161 - CORRELATION BETWEEN THE RESULTS OF HEMODYNAMICS VARIABLES OF EFFORT CARRIED THROUGH IN 2 TYPES OF ERGOMETERS

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ABSTRACT

It is called for a fact in the current literature, that the aerobic training, by itself, without the control in its accomplishment, does not attend to the necessities destined. Such controls are carried through the heart rate, blood pressure, Subjective Perception of discomfort and effort, METs, and in some cases, the generated by Blood Lactate levels in the effort. The objective of this study was to compare the alterations of the physiological parameters (Cardiac Frequency, Arterial Pressure, Blood Lactate concentration, Double Product and Subjective Perception of Effort) of individuals that are not sedentary, when submitted to a test with two types of ergometers - treadmill and Transport (T). The model of this study was descriptive and correlative. The type of the sample was intentional and none probabilistic. Ten men participated in this research, with the average and standard deviation with ages between 27, 20 ± 6, 05 years, the average height and standard deviation of 1,76m ± 0,08m and body mass of 79,79kg ± 10,49kg. The analysis of the results was made by means of descriptive statistics and later inferential statistics. In the Subjection Perception of Effort the values in the Treadmill test had been bigger in the intermediate periods of training and the Transport in the first and the last periods of training. In relation to Blood Lactate they had been bigger in the Treadmill than the Transport during the test as in the recovery. Regarding to the Cardiac Frequency, the values observed in the Transport in average were smaller in relation to the one of the Transport. Based on the Arterial Pressure, the systolic, the average values were bigger in the Treadmill in relation to the Transport. But, in the Diastolic Arterial Pressure the average values for the Transport were bigger than the values from the Treadmill. As for the Double Product, it showed bigger results for the Treadmill when collated to the results gotten from the Transport. Even not being the main object of the study it fits to stand out that the information proceeding from the kinetic of the Cardiac Frequency in the 2 ergometers propitiated the attainment of an equation that relates the Cardiac Frequency gotten in the Treadmill test with the one that must be used in the work carried through with the Transport in the same emphasis.

Key-Words: Ergometer, SPE, Heart rate, Lactate, Double Product

INTRODUCTION:

Each year the search of the population of the great urban centers for an improvement in its quality of life becomes bigger. The scarcity of spaces to the outdoors adequate and safety for the practical one of a physical activity, and in special cardio training, each time more increases the number of training centers, is these, personal or collective.

According to Araújo (1982), Heart Rate (HR), is the number of systoles per minute for a normal heart, is one of the vital signals of our organism and basic importance, where the attainment of this value in any physical examination. A HR in such a way in rest how much during the exercise the heart is a good pointer of intensity working. The Heart Rate increases during the exercise to help to increase the cardiac debit. This increase is caused in the beginning mainly for neural influences, however, to the one in them to approach to the maximum exercise the increase is also influenced by neuron-hormone and chemical factors.

According Albergaria (2003), to irrigate the organism, the blood if it finds on pressure in the interior of the cardiovascular system. This pressure that the blood exerts on the arteries is called of Arterial Pressure. Guyton (1997), affirms that during the gradual exercise, the systolic AP (SP) increases with the intensity of the exercise, while the diastolic AP (DP) remains steady or increases slightly. The SPA can increase more for 200 mmHg or, being probably influenced for the great movement of the blood for the heart during the exercise.

According to McArdle et al (2003), when the individual is in aerobic conditions, the rhythm of removal lactate for other corresponding fabrics its rhythm of formation, or either, not occurring effective accumulation of lactate, then, the lactate concentration if keeps steady. The adaptations that occur in the muscle induced for the aerobic training allow the high rhythms of renewal of lactate. The production and the accumulation of lactate are speed up when the exercise becomes more intense, therefore the muscular cells do not obtain to take care of the energy demands add and nor to the same oxidation lactate with rhythm of its production.

According to Borg (2000), perceived effort is the sensation of heavy and extenuate it is a physical task. Applying this concept to the physiology of the exercise, one notices that it is intimateness on to the concept of intensity of the exercise. Allevato (2004), in informs them that, however, aspects motivation, emotional, and pathological can be involved, making with that this extended concept either, it starts to depend on the situation and the context, the operational definition and the method of used exercise

Double-product (DP), is defined by the product between HR and the SP. It deals with a not evasive method, whose correlation with the consumption of miocardic oxygen (MVO2) makes with that it is had as the trustworthy pointer of the work of the heart during continuous physical efforts of aerobic nature.

