# 69 - RESPONSES OF BLOOD PRESSURE IN YOUNG GUYS NORMOTENSIVE AFTER COMPLETION OF EXERCISE IN STATIONARY BIKE

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## INTRODUCTION

During performing exercises,it is perceived that the body displays physiological adjustments to meet the demands required for running your practice. Changes in the cardiovascular system is a form of the organism to adjust to these demands required, such as increased blood flow resulting from increased sympathetic nerve activity and decreased vagal activity, resulting in increase in systolic volume, heart rate and cardiac output causing the blood pressure (BP) shows increased during exercise (deBusk et al, 1978;. FORJAZ, 2000; BRUM et al., 2004).

Although the increase in BP is essential for the realization of the exercise, when this increase is exacerbated may pose risks to the performer (FILIPOVISKY et al., 1992). It is known that exacerbated or even abrupt increases in BP during exercise can lead to some kind of cerebral vascular accident (Vermer et al., 1997).

In fact, the magnitude of the increase in BP during exercise depends on its characteristics, such as duration and intensity that this is being developed (ACSM, 2010), but little is known of their answers after their practice, particularly when it comes aerobic exercises involving the upper and lower members at the same time.

The aim of this study was to evaluate blood pressure in normotensive immediately after the completion of a session of aerobic exercise, comparing the blood pressure responses between the experimental and control groups.

## MATERIALS AND METHODS

This is a randomized experimental study, conducted at the Laboratório de Fisiologia do Exercício (LAFEX), of the Escola de Educação Física e Fisioterapia de Goiás - ESEFFEGO, approved by the Research Ethics Committee of the Hospital de Urgências de Goiânia (HUGO ) /195.225.

Were selected for this study a sample of 50 young individuals of both sexes, were randomly divided into 2 groups of 25 subjects: Experimental Protocol - Stationary Bike (Pbike) and Control Protocol (Pcontrole).

For inclusion, participants signed the Informed Consent Form (ICF), be aged between 18 and 30 years, systolic blood pressure (SBP) equal to or below 130 mm Hg and diastolic blood pressure (DBP) equal to or below 85mmHg . Exclusion criteria, there were not obese (BMI> = 30 kg / m2), diabetes mellitus, CHF, cardiovascular event, IRC, orthopedic impairments, or any physical or mental limitation that prevented the exercises.

All volunteers, after signing the informed consent were submitted to clinical and physical assessment to identify the criteria for inclusion and exclusion of studies in LAFEX. Individuals attended the first visit before the start of data collection, given more detailed presentation and explanation about the research, where the subjects signed an informed consent and were submitted to clinical and physical assessment, addition to performing the adaptation / learning gestural of exercise proposed.

The Pbike protocol was performed with cycloergometer for lower limbs brand Aerobike R7, being a conventional stationary exercise bike. When they reached the place where the experiment (LAFEX) was performed, the individuals remained at rest in the sitting position for 10 minutes for the initial measurement of pre-exercise BP (semi-automatic device Omron 705 IT brand, endorsed by international organizations) position according to SBC (2010). After the individuals were submitted to a session of continuous exercise for 30 minutes (with moving upper and lower limbs), in intensity of 65% of Heart Rate Reserve. After exercise, the individuals sat on a chair to measure the blood pressure after exercise for 45 minutes in the moments immediately after (T / 0), after 15 minutes (T / 15), after 30 minutes (T / 30) and 45 minutes after exercise completion (T / 45).

The control protocol is a session control with BP measurements similar to the experimental session, but without performing any exercise. When they reached the place where it was held the control protocol (LAFEX), the individuals remained at rest in the sitting position for 10 minutes for the initial measurement of pre-exercise BP (semi-automatic device Omron 705 IT brand, endorsed by international organizations position ) according to SBC (2010). After, the individuals were in the lab for 30 minutes without performing any type of exercise. These might stand, talk, sit up, but was forbidden food intake. After this period, subjects sat on a chair to measure post-exercise for 45 minutes. The intensity of the sessions was controlled by heart rate that was measured continuously using a heart rate monitor (Polar RS 800 CX, USA).

