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Nutritional Profile of Street Runners from a Sports Club in Belo Horizonte City, MG, Brazil

Janaina Lavalli Goston
Larissa Loures Mendes

Faculdade Pitágoras, Belo Horizonte/MG, Brasil.

Correspondence address:
Rua Turvo, 3, apto. 3, Lagoinha, Belo Horizonte/MG – Brasil.
E-mail: jananutricao@yahoo.com.br

ABSTRACT

The anthropometric and/or dietary profile of elite runners has been studied; however, little is known about the characteristics of recreational street runners. This study was aimed to characterize the nutritional profile of recreational runners from a sports club in Belo Horizonte, MG, Brazil, who were referred to a nutritional clinic of a local private college. The sample study was composed of 19 athletes, aged between 28 and 53 years. The diagnosis of the runners' nutritional status was obtained by assessment of their energy and macronutrients – carbohydrates (CHO), lipids (LIP), and proteins (PTN) consumption– through the 24-hour dietary recall (R24h), as well as analysis of their anthropometric profile. The results obtained from the dietary evaluation showed that according to the recommendations proposed by the DRIs (Dietary Reference Intakes), the distribution of energy among the macronutrients in both men and women was adequate: 48.1±9.2% (CHO), 29.6±7.2% (LIP) and 22.3±4.96% (PTN). However, when considering energy consumption in g/kg of body weight, the intake of CHO was low (3.54±1.45g/kg/d) and of PTN was high (1.7±0.57 g/kg/d) for this type of recreational exercise. Regarding total energy consumption, 89.5% of runners presented energy intake below the recommended values, resulting in daily caloric deficiency. Concerning the anthropometric evaluation, the average percentage of body fat (%G) for men and women was not statistically different and was considered adequate based on their age. Waist circumference (WC) and waist/hip ratio (WHR) of the studied group showed normal results and do not represent increased risk for cardiovascular diseases. In conclusion, the study indicates that although the athletes showed adequate caloric distribution of macronutrients, it was still not sufficient to meet the energy requirements of their modality, suggesting hence that continuous nutritional guidance is needed.

Keywords: sports nutrition, running, nutritional assessment, recreational athletes.

INTRODUCTION

Physical exercise is usually associated with wellness of its practitioners. Among its several manifestations, running is one modality with a large number of practitioners, both due to its easiness of practice and to its benefits to health, as well as its low cost. Street running has become popular due to these and other reasons[1]. Currently, the criterion by the International Association of Athletics Federations /IAAF (2005) defines Street Runs as running on street, avenue and road circuits, with official distances ranging between 5 and 100km[2]. Genetic, environmental (e.g. temperature, humidity), climate, kind of training and different running strategies can influence on performance. Nonetheless, fluid intake and nutritional manipulation are essential components in performance improvement in any sports modality. Many factors should be considered for a suitable nutritional planning, among these, energetic adjustment of the diet, distribution of macronutrients and suitable supply of vitamins and minerals[3]. Studies[4-6] have presented data concerning the anthropometric and/or nutritional profile of elite athletes whose practiced modalities involve running (e.g. marathon, track and field, endurance sports, etc); however, little is known about these characteristics in street running practitioners or the so-called 'recreational' athletes. Differently from athletes, who make sport their profession and finish a marathon in less than 2h30min, the recreational street runners regularly train with many interests which go from health promotion aesthetics, social integration, break from modern life stress, as well as to keep competitively well-qualified[2,7]. The present study has the aim to characterize the nutritional status of street runners from a sports club in Belo Horizonte (BH) /Minas Gerais (MG), referred to the nutritional unit of the school clinic of a private University of the city.

METHODS

This is a descriptive transversal study performed with members of a street running team of a sports club in BH/MG, referred to the Nutrition Unit for nutritional clinical-sports counseling. All participants were under regular training through weekly individualized planning provided by physical educators from the club and were encouraged to participate in the annual street running calendar which occurs in Brazil and overseas. Thus, in one year period (March/2008-2009), 19 runners were assessed by a nutritionist faculty from the undergraduation course in nutrition and a group of college students from the course, integrated in the project.

This study was approved by the Committee in Ethics and Research in Humans of the University Center of Belo Horizonte, under the Resolution # 196/1996 of the National Health Board, under law ETIC # 015-208. All participants signed a free and clarified consent form and were informed on the aim of the research and their rights as participants.