The objective of this study was to compare the alterations of the physiological parameters (Heart Rate, Arterial Pressure, Sanguine Lactate concentration, Double Product and Subjective Perception of Effort) in not sedentary individuals, when submitted the test in two types of ergometer Treadmill and Transport .

METHODOLOGY:

The sample was of the intentional type and not of the probabilistic type. Had participated of this research 10 individuals of the masculine sort with averages of age of 27,2±6,05, stature 1,76±0,08 meters, weight 79,79±10,49 kg and IMC 25,79±2,61, in active state moderately (ACSM, 2000), volunteers for the study.

The collection of the tests was carried through in the Laboratory of Physiology of Exercise (LAFIEX) of the University Estácio de Sá in the Akxe Campus and in an Academy Barra da Tijuca, that possess the ambient standards and the ergometer adjusted for accomplishment of the test.

For the maximum test of Treadmill, a protocol of Bruce was used. The same procedure occurred for the experimental protocol of the test in the Transport

Test Period	Inclination	Resistance
1	10	5
2	12	8
3	14	11
4	16	14
5	18	17
6	20	20

The analysis of the data was made at two moments: in first the mansards variable (HR, AP, Sanguineous Lactate, Subjective Perception of Effort, Double Product and Time of the Tests), they had been analyzed through descriptive statistics, using average and shunting line standard, as well as determined the maximum and minimum values of each one of the variable.

At the second moment, inferential statistics was used. For comment of the behavior of the curves that relate secular extracts and the respective Cardiac Frequencies, was used the Correlation of Pearson to check the level of significant.

After that was used Test T of Student, to verify if it had significant difference enters the average Heart Rate in the secular common moments.

To reach the conformation of the Equation that expressed the relation of the measured Heart Rate in the Treadmill, with the measures in the Transport, an analysis of regression between the respective curves was used

RESULTS:

In the direction to establish an esteem point of cut according to curve of the HR Máx observed for the average behavior of a series of comments (n = 20), distributed throughout a secular series of 20 minutes approximately, was considered initially that

For direct comment, according to a secular series, the HR curve belongs to a curve of the parabolic family with concavity for low (C<0)

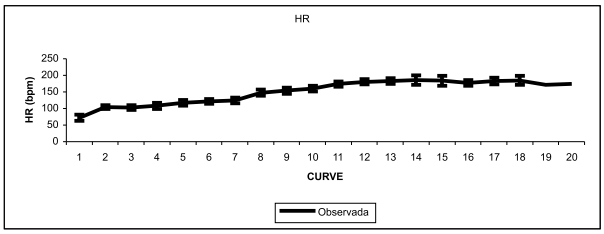

Figure 1: Behavior of the Curve of the HR

A consisting time the equation that defines the functional behavior of HR (transport), we overlap the two curves, Observed and Estimate:

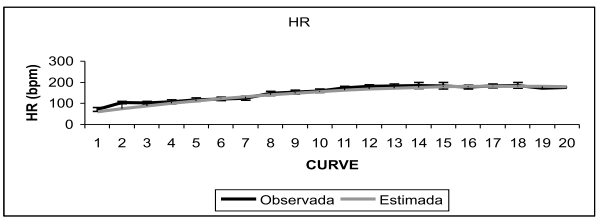

Figure 2: Behavior of the Curve of the HR - Observed and Estimate.

A time that if deals with an average behavior, not mattering, therefore here the Observed and Esteem equality between in the absolute values, even because each individual is an independent element. It matters yes, the similarity of the behaviors. Thus being, one normalize the values, objectifying to analyze the behavior and not it absolute value, having as base HR Máx=100%

We have, therefore that with 95% of certainty, we can affirm that the best point of cut for 85% of the HR Máx, it will have to occur between minutes 8 and 9 of a test any, according to protocol used for quantification results of the matrix data for the observed values.

