40 - INFLUENCE OF INTERNATIONAL MARATHON FOZ IGUAÇU ON BONE MINERAL DENSITY AND BASAL METABOLIC RATE - A CASE STUDY.

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INTRODUCTION

The marathon is one of the toughest endurance competitions, being a sporting event of mass participation, performed under changing environmental conditions (Helou et al., 2012).

With each passing year increases the number of participants in this type of race. This fact is mainly due to its characteristics, which can receive any practitioner of the sport and is characterized as a democratic sport where racers run alongside the greats of the sport (TRUCCOLO, 2008).

According Tokodum et al. (2004), there are advantages and disadvantages to participation in physical activity, exercise and sports. Studies demonstrate that compete in sporting events of long duration, can cause significant musculoskeletal injuries, but it is known, also, the adaptability of the human body when exposed to overhead (MURRAY and COSTA, 2012).

The bones respond to stress factors such as race and the impact associated with the beat of the feet on the floor, which carries up to six times body weight for bones every collision (TUCKER et al., 2010).

Thus, the present study aimed to analyze the influence of a marathon race on bone mineral density, basal metabolic rate and body composition of an adult.

METODOLOGY

The study is characterized as a case study (THOMAS NELSON and SILVERMAN, 2007), performed with an adult, 25 years old, male participant International Marathon Foz do Iguaçu, held on 25 September 2011 in the city of Foz do Iguaçu, Paraná, Brazil.

Proof owned a path 42,195 meters, officially measured and certified by the Brazilian Athletics Confederation, in accordance with the official guidelines recommended by the International Association of Athletics Federations. Figure 01 shows the official route and the altitude of the test.



Credits: Mapa – Revista Contra-Relógio/ Infografe (2007).
Figure 01. Route and altitude of the International Marathon Foz do Iguaçu 2011.

Anthropometric, bone densitometry and direct gas analysis were collected at the Multidisciplinary Center for the Study of Obesity (NEMO) located in the Department of Physical Education, State University of Maringá, in the city of Maringa, Parana, Brazil.

Bone mineral density was obtained by X-ray absorptiometry Dual Energy (DXA), the equipment being used Brand GE Lunar Prodigy Primo® model and software version Encore 13.50® for image reconstruction of the underlying tissues, allowing the quantification of content bone mineral (BMC), total fat mass and fat-free body mass and bone. The protocol was used to scan One full body scan performed by an appraiser duly certified by the Brazilian Society of Bone Densitometry - SBDens.

The Basal Metabolic Rate was obtained through an analyzer VO2000 Metabolic Gases - MedGraphics®. The VO2000 is a transducer for metabolic analysis, self-calibrating, designed to operate via computer. It extracts and measures the expiration micro samples by the method of breaths (Breath by breath), displaying the values of the volume of oxygen consumed, the carbon dioxide exhaled air and volume, all expressed in liters per minute STPD (Standard Temperature and Pressure Dry), and the average heart beats per minute. Through these parameters, the Breeze software, calculates other parameters for making use of the information contained herein. The volume is measured by an external Prevent connected via air lines (hoses) to the sensor (internal) of the expired volume VO2000. This model of spirometry equipment is a valid system for evaluating the BMR in populations of different ages (WAHRLICHA et al., 2006). The protocol used to measure TMB was proposed by Carey et al. (2006).

Measures Weight, Total Body Water (TBW), Proteins, Minerals, Body Fat Mass (GCM), Skeletal Muscle Mass (MME), Body Fat Percentage (BF%) were performed with the apparatus of multifrequency bioelectrical impedance octapolar Biospace® brand, model Inbody® 520, with a capacity of 250 kg and 100g precision, validated by Malavolti et al. (2003). This unit has eight electrodes and performs analysis of body composition using different frequencies (5, 50 and 500 kHz), which allows to estimate, and body composition, the amount of total net intra and extracellular (KYLE et al. , 2004).

Height was measured with a stadiometer aluminum, attached to the wall of the brand Sunny® with a precision of 0.1 cm. The BMI calculation is given from the equation BMI = weight/ height ². The body fat percentage was classified using the criteria established by Lohman (1992).

Evaluations were made on 23 and 26 September 2011, featuring respectively the periods pre and post test.

Data were organized in Microsoft Excel spreadsheet 2007® and influence of marathon presented by percentage difference.

RESULTS AND DISCUSSION

In Table 01 are shown the values of body composition obtained by octopolar multifrequency bioimpedance.