Data collection included many anthropometric as well as body composition variables. Stature and body mass were verified with a mechanical Filizola scale with accuracy of 100g, capacity of 150kg and anthropometric ruler with accuracy of 200cm, with participants wearing light clothes and being bare feet following protocol proposed by Filho[8]. Body mass index (BMI) was calculated from these data, which was classified according to the cohort points established to adults and older adults by the World Health Organization (WHO, 1995)[9]. Although this measurement is contra-indication in the individual assessment of athletes, we chose to maintain it, since the population is composed of sports individuals and it has been recently suggested that assessments for stratification of the "risk of disease" (type 2 diabetes, high blood pressure and cardiovascular diseases) should include, at least the waist circumference (WC) or BMI and preferably both[10]. However, as the BMI is not able to identify how much of body mass corresponds to fat or lean mass, the following measurements were collected: thoracic (THOR), abdominal (ABD), thigh (TH), tricipital (TR), suprailiac (SI) skinfolds with scientific skinfold calipers brand name Sanny . Each skinfold was measured three times in a circuit, and the mean of these three measures was considered as final value. Body density of this group was estimated by the equation of the sum of three skinfolds (SF) proposed by Jackson and Pollock for men (1978) and women (1980). This result was converted into body fat percentage (%BF) through the equation proposed by Siri (1961)[8].

Waist circumference (WC) was measured with a non-elastic measuring tape, placing it on the mean point between the last rib and the superior part of the iliac crest. The hip circumference was measured in the site of greatest prominence of the gluteus region. Both were classified according to the guidelines by the World Health Organization (WHO, 1995)[9].

The nutritional data were obtained through a R24h (applied only on the appointment day) and the data were transformed in energy values and nutrients with the aid of tables of food composition[11] and home measurements[12] directly inserted in the software Excel.

Although the exclusive use of R24h in order to assess food and nutrients consumption is not recommended in scientific studies, it was necessary here due to the operational difficulty in reaching the same patient more often in other moments, since the used environment was a first-aid unit with great demand for nutritional assistance from the population. Some caution was taken to obtain more complete data on the daily routine of the sample's individuals: each individual was interviewed by a faculty nutritionist, asked about all items ingested at lunch, dinner, breakfast and snacks of previous days as well as questions concerning other types of physical activity, health status, use of supplements/medication as well as consumption of diet or light food.

Adjustment of macronutrients intake was calculated based on the DRIs[13], which recommend caloric intake between 45 and 65% derived from carbohydrates; 10 and 35% from proteins; 20 and 35% of lipids.

Basal metabolic rate of the individuals was calculated according to the formulas proposed by the FAO/WHO/UNU[14]. Adjustment of energetic consumption was calculated by the total energetic need (TEN) which is the product of the multiplication of BMR by LPA (TEN = BMR x LPA), in which BMR = basal metabolic rate and LPA = level of physical activity (coefficient). The level of physical activity (LPA) adopted for the population under study was 1.78 for mean and 1.64 for women, according to table 1. The values termed adjustment percentage (%TEN) were calculated by %TEN = (energy nutritional intake value (ENI)/reference TEN) x 100[3].

Data were processed and assessed by the Statistical Software for Professionals (STATA) program, version 9.0 and, for interpretation effect, type I error was up to 5% ($p \leq 0.05$). Tables of frequency and tables of central tendency measurements and variables dispersion are presented according to sex for sample characterization. Quantitative variables which presented symmetric distribution were described by mean± standard deviation (SD) and those which presented highly asymmetric distribution were described by median (interquartile interval). Differences between means and medians were compared by the Student's t and Mann-Whitney tests, respectively.

Table1. Mean of daily energy needs of adults with occupational activity classified as light, moderate or intense expressed as multiple of BMR.

	Intensidade		
	Light	**Moderate**	**Intense**
Women	1.56	1.64	1.82
Men	1.55	1.78	2.1

FAO/WHO/UNU (1985).

RESULTS

Out of the 19 street runners assessed, 68.4% are men and 31.6% women. Mean age was 40.5 ± 8.9 years. Table 2 presents the age means and anthropometric measurements means values of the participants of the study according to sex. According to the results, weight, height and BMI means of men are higher than of women ($p < 0.01$), but BMI did not surpass 25kg/m^2, a lower limit value, indication of surplus weight. Women and men who presented normal mean of the waist-hip ratio (WHR), that is to say, ≤ 1.0 for men and ≤ 0.85 for women and neither presented WC means above 94cm and 80cm. No difference of mean %FC between men and women was observed.

The mean values of energy nutritional intake (ENI), basal metabolic rate (BMR), total energetic need (TEN) and percentage adjustment of total energetic need (%TEN) by sex are found in table 3.

