R. Vasco da Gama-Núcleo Resende, sem experiência no treinamento de força. A coleta de dados ocorreu em dias alternados. No primeiro dia foi testada a carga de 10RM no exercício leg-press. No segundo dia, foram realizadas três séries de 10 repetições com cargas de 50, 75 e 90% de 10RM, Método De Lorme. No último dia, foram realizadas igualmente três séries de 10 repetições, sendo as cargas de 90, 75 e 50% de 10RM, Método Oxford. Para mensurar a FC foi utilizado um frequencímetro, a PA foi mensurada pelo método auscultatório. As medidas foram realizadas em repouso, ao final do aquecimento e de cada série e durante 20 min (em períodos de 5 min pós-exercício). Foi utilizada a ANOVA de duas entradas com medidas repetidas seguida do teste post-hoc de Fisher e uma significância de p<0,05. Não foram constatadas diferenças entre os métodos para a FC (F=0,16; p=0,70), PAS (F=0,24; p=0,63) e DP (F=0,0003; p=0,99). No entanto, houve um efeito de interação importante entre os métodos para FC (F=5,38; p<0,01), PAS (F=3,75; p<0,02) e DP (F=5,31; p=0,02), indicando um comportamento crescente em todas as variáveis para o método de De Lorme e decrescente para o de Oxford. Concluímos que, de acordo com os dados encontrados nesta amostra, a relação entre se exercitar com um método de carga crescente ou decrescente não altera de maneira acentuada a PAS, a FC e o DP, não acarretando alterações significativas nestes parâmetros.

PALAVRAS-CHAVE: Pressão Arterial, Freqüência Cardíaca, Duplo Produto