To perform the analysis of the BP the software SPSS (; IBM Chicago, IL, USA version 20.0) was used. To assess the distribution of data normality, the Kolmogorov-Smirnov test was used. For intergroup comparison of mean values of the BP the t-student paired test was applied (normally distributed data) were considered significant 5%.

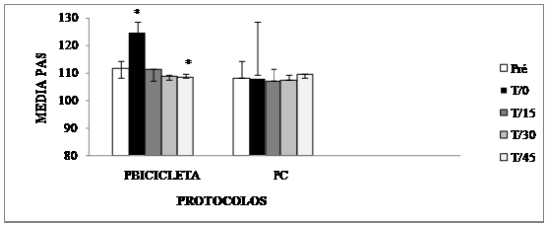
## RESULTS

While observing the data of DAP (pre, T / 0, T / 15 / T / 30 / T / 45), it was considered that increased significantly after exercise in experimental protocol (Pbike) except at T / 15 and T / 45 after exercise that was not submitted changes, while in the PC there was no significant change after the session compared to the pre moment.

| Momento | Bicicleta (n=25) | Controle (n=25) | p‡ |
|---|---|---|---|
| Pré | 111,6±11,7 | 108,2±7,9 | 0,151 |
| T/0 | 124,7±13,5* | 107,9±8,9 | **<0,001** |
| T/15 | 111,2±12,1 | 107,1±9,5 | 0,419 |
| T/30 | 108,9±13,1* | 107,5±8,6 | 0,898 |
| T/45 | 108,3±12,1 | 109,6±8,2 | 0,911 |

Values expressed in averages + standard deviations. * Difference from pre moment (p <0.05). ‡ t-student test.
Figure I: Behavior of systolic blood pressure (SBP) before the session, immediately after and every 15 to 45 minutes.
Source: Own authors, 2014.

After the session, the experimental protocol had increase of SBP. In Pbike decreased of SBP after exercise at all times, however, was significant only in T / 45. In Pc, there were pressure changes, but none was considered significant, and can be seen in Figure 2, below.




*Values of p<0,05.
Figure 2: Analysis of blood pressure responses (SBP) intragroup.
Source: Own authors, 2014.

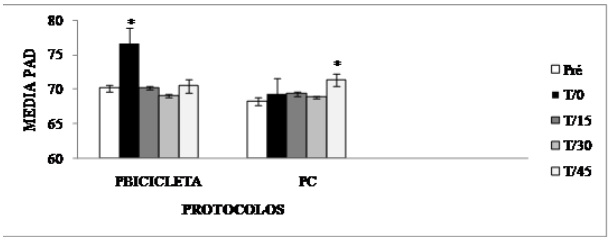
When analyzing the DBP, in the experimental protocol was observed a significant increase in the time immediately after exercise. In Pc increased significantly only when T / 45.

In the subsequent moments, there were no changes in DBP in Pbike protocol except at T / 45 in Pc. Comparing the moments between protocols (intergroup analysis), significant differences were observed only immediately after exercise protocols defined and no difference in others. DBP responses can be observed in Figure 3, below.

| Momento | Bicicleta (n=25) | Controle (n=25) | P‡ |
|---|---|---|---|
| Pré | 70,2±8,0 | 68,3±5,6 | 0,586 |
| T/0 | 76,8±8,1* | 69,4±5,5 | **0,001** |
| T/15 | 70,3±6,4 | 69,4±6,3 | 0,868 |
| T/30 | 69,1±7,3 | 68,9±5,2 | 0,919 |
| T/45 | 70,5±6,7 | 71,4±6,0* | 0,150 |

*Difference from pre moment - intragroup (p <0.05). Values expressed in averages ± standard deviations. ‡ t-student test.
Figure 3: Behavior of diastolic blood pressure (DBP) before the session, immediately after and every 15 to 45 minutes.
Source: Own authors, 2014.