The Tests had finished, with the maximum reach of work, as much in the Treadmill how much in the Transport, in 6º period of training. The biggest reached average values in the PSE during the execution of the Tests had been of 7,00 and 7,25, in the Tests of Mat and Transport, respectively

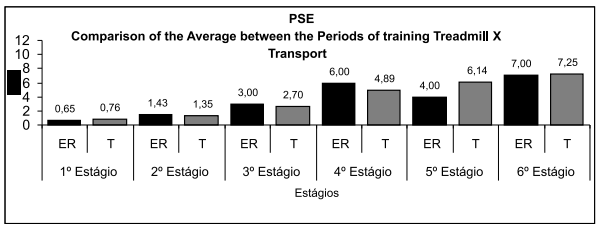

Figure 3: Comparison of the PSE between the Tests of Treadmill and Transport

With relation to the cut point (3º period of training), the behavior of the PSE was lesser in the Test of the T of that the Treadmill test, as visualization in Figure 4.

In the cut point, or either, to the 85% of the HR Máx, in the Test of Treadmill reached the average Lactate levels had been of 4,98 ± 1,60 Mmol, and in 0,90 4,52 T ± Mmol.

However, in the third minute of recovery, the Lactate average proceeding from the individual results in the Treadmill had reached 2,38 10,63 values of ± Mmol, while in the same situation in the T Mmol had reached 6,79 ± 2,69.

Probably, beyond the accumulation of Lactate being lesser in the T, the biggest removal that apparently occurs in the Treadmill can have the biggest involved muscular mass in the activity, what it facilitates to the venous return and the circulation as a whole, facilitating of global form, what it propitiates the best Lactate removal in lesser time.

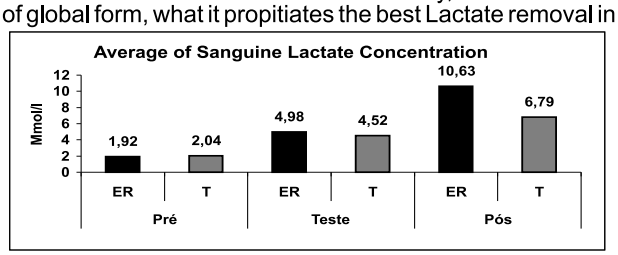

Figure 4: Comparison of the lactate Daily pay, during and After Tests of Treadmill and Transport

How much the HR, the averages gotten in the cut point (8º and 9º minute) had been inferior in the test carried through in the T of that in the carried through one in the Treadmill, with 17,83 bpm and 135,00 17,00 the 131,70 values of ± ± bpm, in 8º and 9º minutes respectively, in 12,70 bpm and 155,60 15,18 T and 149,90 ± ± bpm, in 8º and 9º minutes respectively, in the Treadmill.

However the value highest was reached in 7º period of training in the Treadmill and 8º period of training in the T, what it corroborates with the fact of that in as the device, for the lesser involved muscular mass to generate minors increases in the HR.

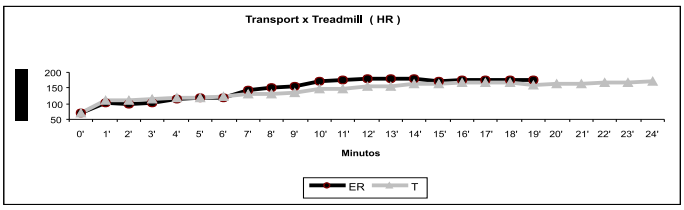

Figure 5 - Behavior of the HR during the test in Treadmill and Transport

Again the individuals reach bigger values of arterial Pressure in the T for obtaining to complete plus a period of training in the test in comparison with the Test of Treadmill.

In the cut point (85% of the HR Max) - 8º and 9º minutes, as much the 18,53 APS(161,00 ± mmHg), how much the 7,38 APD(79,00 ± mmHg), had reached bigger values in the Transport, of that in the Treadmill, that reached 159,00 ± 23,78 mmHg and 78,50 ± 7,09 mmHg, in SAP and DAP, respectively, as displayed in figures 6 and 7.