Table 3 data states that the mean of BRM and TEN of men is higher than of women ($p < 0.01$). Conversely, there was not difference between values for ENI and %TEN in both groups. Regardless of sex, the street runners present energetic consumption lower than the optimum level to support the training volume usually imposed in the run practice.

Food distribution between macronutrients is presented in table 4. There was no difference between the mean value of consumption in percentage and in g/kg/day of macronutrients between sexes.

DISCUSSION

The application of anthropometric variables for determination of the nutritional status provides important information and constitutes a good predictor of the health status. Thus, it can be stated that the present study is composed of healthy individuals, since many anthropometric parameters were within the mean values of normality, among these, the BMI, WHR, WC and %F (table 2), not presenting increased risk for cardiovascular diseases either[9]. When compared to the %FC values proposed by Pollock and Wilmore (1993), for men (19-21%) and women (20-23%) in the age group between 36 and 45 years were classified with suitable %FC[8]. Body dimensions and composition present straight correlation with performance in different sports modalities. Thus, amount of fat and muscle mass may mean advantage and disadvantage in different sports, especially in he ones which demand body dislocation, such as running[15].

According to table 3, the mean values of energetic consumption (ENI) of the studied population were inadequate both in men and women. During regular training volume, and many times of high intensity, suitable amount of energy should be ingested for body weight maintenance, with the aim to maximize the training effects and keep healthy. Although many of the assessed individuals have reported intention to reduce body fat as main aim in the nutritional assistance, such low energetic consumption concerning the total needs of the group is worrisome. Diets with energetic content too low, and specifically with low content of carbohydrates, result in low glycogen storage in the muscles and can cause fatigue and performance debilitation of athletes and practitioners with extenuating weekly training regimen. Fast weight loss without suitable professional guidance can lead to muscle mass loss, increase in fatigue risk and, in some cases, complex metabolic and hormonal alterations, which on their turn, can negatively affect general performance of the individual[1,3,5,16,17].

On the other hand, it should be reminded that the research on food usually presents limitations concerning real energetic consumption of the involved individuals and the success of a study will depend on the accuracy of the information provided about what was actually ingested. Generally, the results of the research on assessment of food ingestion is lower than the real energetic consumption of the majority of the individuals, since they report

Table 2. Results of the central trend measurements (mean and standard deviation) of the anthropometric variables and body composition of the running practitioners according to sex (n = 19).

Variables	Studied population								
	Men			Women			Total		
	min	max	Mean ± SD	min	max	Mean ± SD	min	max	Mean ± SD
Age (years) 28	28	53	41.5 ± 9.8	29	46	38.2 ± 6.8	28	53	40.5 ± 8.9
Height (m)*	1.6	1.97	1.75 ± 0.10	1.51	1.73	1.63 ± 0.07	1.51	1.97	1.71 ± 0.11
Body weight (kg)*	64	101.3	76.3 ± 9.85	50.2	63.2	56.2 ± 4.60	50.2	101.3	69.9 ± 12.7
IMC* (kg/m2)	19.11	29.1	24.8 ± 2.67	19.85	23.05	21.3 ± 1.09	19.11	29.1	23.7 ± 2.83
% GC	9.01	34.7	18.95 ± 6.9	18.75	32.5	23.8 ± 4.8	9.01	34.7	20.5 ± 6.6
RCQ*	0.73	1	0.87 ± 0.07	0.75	0.78	0.74 ± 0.01	0.73	1	0.84 ± 0.07
CC*	73	103	86.23 ± 8.01	67	74.5	70.41 ± 2.82	67	103	81.24 ± 10.1

Notes: *p < 0.01 (Student's t test); SD – standard deviation; BMI – body mass index; %BF – body fat percentage; WHR – waist-hip ratio; WC – waist circumference.

Table 3. Median and interquartile interval of ENI, BMR, TEN values and energetic adjustment of the studied population..

Sex	N	IDE (kcal)	BMR (kcal)	TEN (kcal)	% TEN
All	19	1973.0 ± 1086.5	1672.4 ± 490.8	3041.5 ± 925.4	70.7 ± 38.85
M	12	2118.8 ± 1297.9	1760.6 ± 217.3*	3131.8 ± 236.9*	63.6 ± 38.04
F	6	1807.1 ± 582.9	1317.1 ± 80.2	2150.0 ± 107.7	82.4 ± 24.4

Notes: Descriptive analysis, data presented in median ± interquartile interval; ENI= energy nutritional intake; BMR = basal metabolic rate; (TEN) total energetic need; %TEN = adjustment to total energetic need percentage; M = male; F = female. *p < 0.01 (Mann-Whitney test)..