Immediately after exercise, the Pbike group significantly increased DBP. And there was a change just at the moment T/45 in Pc, this increase can be in Figure 4, below.




*Values of p <0,05.
Figure 4: Analysis of the blood pressure responses (BPD) intragroup.
Source: Own authors, 2014.

**DISCUSSION**

In the experimental protocol Pbike of the present study we observed an increase in the SBP while in the PC there was no changes. This is justified because in aerobic exercise is increased sympathetic nerve activity, contributing to the increase in heart rate and cardiac output (Brum et al, 2004;. & Forjaz Tinucci, 2000). The DAP increased significantly immediately following the experimental protocol, whereas the control was only observed when T / 45 and then maintained with no alterations arising due to widespread vasodilation aerobic exercise, thus decreasing peripheral vascular resistance (& Forjaz Tinucci, 2000).

The post-exercise hypotensive effect may be influenced by aspects such as exercise intensity (Jones et al., 2000; FORJAZ et al, 2004;.. Piepoli et al, 1994), size of muscle mass involved during exercise (CASONATTO, 2009) and duration of the exercise session (JR Cardoso, 2005; MACDONALD JR et al, 2000).

In the study of young normotensive Lizardo et al. (2007) compared the hypotensive effect of different intensities of exercise on a treadmill and cycloergometer. The finding of this study is that exercise performed on a treadmill promotes greater postexercise hypotensive effect than exercise performed on a cycle ergometer. It is possible that the greater hypotensive effect of exercise performed on a treadmill is a function of the increased recruitment of muscle mass involved with respect to exercise on a cycle ergometer. Here there was no influence of exercise intensity on post-exercise pressor response.

A study of normotensive and hypertensive MacDonald Jr et al. (2000) it was demonstrated that aerobic exercise of moderate intensity performed in cycle ergometers are sufficient to cause a hypotensive effect, and 10 or 30 minutes of exercise promote same hypotensive response. Like the present study, our findings showed that one session of 30 minutes of continuous exercise is sufficient to promote postexercise reduction.

According to studies by Forjaz et al., (1998), 30 to 80% intensity of the peak VO2 being evaluated, the results of the hypotensive effect is not influenced by intensity, however, in recent studies, there evidences that higher the exercise intensity, greater the postexercise decrease (Jones et al., 2000; FORJAZ et al, 2004;. Piepoli et al., 1994).

According Casonatto (2009) exercises involving larger muscle mass may produce more ions and metabolites such as adenosine and potassium, which are directly linked to postexercise decrease effect, however, the sample of MacDonald et al. (2000), in a study in hypertensive subjects with cycloergometer active of arms compared with ergometer of legs noted that the

amount of muscle mass involved did not directly affect the magnitude of the hypotensive response.

As shown in some studies (MACDONALD JR et al., 2000; CASONATTO, 2009) a decrease in blood pressure after exercise is greater in magnitude in hypertensive individuals compared with normotensive individuals. But as observed in this study with normotensive BP decreased after exercise at all times in the Pbike, however, was significant only in T / 45, and significant postexercise decrease of SBP after exercise performed on a cycle ergometer was observed.

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**CONCLUSION**

Became clear that there was at the time immediately after the completion of the exercise, an increase of BP in the experimental group, however, this increase was not of great magnitude, so that worry us with the answers of the cardiovascular system when prescribing exercise bike exercise at an intensity equal to or close to 65% of FC.

After the session, there was a reduction of SBP at all times, however, was significant only when T / 30 in the Pbike, in the Pc were no pressure changes, but none was considered significant. The DAP, we obtained a significant increase immediately after the experimental protocol, whereas in controls, was observed only when T / 45.

Studies have demonstrated postexercise decrease after cyclic exercises such as cycling sessions, however, perhaps the sample size of this study was limited largest findings with respect to this interpretation. All medium values were under the pre exercise, however, were not statistically proven.