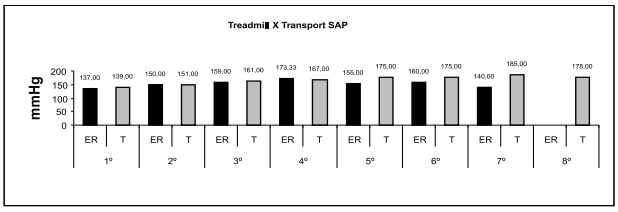

Figure 6: Behavior of the averages of the Systolic AP during the Tests of Treadmill and Transport

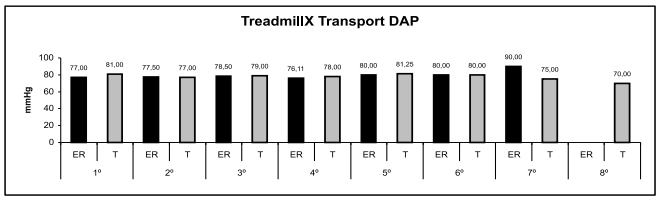

Figure 7: Behavior of the averages Diastolic AP during the Tests of Treadmill and Transport

As figure below, the result of the DP was bigger in the Treadmill of that in the T, 31083,3 and 30247,5 mmHg.bpm, respectively, with this in informing that the heart work was bigger in the first device. This can in indicating them that, as the T involves a lesser muscular mass, perhaps the work of the heart can be lesser.

Another important information is that in the two results, as much in the Treadmill how much in the T, they had been, according to Merril (1973), inside of a normality interval that inside varies of the band of 29.000 the 39,000 mmHg.bpm

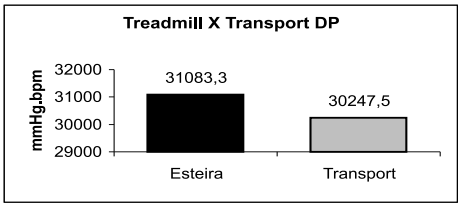

Figure 8 - Behavior of the DP in the Tests of Treadmill and Transport.

In the direction to carry through a comparative analysis between protocols Transport and Treadmill, one applied of agreed form two inferential tests, the test of correlation of Pearson applied minute the minute for verification of parallelism and the test of Student in the way for verification of overlapping (equality between the averages). Combined the two results we have the analysis enters the two curves developed on the line of the taken time in minutes.

Of the initial results above, we have that the comments for calculation of correlation between the two curves if give between minutes 0 and 14, a time that in this interval, the number of observed if makes significant (n>3), for too much subsequent secular stratus, until the return phase the calm, the protocols present differences in the quantitative observed face the "death" of the sample.

Analyzing the correlation coefficients, taken minute the minute, we have that in a general way, they are significant, being the same ones understood between 0,41 and 0,91. Therefore, the protocols if analyzed by the HR, observe curves of one same family, that is, they are parallel bars. At as the moment when the points then are compared way it has tested t of Student way, we have that in minutes 2 and 3, the taken average HR in protocol T is significantly (sig.p <0,05) greater that the taken average HR in protocol Treadmill. Of minute 4 until the 6, the curves are collinear and of the 7 until minute 14, the same ones if they, being the one that the average HR in the Treadmill is significantly bigger that the average HR in the T.

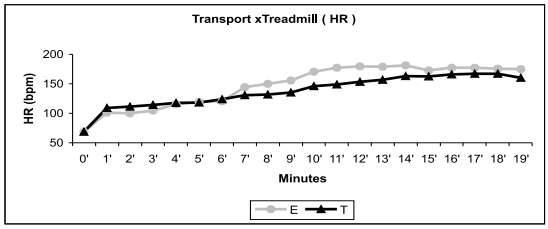

Figure 9: Behavior of the HR during the Tests of Treadmill and Transport.

To follow an analysis of regression between the two curves was made, observing itself the average values (minute). Of the results above we have that the correlation between the two curves is significant (r=0,965) (sig.p<0,0001)

HR (Transport) = 40,084 + 0,642 x HR (Treadmill)

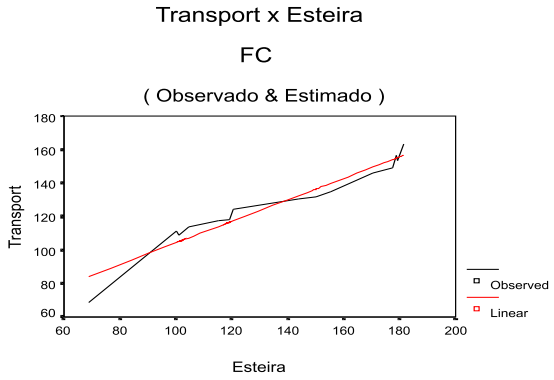

Figure 10: Behavior of the observed HR and estimate, in Treadmill and Transport

CONCLUSION:

After analysis of the parameters measured in test of Treadmill and repeated by the same individuals in test adapted for the Transport, we can verify, for the Target

population of this study that in that it refers to the PSE, in average the results of the Treadmill test denote superior values in the intermediate periods of training and inferior average values in the first one and in the last periods of training. This result in the sample that for being the activity of the Treadmill most global, this fact can unchain answers painful subjective greater of that in the Transport, that involves a quantitative minor of nociceptor. This result goes to the meeting of the hypothesis made in the beginning of the study.