Table 4. Percentage energetic distribution and in g/kg of body weight/day of macronutrients.

Sex	N	Carbohydrates		Proteins		Lipids	
		(%)	(g/kg/d)	(%)	(g/kg/d)	(%)	(g/kg/d)
Todos	19	48.1 ± 9.20	3.54 ± 1.45	22.3 ± 4.96	1.70 ± 0.57	29.6 ± 7.2	0.97 ± 0.45
M	13	46.0 ± 10.10	3.32 ± 1.61	22.4± 5.23	1.64 ± 0.67	31.5 ± 7.24	1.0 ± 0.49
F	6	52.3 ± 5.56	4.05 ± 0.93	21.9 ± 4.82	1.82 ± 0.25	25.8 ± 6.22	0.9 ± 0.34

Notes: Descriptive analysis, data of the macronutrients values in % of energy nutritional intake (ENI) and in g/kg of body weight/day presented in mean ± standard deviation (carbohydrates and lipids) and in median ± interquartile interval (proteins); M = male; F = female.

to have eaten less than they really ate or eat less than normal during the period at which the are assessed[16]. Moreover, the methods available to quantify the energetic intake of individuals and populations present advantages and disadvantages. Quantitative methods such as R24h and nutritional records are used when one wishes to know the amount of calories, macro and micronutrients ingested. On the other hand, questionnaires of nutritional frequency are used when one wishes to know the eating habit[18]. Thus, the single use of R24h in the present study did not allow characterizing the habit of these individuals, despite the researchers' trial to complement missing information of the 24h method through a complementary questionnaire applied during the single nutritional visit with the participants.

Estimation of the energetic cost by prediction equations has been frequent in the studies since the calorimetry requires costly specific methodological techniques. However, when a prediction equation is applied, it is important to know the population from which it was obtained as well as the factors which affect and alter its predictive capacity. Despite these factors, authors have demonstrated that there may be under or overestimation of results found by them[19,20]. Based on this reality, even if the calculations of the energetic need estimation (ENI) in the present study point to be inadequate, the street runners still present caloric cost below the expected values for running or marathon runners practitioners, estimated between 3.000kcal and 5,000kcal[6,21]. When caloric intake was considered according to body weight, the group of runners presented mean intake of 28kcal/kg of weight/day, much below the DSBME[22] guidelines, between 30 and 50kcal/kg of body weight/day according to the kind of exercise practiced. The Guideline highlights the existence of studies which demonstrate low caloric intake and nutritional imbalance in the diets both of professional and amateur athletes. Considering that the group when referred to the nutrition first-aid unit had as aim, besides performance improvement and body %F reduction, diets which favor the energetic supply in the range between 25-33kcal/kg of weight, can in fact promote ponderal reduction of 0.5kg/week. Nevertheless, the offer of essential carbohydrates should be complementarily observed to the maintenance of the glycogen storage and consequently of general performance[23]. Thus, the found results show that at these nutritional conditions it is crucial that new nutritional planning of the group is designed, since in case the diet of these sports people is not adequate to the demand, they will not present good performance conditions, being able even to produce nutritional deficiency and health damage. Modalities categorized by weight (e.g. fights) and those in which weight may negatively influence performance (e.g. marathon runners, gymnasts, cyclists ,etc) make individuals frequently limit energetic consumption to reduce body weight, trying hence to take advantage over their competitors[3]. However, when one wishes to modify body composition by reduction of fat mass, reduction of only 10 to 20% in caloric intake with choice for low energetic density food, so that hunger and fatigue are not induced is sufficient. Dramatic diet fat reduction may not guarantee the reduction of body fat and lead to significant muscular losses by lack of important nutrients in the recovery after physical exercise, as liposoluble vitamins and proteins[22].

Considering that the energetic consumption of the runners is below their needs (table 3), but they presented %F suitable for their age group, increase in the daily energetic consumption becomes necessary, either by energetic density of the meals or by number of daily meals[3]. The follow-up of a nutritionist specialized in sports may help athletes and amateurs to keep a healthy diet during the period of reduced caloric intake so that the weight loss is gradual and healthy[24].