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**RESPONSES OF BLOOD PRESSURE IN YOUNG GUYS NORMOTENSIVE AFTER COMPLETION OF EXERCISE IN STATIONARY BIKE**

**ABSTRACT**

Introduction: Aerobic exercise causes different responses in the cardiovascular system. Objective: To evaluate the blood pressure responses of normotensive young subjects underwent a workout performed on a stationary bicycle. Methodology: experimental, and randomized study conducted in LAFEX, conducted with 50 young individuals of both sexes, and were divided into 2 groups (Pbike; Pcontrol), 25 subjects for each group. For realization of Pbike, an stationary bike exercise Movement brand, R7 model was used. Individuals in the experimental protocol were evaluated by intensity of 65% HR reserve, while Pcontrole was at rest. BP was measured at the moments: pre-exercise, immediately after (T / 0), 15 minutes (T / 15), 30 minutes (T / 30) and 45 minutes after exercise completion (T / 45). For BP measurement, was used a semi-automatic machine, brand ONROM 705 IT . For statistical analysis SPSS software (version 20.0) was used. The assessment of data normality is given by the Kolmogorov-Smirnov test. For intergroup and intragroup analysis, the T-Student test, with $p < 0.05$ was applied. Results: In protocol Pbike increased SBP after exercise, except at T / 15 and T / 45, while the PC was no significant change after the session compared to pre. The DAP had significantly increased in the experimental group, both at the time immediately after exercise. In PC increased significantly only when T / 45. Conclusion: The increase of BP in individuals tested were not of great magnitude cardiovascular ensuring the completion of the exercise even with postexercise decrease.

**KEYWORDS:** Blood pressure; Responses Of Blood Pressure; Aerobic exercise.

**REPONSES DE LA PRESSION ARTERIELLE DANS LES INDIVIDUS JEUNES NORMOTENDUS APRES LA REALISATION DE L'EXERCICE BICYCLETTE ERGOMETRIQUE**

**RÉSUMÉ**

Introduction : L'exercice aérobic cause des réponses variées sur le système cardiovasculaire. Objectif : Evaluer les réponses précises de la pression d'individus jeunes normotendus soumis à une séance d'exercice réalisée en bicyclette ergométrique. Méthodologie : Etude transversal et randomisée réalisée dans le LAFEX, faite avec 50 individus jeunes, de tous les deux sexes et partagés en 2 groupes (Pvélo ; Pcontrôle), 25 individus pour chaque groupe. Pour la réalisation du Pvélo, on a utilisé une bicyclette ergométrique de la marque Moviment, modèle R7. Les individus du protocole expérimental ont été soumis à l'intensité de 65% de la FC de réserve, pendant que le Pcontrôle restait en repos. La PA a été mesurée dans les moments : préexercice, immédiatement après (T/0), 15 minutes (T/15), 30 minutes (T/30) et 45 minutes après la réalisation de l'exercice (T/45). Pour la mesure de la PA, on a utilisé l'appareil semi-automatique de la marque OMROM 705 IT. Pour l'analyse statistique on a utilisé le logiciel SPSS (version 20.0). L'évaluation de normalité des données a été faite par le test de Kolmogorov-Smirnov. Pour l'analyse intergroupe et intragroupe, a été appliqué le test T-student, en considérant $p<0,05$. Résultats : Dans le protocole Pvélo, il y a eu une augmentation de la PAS après l'exercice, sauf dans les moments T/15 et T/45, pendant que dans le PC il n'y a pas eu d'altération significative après la séance quand cela est comparé au préexercice. La PDA a eu une augmentation significative dans le groupe expérimental, tous les deux dans le moment immédiatement après l'exercice. Dans le PC, il y a eu une augmentation significative seulement dans le moment T/45. Conclusion : L'augmentation de la PA dans les individus analysés n'a pas été de grande importance cardiovasculaire, en assurant la réalisation de l'exercice.