Table 01. Characterization of body composition Pre and Post Marathon

	PRE	POST
Weight (kg)	91,4	90,8
BMI (kg/m^2)	25,9	25,7
TBW (l)	52	52,2
Proteins (kg)	14	14,2
Minerals (kg)	5	5,1
BFM (kg)	20,4	19,3
LMM (kg)	40,2	40,8
BF (%)	22,3	21,3

It is observed that after the marathon there was a reduction in the values of Body Weight, BMI, and %BF and BFM, and an increase of TBW, Proteins, Minerals and LMM. These data are in agreement with Williams and Paul (2006), calling for the body composition indexes are inversely related to the running distance traveled.

Table 02 shows the values of body composition by body compartments, obtained by DXA.

	Tissue (%Fat)		Region (%Fat)		Tissue (g)		Fat (g)		Lean (g)		Total Mass (Kg)	
REGION	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
Left Arm	14,8	14,3	14,1	13,7	5331	5221	790	747	4542	4474	5,6	5,5
Left Leg	29,8	28,8	28,4	27,5	14785	15232	4408	4387	10377	10844	15,5	15,9
Left Trunk	35,7	36	34,7	34,9	22019	21701	7868	7823	14151	13879	22,7	22,4
Total Left	30,3	30,1	29,1	28,9	44129	43910	13358	13207	30771	30702	46	45,7
Right Arm	14,8	14,3	14,1	13,6	5168	5221	763	745	4405	4476	5,4	5,5
Right Leg	29,9	28,8	28,5	27,6	14859	15326	4436	4415	10423	10911	15,5	16
Right Trunk	35,7	36	34,6	34,9	20709	19704	7393	7092	13316	12611	21,5	20,3
Total Right	29,9	29,4	28,7	28,2	43313	42982	12967	12639	30347	30343	45,2	44,8
Arms	14,8	14,3	14,1	13,7	10500	10442	1553	1492	8947	8950	11	10,9
Legs	29,8	28,8	28,5	27,5	29644	30557	8844	8802	20800	21755	31	32
Trunk	35,7	36	34,6	34,9	42728	41405	15262	14915	27466	26490	44,1	42,7
Android	41,2	42,1	40,8	41,6	6613	6704	2728	2820	3885	3884	0,7	0,8
Gynoid	36,2	33,4	35,3	32,6	14170	14224	5132	4753	9038	9470	14,5	14,6
Total	30,1	29,7	28,9	28,5	87442	86892	26325	25846	61118	61046	91,1	90,5

According to the data presented shows the lower limbs showed that the greater values Reduction When Compared to the upper limbs due to the characteristic test.

This was also observed when comparing the body composition of android and gynoid regions, where there is a decrease of almost 3% from fat tissue when post race in the region gynoid, android already in an increase of almost 1%.

In figure 02 contains values of Basal Metabolic Rate Expressed in kilocalories expended per day, in the moments before and after the marathon.

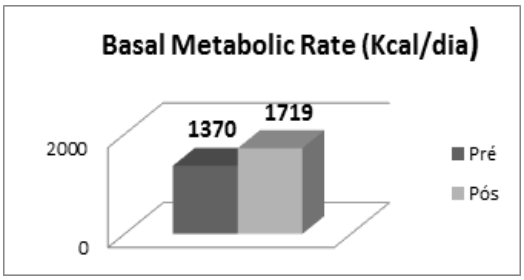

Figure 02. Basal metabolic rate in the periods pre and post marathon.

It was observed with the data presented that there was a significant increase in BMR, due to the potential of exercise to increase the activity of the sympathetic nervous system, due to the body's need for recovery after the effort (BOUCHARD, 2000). Emphasizing that the Marathon was held on the 25th and reassessment performed on day 26 at 7 pm, totalizing 19 hours after completion.

Tabela 03. Bone mineral content.

	PRE	POST
Head	1,899	1,885
Left Arm	0,947	0,976
Left Leg	1,595	1,533
Left Trunk	1,059	1,047
Total Left	1,266	1,248
Right Arm	0,987	1,002
Right Leg	1,445	1,442
Right Trunk	1,043	1,015
Total Trunk	1,236	1,232
Arms	0,967	0,989
Legs	1,518	1,487
Trunk	1,051	1,032
Ribs	0,812	0,797
Pelvis	1,298	1,293
Column	1,223	1,191
Total	1,251	1,240

With the data presented above emphasizes the reduction of 0.032 g/cm3 and 0.015 g/cm3 spine ribs, and the left side of the body most affected by race, with a reduction of 0.018 g/cm3. Since the reverse process was observed with respect to the upper limbs, occurring an increase of 0.029 g/cm3 in the left arm and right arm 0.015 g/cm3,

Thus, the results of BMC, there was a reduction in total indexes after the marathon, and Legs, Ribs and Spine regions most affected. Current literature reports that track and field athletes may have lower bone mineral content than non-athletes because of the repetitive endurance exercise may adversely affect the bone mineral content of these athletes (SHIN et.al, 2012).