With regard to Sanguine lactate concentration, in the comparison between the two ergometer, again the values of the levels, as much during the test how much in the recovery, they had been bigger in the Test of Treadmill of that the Experimental test of the Transport. This fact can have to a bigger number of involved muscular groupings in the movement carried through in the Treadmill. However, the values gotten during the tests (Treadmill and Transport) had been similar, confirming one of the hypotheses of the study already in the recovery; the values had not been similar, opposing the daily pay-cited hypothesis.

How much the Heart Rate, the values observed in the Transport had been, in average, minors with relation to the observed ones in the Treadmill. Despite the behavior of this average, in the beginning, the values observed in the Transport, are bigger even, approximately, the fifth minute. After, it has a rise in the Heart Rate in the Test of Treadmill, until the conclusion of the test. It is still noticed, bigger numbers of periods of training completed in the Transport, leading one more time to assume that, for involved a lesser muscular mass, to generate a lesser Heart Rate, in this ergometer. Going again to the meeting of the hypothesis suggested in the beginning of the study.

Although not to have been central object of the study it fits to stand out that the data proceeding from the kinetic one of the Heart Rate in the second equipment propitiated the attainment of an equation that relates the HR gotten in a Treadmill test with that it must be used in the work carried through with the Transport in the same intensities.

In relation to the Arterial Pressure, systolic, the average values had been bigger in the Treadmill in relation to the Transport. Already in the Arterial Pressure Diastolic the average values in the Transport had been bigger of the one than in the Treadmill. In relation to the Point of Cut (3º Period of training), as much the values of the Systolic arterial Pressure, how much the Diastolic, had been slightly bigger in the Transport.

As for the Double Product, the same it presented greater values in the Treadmill when collated to the results gotten in the Transport. This suggests that the miocardic work, how much has execution of a work in the Transport, is lesser, therefore the same involves a lesser muscular mass for the accomplishment of the execution movement. Valley to stand out that in both the ergometer the gotten results of the different parameters, are inside of a normality standard.

One sends regards new studies about of this subject, with bigger and different populations of the sample of this study, therefore still few works exist on the Transport and its use, since we have the duty to propitiate health to that they are to our cares.

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CORRÉLATION PARMI LES VARIABLES HEMODINÃMICAS RÉSULTANT D'EFFORT A ACCOMPLI DANS 2 TYPES D'ESGÔMETROS

RÉSUMÉ:

Il est informé le fait dans la littérature efficace qui la formation aérobique, par elle-même, sans le contrôle dans sa réalisation, il/elle n'aide pas aux besoins il y a que ceux-ci qu'ils sont destinés. Les tels contrôles sont accomplis à travers une assistance de la Fréquence du Coeur (FC), tension (PELLE), Perception Subjective d'Effort (PSE), METs et dans quelques cas, les niveaux de Lactato Sanguin ont produit dans l'effort. L'objectif de cette étude était comparer les modifications des paramètres du physiologic (Fréquence du Coeur, tension, concentration de Lactato Produit Sanguin, Double et Perception Subjective d'Effort) dans les individus aucun sédentaire, quand a soumis pour tester dans deux ergômetros écrit à la machine - il Natte, en Roulant (ER) et Transport (T). LE modèle de cette étude était descriptif et correlacional. L'échantillon était du type intentionnel et pas du probabilística du type. Ils ont participé à cette recherche 10 individus du genre masculin, avec moyenne et déviation standard de l'âge de 27,20 ± 6,05 années, moyenne de la taille et déviation standard de 1,76 ± 0,08 m et masse du caporal de 79,79 ± 10,49 Kg. L'analyse des données a été faite par statistiques descriptives et inferencial plus tardif. Dans PSE les valeurs dans l'Épreuve de Tapis étaient plus grandes dans les apprentissages intermédiaires et dans Transport dans le premier et dans les derniers apprentissages. Concernant Lactato Sanguin ils étaient plus grands dans le Tapis que dans Transport pendant l'épreuve comme dans la récupération. Comme la Fréquence du Coeur, les valeurs observées dans Transport étaient sur moyenne plus petit par rapport au de Transport. Par rapport à la tension, le systolique, les valeurs moyennes étaient plus grandes dans le Tapis par rapport à Transport. Déjà dans le Pressão Diastólica les valeurs moyennes dans Transport étaient plus grand que dans le Tapis. Dans ce qu'il/elle fait référence au Produit Double, les mêmes plus grandes valeurs présentées dans le Tapis quand a affronté aux résultats obtenus dans Transport. Malgré lui n'être pas objet central de l'étude il va ressortir que les données futures de la cinétique de la Fréquence du Coeur dans les 2 ergômetros se sont conciliées l'obtenir d'une équation qui raconte FC a obtenu dans une épreuve de Tapis avec celui qui devrait être utilisé dans le travail accompli avec Transport dans les mêmes intensités.