**MOTS-CLÉS :** Pression Artérielle ; Réponses de Pression; Exercice Aérobic.

**REACCIÓN DE LA PRECION ARTERIAL DE LAS PERSONAS JOVENES NORMOTENSOS DESPUES DE HACER BICICLETA**

**RESUMEN**

Introducción: El ejercicio aeróbico provoca diferentes respuestas en el sistema cardiovascular. Objetivo: Al Evaluar las respuestas de la presión arterial de los sujetos jovenes normotensos que se sometieron a un entrenamiento realizado en una bicicleta estacionaria. Metodología: transverso, estudio aleatorio llevado a cabo en Lafex e realizo con 50 personas jóvenes de ambos sexos. Estos fueron divididos en 2 grupos (Pbike; Pcontrole), 25 sujetos de cada grupo. Para la realización de Pbike, una marca Moviment bicicleta de ejercicio, se utilizó el modelo R7. Los sujetos en el protocolo experimental se evaluó la intensidad del 65% de reserva de recursos humanos, mientras que Pcontrole estaba en reposo. PA se midió en los momentos: antes del ejercicio, inmediatamente después (T / 0), 15 minutos (T / 15), 30 minutos (T / 30) y 45 minutos después de finalizar el ejercicio (t / 45). Para la medición de la PA OMROM semiautomática marca de máquinas de TI 705 se utilizó. Para el análisis estadístico software SPSS (versión 20.0) fue utilizado. La evaluación de la normalidad de los datos viene dada por la prueba de Kolmogorov-Smirnov. Para intergrupal y intragrupo análisis, la prueba t de Student, con $p <0,05$ se aplicó. Resultados: En el protocolo Pbike aumentaron la PAS después del ejercicio, excepto en T / 15 y T / 45, mientras que el PC hubo ningún cambio significativo después de la sesión en comparación con pre. La PAD se había incrementado significativamente en el grupo experimental, tanto en el momento inmediatamente después del ejercicio. En PC aumentado significativamente sólo cuando T / 45. Conclusión: El aumento de la PA en los individuos analizados no fueron de gran magnitud cardiovascular garantizar la realización del ejercicio.

**PALABRAS CLAVE:** Presión Arterial; Respuestas de la Presión; Ejercicio Aeróbico

**RESPOSTAS DA PRESSÃO ARTERIAL EM INDIVÍDUOS JOVENS NORMOTENSOS APÓS A REALIZAÇÃO DO EXERCÍCIO BICICLETA ERGOMÉTRICA**

**RESUMO**

Introdução: O exercício aeróbio provoca respostas diversas no sistema cardiovascular. Objetivo: Avaliar as respostas pressóricas de indivíduos jovens normotensos submetidos a uma sessão de exercício realizada em bicicleta ergométrica. Metodologia: Estudo transversal randomizado realizado no LAFEX, realizado com 50 indivíduos jovens de ambos os sexos e, divididos em 2 grupos (Pbike; Pcontrole), 25 indivíduos para cada grupo. Para realização da Pbike, foi utilizado uma bicicleta ergométrica de marca Moviment, modelo R7. Os indivíduos do protocolo experimental foram submetidos a intensidade de 65% da FC de reserva, enquanto o Pcontrole ficava em repouso. A PA foi aferida nos momentos: pré-exercício, imediatamente após (T/0), 15 minutos (T/15), 30 minutos (T/30) e 45 minutos após a realização do exercício (T/45). Para aferição da PA foi utilizado o aparelho semi-automático de marca OMROM 705 IT. Para análise estátistica foi utilizado o software SPSS (versão 20.0). A avaliação de normalidade dos dados se deu pelo teste de Kolmogorov-Smirnov. Para análise intergrupo e intragrupo, foi aplicado o teste T-student, considerando $p<0,05$. Resultados: No protocolo Pbike houve aumento da PAS após o exercício, exceto no momento T/15 e T/45, enquanto no PC não houve alteração significativa após a sessão quando comparado ao pré. A PAD teve aumento significativo no grupo experimental, ambos no momento imediatamente após o exercício. No PC teve aumento significativo somente no momento T/45. Conclusão: O aumento da PA nos indivíduos testados não foram de grande magnitude cardiovascular assegurando a realização do exercício.

**PALAVRAS-CHAVE:** Pressão arterial; Respostas Pressóricas; Exercício aeróbio.