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Nutritional Intake of surfers through a National Championship

Ingestão nutricional de surfistas durante um Campeonato Nacional

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Abstract

This study aimed to assess the body composition, energy intake and nutritional status of a group of Portuguese surfers. Secondly, it also intended to determine weight alterations during competition.

The evaluation of the athletes' nutritional and caloric intake was based on a 3-day dietary record. In order to assess body composition, measurements for height and weight were taken, as well as seven skinfolds (triceps, subscapular, biceps, iliac crest, supraspinale, abdominal, front thigh and medial calf) which allowed to calculate the percentage of body fat (BF) and the sum of skinfolds (SF).

The sample consisted of 13 surfers with an average age of 28.6 ± 6.4 years with a mean of 12.7 ± 3.8% for BF and 78.6 ± 36.0 on the SF. The variation in weight between the two days of competition was not statistically significant (71.3 ±6.3 to 70.3 ±6.7kg) p=0.33, but significant differences were seen between events (70.3 ±6.7 to 69.6±6.6kg) p=0.007.

Regarding the athletes' nutritional, it was verified that they don't realize any special diet which could promote a better performance.

It would be beneficial for athletes to seek monitoring by a nutrition professional, in order to maximize their performance.

Key Words: Surfers; Food intake; Body fat; Dehydration; Competition;

Resumo

Este estudo teve como objetivo avaliar a composição corporal, ingestão nutricional de uma amostra de surfistas portugueses e a sua variação de peso durante a competição.

Para a avaliação da ingestão energética e nutricional recorreu-se a um Registo Alimentar de 3 dias. Para a avaliação da composição corporal foi medido o peso, altura e ainda utilizou-se 7 pregas cutâneas (Tricipital, Subescapular, Bicipital, Iliocristal, Supraespinal, Abdominal, Crural Geminal) para o cálculo da percentagem de massa gorda (MG), assim como o somatório de pregas (SP). A amostra foi constituída por 13 surfistas com uma média de idades de 28,6±6,4 anos com uma média de 12,7±3,8% de MG e 78,6±36,0 no SP. A variação de peso entre os dias de competição foi sem significado estatístico (71,3 ±6,3 para 70,3 ±6,7kg) p=0.33, e entre eventos foi com significado estatístico (70,3 ±6,7 para 69,6±6,6kg) p=0,007.

No que diz respeito à alimentação dos surfistas durante a competição, verificou-se que não praticam uma alimentação que promova a boa performance desportiva.

Estes desportistas beneficiariam de um acompanhamento de um profissional da área da nutrição de forma a maximizar os seus esforços durante a competição.

Palavras-Chave: Surfistas; Consumo alimentar; Massa gorda; Desidratação; Competição;

Abbreviations

AI – Adequate Intake

BC – Body Composition

BMI – Body mass index

BW – Body weight

CHO – Carbohydrates

DR – Dietary record

RDA – Recommended Dietary Allowance

EI – Energy intake

FM – Fat Mass

ISAK – International Society for the Advancement of Kinathropometry

SF – Sum of skinfolds

SPSS – Statistical Package for the Social Sciences

UL – Tolerable Upper Intake Level

Contents

Introduction

In Hawaii, the act of sliding on the wave of standing is an ancient past, practiced long before the arrival of European peoples [1, 2].

In the early XX century, began the modern era of surfing, attributing the cause to Kahabamoku Duke, being now a very popular sport, practiced on the beaches of five continents, both for leisure or professional [2-4].

Surfboard riding (surfing) is an intermittent sport activity characterized by periods of high-intensity exercise intercalary with low-intensity and rest periods. Surfers ´activities are classified into 1 of 4 categories (paddling, stationary, wave riding and miscellaneous (activities such as ducking under white water and wading) with 51, 42, 4 and 2% of the time-motion respectively [5, 6].

The surf movement usually involves the surfboard being paddled out in the prone position until the surfer is behind the area of breaking waves at the “line up” or “take-off zone”. Once in there, the surfer waits until a suitable wave approaches. Then, with some powerful sprint type arm strokes, the surfer accelerates the board to allow to “catch” the wave. Once the surfer catches the wave his performance begins with a series of maneuvers. This process is repeated many times during a session of leisure or competition [3, 4, 7].

Surfing contests are based on elimination heats. The normal contest format consists of 20 to 40 minute heat of 2, 3 or 4 surfers. A group of judges score the execution quality of variety of maneuvers with “style, power and speed”. The winners of each heat advance to the next round [4-6]. Each surfer performance is influenced by weather conditions and equipment, as well as physiological,

psychological and physical adaptations, with levels of fat and muscle influencing the ability and progress in the surf [7, 8].