Mots clef: Ergômetros, Fréquence du Coeur, PSE, Lactacidemia, Produit Double,.

CORRELACIÓN ENTRE LAS VARIABLES HEMODINAMICAS RESULTANTES DEL ESFUERÇO REALIZADO EN 2 TIPOS DE ERGÔMETROS

RESUMEN

Es un hecho informado en la literatura vigente, que el entrenamiento aerobio, solo, sin el control en su realización, no atiende a las necesidades que estas se destinan. Tales controles son realizados a través de la Frecuencia Cardiaca (FC), Presión Arterial (PA), Percepción Subjetiva del Esfuerzo (PSE), ***METs*** y en algunos casos, los niveles de Lactato Sanguíneo generado en el esfuerzo. El objetivo de esta investigación fue comparar las alteraciones de los parámetros fisiológicos (Frecuencia Cardiaca, Presión Arterial, concentración de Lactato Sanguíneo, Doble Producto y Percepción Subjetiva del Esfuerzo) en individuos no sedentarios, cuando sometidos a un examen de dos tipos de ergómetros Cinta mecánica y Transport (T). El modelo de esta investigación es descriptivo e correlacional. La muestra fue del tipo intencional y no del tipo probabilística. Diez individuos del género masculino participaron de esta investigación, con promedio y desviación standard entre las edades de 27,20 ± 6,05 anos, el promedio de la estatura y desvío Standard es de 1,76 ± 0,08 m y masa corporal de 79,79 ± 10,49 Kg. El análisis de los datos fue hecha mediante la estadística descriptiva y luego la estadística inferencial. En la PSE los valores de la prueba de la cinta mecánica fueron más grandes en los periodos intermediarios y en el Transport en el primer y en los últimos periodos. Con relación al Lactato Sanguíneo fueron mas grandes en la cinta mecánica que en el Transport durante la prueba como en la recuperación. En cuanto a la Frecuencia Cardiaca, los valores observados en el Transport fueron en promedio menores en relación al del Transport. En relación a la Presión Arterial, la sistólica, los valores promedios fueron mayores en la Cinta Mecánica en relación al Transport. En la Presión Arterial Diastólica los valores promedios no Transport fueron mayores que la Cinta Mecánica. A lo que se refiere al Doble Producto, el mismo presento un mayor valor en la Cinta Mecánica cuando confrontados a los resultados obtenidos en el Transport. A pesar de no haber sido el objetivo central de la investigación cabe a resaltar que los datos provenientes da la cinética de la Frecuencia Cardiaca en los 2 ergómetros proporciono la obtención de una ecuación relacionada a la FC obtenida en una prueba de cinta mecánica con la que debe ser utilizada en el trabajo realizado con el Transport en las mismas intensidades.

Palavras Claves: Ergómetros, Frecuencia Cardíaca, PSE, Lactacidemia, Duplo Produto.