FINAL CONSIDERATIONS

Thus, we conclude this study with the marathon running causes changes in body composition, body fat distribution, increased basal metabolic rate and reduction in bone mineral content. Highlights the limitations inherent in a case study, and further studies needed for the complete elucidation of the subject. At the same time, testaca up the importance of this type of study to increase understanding about the adaptations promoted by acute endurance events like the marathon.

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INFLUENCE OF INTERNATIONAL MARATHON FOZ IGUAÇU ON BONE MINERAL DENSITY AND BASAL METABOLIC RATE - A CASE STUDY.

ABSTRACT

The marathon is one of the toughest endurance competitions, being a sporting event of mass participation, performed under variable environmental conditions. The main objective was to analyze the influence of a marathon race on bone mineral density, basal metabolic rate and body composition of an adult. It is characterized as a case study, conducted with an adult, 25 years old, male participant International Marathon Foz do Iguaçu, held on September 25, 2011, in the city of Foz do Iguaçu, Paraná, Brazil. Data were collected at the Center for Multidisciplinary Studies of Obesity (NEMO), the State University of Maringá - DEF/UEM, in the city of Maringa, Parana, Brazil. Bone mineral density was obtained by X-ray absorptiometry Dual Energy (DXA), the Basal Metabolic Rate was obtained with the analyzer VO2000 Metabolic Gases - MedGraphics measures Weight, Total Body Water (TBW), Proteins, Minerals, Body Fat Mass (BFM), Lean Muscle Mass (LMM), Body Fat Percentage (%BF) were performed with the apparatus of multifrequency bioelectrical impedance octapolar Biospace ® brand, model Inbody 520. It was observed that there was a reduction in the values of Body Weight, BMI, and %BF and MGC increase in TBW, Proteins, Minerals and MME. The lower limbs showed decreased levels compared to upper limbs due to the feature race. It is noteworthy reduction

of 0.032 g/cm3 and 0.015 g/cm3 spine ribs, and the left side of the body most affected by race, with a reduction of 0.018 g/cm3. We conclude that marathon running causes changes in body composition, body fat distribution, increased basal metabolic rate and reduction in bone mineral content. Highlights the limitations inherent in a case study, and further studies needed for the complete elucidation of the subject.

KEYWORDS: Marathon; Bone Mineral Density; Basal Metabolic Rate.

INFLUENCE DU MARATHON INTERNATIONAL IGUAÇU FOZ SUR LA DENSITÉ MINÉRALE OSSEUSE ET LE TAUX MÉTABOLIQUE BASAL - UNE ÉTUDE DE CAS.

RÉSUMÉ

Le marathon est une des compétitions les plus difficiles d'endurance, d'être un événement sportif de la participation de masse, réalisée dans des conditions environnementales variables. L'objectif principal était d'analyser l'influence d'un marathon sur la densité minérale osseuse, le taux métabolique basal et la composition corporelle d'un adulte. Il est caractérisé comme une étude de cas, réalisée avec un adulte, 25 ans, de sexe masculin participant Marathon International de Foz do Iguaçu, qui s'est tenue le 25 Septembre 2011, dans la ville de Foz do Iguaçu, Paraná, Brésil. Les données ont été recueillies au Centro de Estudos Multiprofissional da Obesidade (NEMO), Universidade Estadual de Maringá- DEF/UEM, dans la ville de Maringa, Parana, Brésil. La densité minérale osseuse a été obtenue par l'énergie absorptiométrie à rayons X double (DXA), le taux métabolique basal a été obtenu avec les analyseurs de gaz métaboliques VO2000 - MedGraphics mesures de poids, de l'eau corporelle totale (ECT), les protéines, les minéraux, la masse grasse corporelle (BFM) , la masse musculaire maigre (LMM), pourcentage de graisse corporelle (%MG) ont été réalisés avec l'appareil de multifréquence impédance bioélectrique octapolar marque Biospace®, modèle Inbody 520. Il a été observé qu'il y avait une réduction des valeurs de poids corporel, l'IMC et% MG et MGC augmentation de TBW, protéines, minéraux et MME. Les membres inférieurs a montré une baisse des niveaux par rapport aux membres supérieurs en raison de la course principale. Il est intéressant de noter la réduction de 0,032 g/cm3 et 0,015 g/cm3 côtes colonne vertébrale, et le côté gauche du corps les plus touchées par la race, à une réduction de 0,018 g/cm3. Nous concluons que le marathon des changements dans la composition corporelle les causes, la distribution de graisse corporelle, augmentation de taux métabolique basal et la réduction de la teneur minérale de l'os.

MOTS-CLÉS: Marathon; Densité minérale osseuse, taux métabolique basal.