Concerning the assessment of the mean values for distribution of macronutrients (table 4), it was observed that the percentages were according to the DRIs guidelines[13] between 45 and 65% of the total calories originated from carbohydrates; 10 and 35% from proteins; 20 and 35% from lipids. However, total mean consumption of carbohydrates in both sexes remained closer to the maximum threshold (48.1% of ENI) compared to the DRIs and can compromise performance as well as the post-training recovery period. Such lower carbohydrate value may have been a result of high mean lipid intake (29.6% of ENI), close to the maximum value suggested in the DRIs. Onywera et al.[5] mentioned that this carbohydrate consumption standard of endurance runners in industrialized countries such as the USA, Holland, Australia and South Africa, representing 49%, 50%, 52% and 50% of total calories, respectively. The standard presented by the Kenyan runners is very different, whose diet composition involved high carbohydrate associated consumption (76.5%) and kept by low fat amount (13.4%)[5].

Although elite athletes present difficulty in meeting their energetic needs in carbohydrates, they already know that these are the components which will improve their performance[7,25], differently from the physically active population in general, where certain difficulty in incorporating balanced quantities of macronutrients can coexist. When body weight is considered as reference, carbohydrate ingestion in the present study presented even less adjusted values (3.54g/kg/day). Ingestion between 6-10g CHO/kg of body weight/day is crucial for the optimization of the initial storage of muscle glycogen, maintenance of glucose blood concentration during exercise and suitable replacement of glycogen storage in the recovery period[3,7,22,26,27]. Therefore, minimum carbohydrate supply of 45% of total calories is recommended[13], with mean of 60% being optimum and in the case of athletes, it can reach 70% of total daily energetic intake.

On the other hand, protein intake in the present investigation, when the consumption % is considered (table 4), was within the suggested guidelines by the DRIs. Nevertheless, when body weight was considered, these individuals kept protein intake suggested to strength athletes (1.7-2.4g PTN/kg of body weight/day)[3]. In the scientific field, higher need of protein intake has been identified among individuals who practice physical exercise, since proteins contribute to energy supply in endurance exercises, besides being necessary in the muscle protein synthesis in the post-exercise period. Thus, the proteins play a supporting role in the energy supply for the activity to endurance athletes, where daily need is calculated as 1.2 to 1.6g/kg of weight/day[22,26,27]. Traditionally, it is strongly believed in the sports environment that high protein or amino acids intake would increase strength and muscle mass[23,28,29]. It cannot be denied that consumption of these nutrients is crucial to synthesis of body structures and is involved in countless metabolic mechanisms associated with exercise. However, it is worth mentioning that for maintenance of its plastic function, it is necessary to ingest suitable quantities of energy in the diet as well as observe the individual characteristics (gender, age, anthropometric profile, health status etc), basic parameters of physical activity practiced, such as intensity, duration, frequency and training history of the individual[22,30,31]. Protein excess may in the long run be swerved for production of energy (synthesis of intermediate components of the Krebs cycle), or be excreted, since humans do not present a compartment of storage proteins[3]. Moreover, it is associated to deleterious effects to health, such as ketosis, gout, renal overload, increase in body fat, dehydration, calcium urinary excretion and bone mass loss[3,32]. Mean lipid consumption of the assessed runners indicated, in energetic distribution percentage and in g/kg of body weight, suitable values (table 4). According to the DSBME[22], an adult needs about 1g of fat per kg/body weight daily, which means 30% of the total caloric value (TCV) of the diet. Regarding the athletes, the same nutritional recommendation aimed at the general population has prevailed, and consumption above these quantities is associated to a deficit in carbohydrate ingestion which tends to be ingested in proportions lower than the recommendations, as actually occurred with the runners in the present study. Lipids are important in the production of energy during exercise and their catabolism during exercise represents metabolic advantage, since higher oxidation of fatty acids will result in economy of the glycogen supplies[3]. Conversely, consumption lower than 15% of the total caloric value of the diet does not seem to bring any benefit to health and performance[26].

CONCLUSION

The outcomes of this research show that concerning the anthropometric variables, the group of street runners maintains suitable nutritional status. However, concerning total energetic intake and macronutrients consumption, the participants presented consumption below the recommendation, being hence inadequate to regular running practice. Considering that carbohydrates are an important energy source during exercise, it is necessary to increase its consumption, while protein ingestion should be reduced (g/kg weight). Although a second nutritional assessment in the runners' group of the present study had not been possible, the data obtained show that continuous support from sports nutrition professionals is necessary, especially in modalities which involve recreational athletes since inadequate nutritional behavior may negatively influence on the results of the final performance. Further studies involving not only athletes of this modality, but also recreational street runners should be carried out. These studies should be concerned with planned nutritional guidance since there are several factors which can expressively influence on the typical eating pattern of an athletic group, and consequently, its performance and health.

All authors have declared there is not any potential conflict of interests concerning this article.

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