CORRELATION BETWEEN THE RESULTS OF HEMODYNAMICS VARIABLES OF EFFORT CARRIED THROUGH IN 2 TYPES OF ERGOMETERS

It is called for a fact in the current literature, that the aerobic training, by itself, without the control in its accomplishment, does not attend to the necessities destined. Such controls are carried through the heart rate, blood pressure, Subjective Perception of discomfort and effort, METs, and in some cases, the generated by Blood Lactate levels in the effort. The objective of this study was to compare the alterations of the physiological parameters (Cardiac Frequency, Arterial Pressure, Blood Lactate concentration, Double Product and Subjective Perception of Effort) of individuals that are not sedentary, when submitted to a test with two types of ergometers - treadmill and Transport (T). The model of this study was descriptive and correlative. The type of the sample was intentional and none probabilistic. Ten men participated in this research, with the average and standard deviation with ages between 27, 20 ± 6, 05 years, the average height and standard deviation of 1,76m ± 0,08m and body mass of 79,79kg ± 10,49kg. The analysis of the results was made by means of descriptive statistics and later inferential statistics. In the Subjection Perception of Effort the values in the Treadmill test had been bigger in the intermediate periods of training and the Transport in the first and the last periods of training. In relation to Blood Lactate they had been bigger in the Treadmill than the Transport during the test as in the recovery. Regarding to the Cardiac Frequency, the values observed in the Transport in average were smaller in relation to the one of the Transport. Based on the Arterial Pressure, the systolic, the average values were bigger in the Treadmill in relation to the Transport. But, in the Diastolic Arterial Pressure the average values for the Transport were bigger than the values from the Treadmill. As for the Double Product, it showed bigger results for the Treadmill when collated to the results gotten from the Transport. Even not being the main object of the study it fits to stand out that the information proceeding from the kinetic of the Cardiac Frequency in the 2 ergometers propitiated the attainment of an equation that relates the Cardiac Frequency gotten in the Treadmill test with the one that must be used in the work carried through with the Transport in the same emphasis.

Key-Words: Ergometer, SPE, Heart rate, Lactate, Double Product

COMPARAÇÃO DOS PARÂMETROS FISIOLÓGICOS FREQÜÊNCIA CARDÍACA, PRESSÃO ARTERIAL, LACTATO SANGÜÍNEO, DUPLO PRODUTO E PERCEPÇÃO SUBJETIVA DE ESFORÇO, NOS TESTES MÁXIMO DE ESTEIRA E NO EXPERIMENTAL NO TRANSPORT

RESUMO: É fato informado na literatura vigente, que o treinamento aeróbio, por si só, sem o controle na sua realização, não atende às necessidades há que estas se destinam. Tais controles são realizados através de um acompanhamento da Freqüência Cardíaca (FC), Pressão Arterial (PA), Percepção Subjetiva de Esforço (PSE), METs e em alguns casos, os níveis de Lactato Sangüíneo gerado no esforço. O objetivo deste estudo foi comparar as alterações dos

parâmetros fisiológicos (Freqüência Cardíaca, Pressão Arterial, concentração de Lactato Sangüíneo, Duplo Produto e Percepção Subjetiva de Esforço) em indivíduos não sedentários, quando submetidos a teste em dois tipos de ergômetros Esteira Rolante (ER) e Transport (T). O modelo deste estudo foi descritivo e correlacional. A amostra foi do tipo intencional e não do tipo probabilística. Participaram desta pesquisa 10 indivíduos do gênero masculino, com média e desvio padrão da idade de 27,20 ± 6,05 anos, média da estatura e desvio padrão de 1,76 ± 0,08 m e massa corporal de 79,79 ± 10,49 Kg. A análise dos dados foi feita mediante estatística descritiva e posteriormente inferencial. Na PSE os valores no Teste de Esteira foram maiores nos estágios intermediários e no Transport no primeiro e nos últimos estágios. Com relação ao Lactato Sanguínea foram maiores na Esteira do que no Transport durante o teste como na recuperação. Quanto a Freqüência Cardíaca, os valores observados no Transport foram em média menores em relação ao do Transport. Em relação à Pressão Arterial, a Sistólica, os valores médios foram maiores na Esteira em relação ao Transport. Já na Pressão Arterial Diastólica os valores médios no Transport foram maiores do que na Esteira. No que se refere ao Duplo Produto, o mesmo apresentou maiores valores na Esteira quando confrontados aos resultados obtidos no Transport. Apesar de não ter sido objeto central do estudo cabe ressaltar que os dados provenientes da cinética da Freqüência Cardíaca nos 2 ergômetros propiciou a obtenção de uma equação que relaciona a FC obtida em um teste de Esteira com a que deve ser utilizada no trabalho realizado com o Transport nas mesmas intensidades.

Palavras Chave: Ergômetros, Freqüência Cardíaca, PSE, Lactacidemia, Duplo Produto.