INFLUENCIA DE LA MARATÓN INTERNACIONAL DE FOZ IGUAÇU EM LA DENSIDAD MINERAL ÓSSEA Y LA TASA METABÓLICA BASAL - ESTUDIO DE CASO.

RESUMEN

El maratón es una de las más duras competiciones de resistencia, al ser un evento deportivo de la participación masiva, realizada bajo condiciones ambientales variables. El objetivo principal fue analizar la influencia de una carrera de maratón en la densidad mineral ósea, la tasa metabólica basal y la composición corporal de un adulto. Se caracteriza por ser un caso de estudio, llevado a cabo con un adulto, de 25 años, sexo masculino participante Maratón Internacional de Foz do Iguaçu, celebrada el 25 de septiembre de 2011, en la ciudad de Foz do Iguaçu, Paraná, Brasil. Los datos fueron recogidos en el Núcleo de Estudos Multiprofissional da Obesidade (NEMO), la Universidade Estadual de MAringá - DEF/UEM, en la ciudad de Maringá, Paraná, Brasil. La densidad mineral ósea se obtuvo mediante la absorciometría de energía dual de rayos X (DXA), la tasa metabólica basal se obtuvo con el analizador de gases metabólicos VO2000 - Peso MedGraphics medidas, el agua corporal total (ACT), Proteínas, Minerales, la masa grasa corporal (GCM)-Masa Muscular Esquelética (MME), porcentaje de grasa corporal (% GC) se realizaron con el aparato de impedancia bioeléctrica multifrecuencia marca octapolar Biospace ®, modelo Inbody 520. Se observó que hubo una reducción en los valores de peso corporal, el IMC y% GC y aumento MGC en ACT, proteínas, minerales y MME. Los miembros inferiores mostraron niveles reducidos en comparación con las extremidades superiores debido a la carrera principal. Es notable reducción de 0,032 g/cm3 y 0,015 g/cm3 costillas columna vertebral, y el lado izquierdo del cuerpo más afectada por la raza, con una reducción de 0,018 g/cm3. Se concluye que la carrera de maratón provoca cambios en la composición corporal, la distribución de la grasa corporal, aumento de la tasa metabólica basal y la reducción en el contenido mineral óseo.

PALABRAS CLAVE: Marathon;Ddensidad Mineral Ósea; Metabolismo basal.

INFLUÊNCIA DA MARATONA INTERNACIONAL DE FOZ DO IGUAÇU SOBRE A DENSIDADE MINERAL ÓSSEA E TAXA METABÓLICA BASAL – UM ESTUDO DE CASO.

RESUMO

A maratona é uma das competições de resistência mais difíceis, sendo um evento esportivo de participação de massa, realizada sob condições ambientais variáveis. O objetivo principal foi analisar a influência de uma prova de maratona sobre a densidade mineral óssea, taxa metabólica basal e composição corporal de um indivíduo adulto. Caracteriza-se como um estudo de caso, realizado com um indivíduo adulto, de 25 anos de idade, do sexo masculino, participante da Maratona Internacional de Foz do Iguaçu, realizada no dia 25 de setembro de 2011, na cidade de Foz do Iguaçu, Paraná, Brasil. Os dados foram coletados no Núcleo de Estudos Multiprofissional da Obesidade (NEMO), da Universidade Estadual de Maringá – DEF/UEM, na cidade de Maringá, Paraná, Brasil. A densidade mineral óssea foi obtida por meio da Absortometria de Raios X de Dupla Energia (DXA), a Taxa Metabólica Basal foi obtida com o Analisador de Gases Metabólicos VO2000 – MedGraphics, as medidas de Peso, Água Corporal Total (ACT), Proteínas, Minerais, Massa de Gordura Corporal (MGC), Massa Músculo-Esquelética (MME), Percentual de Gordura Corporal (%GC), foram realizadas com o aparelho de bioimpedância octapolar multifrequencial da marca Biospace®, modelo Inbody 520. Observou-se que houve uma redução nos valores de Peso Corporal, IMC, MGC e %GC e aumento nos de ACT, Proteínas, Minerais e MME. Os membros inferiores apresentaram redução dos valores quando comparados aos membros superiores devido a característica da prova. Ressalta-se a redução de 0,032 g/cm3 da coluna e 0,015 g/cm3 das costelas, sendo o lado esquerdo do corpo mais afetado pela prova, com uma redução de 0,018 g/cm3. Conclui-se que a corrida de maratona provoca alterações na composição corporal, distribuição da gordura corporal, aumento da taxa metabólica basal e redução no conteúdo mineral ósseo. Ressalta-se as limitações inerentes a um estudo de caso, sendo mais estudos necessários para a completa elucidação do tema.

PALAVRAS-CHAVE: Maratona; Densidade Mineral Óssea; Taxa Metabólica Basal.