This emergent sport has been growing, which is greatly due to the awards of national and international competitions, sponsorship, boards/accessories evolution and the fact that it is a sport practiced outdoors in direct contact with nature. As a result of radical changes which have taken place, the surfers become more able to perform the most diverse and demanding maneuvers [7], however it remains a lack of scientific information in the competitive landscape of this sport [4, 9], specifically in the surfers nutrition [3].

The location of some surfing "paradise" could be one possible cause of this problem because not always a permanent catering service is available, and even when food is provided it may be of questionable nutritional quality [3].

Since this is a sport that requires great aerobic and anaerobic effort, endurance work (rowing) and strength (stronger strokes and maneuvers), nutrition plays an important role for the surfer's performance [10-12] added to the fact that the nature of the competition provides very important recovery times. Nutrition plays another important role not only on the availability of nutrients for good performance, but also for prevention of diseases and enhancement of immune system [13, 14].

Aims

The aim of this study was to assess body composition and nutritional intake of surfers during a stage of the Portuguese National Championship and to identify gaps in their intake that may decrease their performance.

Other important aim was the evaluation of hydration balance at acute (before and after the heat) or at continue level (the 1st for the second day).

Materials and Methods

Sample

The 3rd round of the national championship of Surf had 38 participating surfers, and 20 agreed to join the study. Of these 20, only 13 delivered dietary record (DR) properly completed.

The sample consisted of 13 surfers (professional and non-professional), all males aged between 18 and 36 years.

Materials

- Dietary records for 3 days (DR);
- Records of time in water of 3 days;
- Statistical Package for the Social Sciences (SPSS) version 20.00 for Windows;
- Food Processor Plus version 10.0;
- Scale Seca;

- Stadiometer;
- Caliper Harpenden;
- Tape measure.

Energy intake and nutritional evaluation

The delivery of DR (Appendix 1) proceeded the day before their registration, which took place during the competition (25-27 May). This delivery attended a dialogue to instruct them in accurately recording, with an explanation of the manner and importance of its completion, as well as a text with their specifications. It was also asked to register all foods and fluids consumed, the quantity, the cooking method used and the time and place where it has been consumed. It was focus the importance of not omitting/declare the registration of any food/drink due to a possible perception of healthy food or less healthy, as they do not alter the routine of eating habits during competition[15, 16].

Along with this it was verified the time of the entry/exit of water of each athlete.

Anthropometric evaluation

All measurements were carried out on the same day before the start the competition. Measurements were made through scientific procedures accepted by the International Society for the Advancement of Kinanthropometry (ISAK)[17] and by the same measurer. Height was measured using a SECA® stadiometer (± 0.001 cm), with the head in Frankfort® plane, the weight was recorded using an

electronic scale SECA® (± 0, 01 kg). The athletes were barefooted and dressed in shorts during these measurements. BMI was calculated from the Quetelet Index, Weight (kg)/height ^{2} (m).

A calibrated calliper Harpender was used to measure seven skinfolds (triceps, subscapular, biceps, iliac crest, supraspinal, abdomen, midthigh, and calf) of each athlete. All measurements were performed on the same day and before the start of the competition. Body fat was then calculated using Faulkner [18] equation.

On the 2nd day of competition before and after the "heat" the athletes were weighed again. During the first and second weights they're not allowed to take any fluid/food and none athlete reported that urinate during the test.

Statistical Analysis

For statistical analysis of the data was used SPSS v.20 for Windows. We assessed the normality of distributions using the Shapiro-Wilk test. Comparison of means was performed using the *t Student* test for paired samples.

It was considered that the results were statistically significant when $p < 0.05$.

Results

Sample characteristics

This study had 13 male athletes aged between 18 and 36 years with an average age (28.6 years). In Table 1 are described the characteristics of surfers.

Table 1. Anthropometric variables.

	N	*Age (years)*	*Years of pratice (years)*	*Weight (kg)*	*Height (cm)*	*BMI (kg/m2)*	*% Fat mass*	*Sum of skinfolds (mm)*
Mean	13	28,6 (±6,4)	18,2 (±5,7)	71,3 (±6,4)	1,75 (±0,06)	23,2 (±2,0)	12,7 (±3,8)	78,6 (±36,0)
Minimum-Maximum	13	18,0-36,0	7,0-25,0	59,5-80,5	1,67-1,83	19,9-26,7	7,8-19,3	38,9-152,4

The mean body mass index (BMI) was 23,2. In this sample the average of % Fat mass (FM) and Sum of skinfolds (SF) was 12.7 and 78.6, respectively.

Energy and macronutrient intake

For the analysis of Table 2, we found that the sample mean energy intake (EI) was 2708,6 kcal per day corresponding to 38,1 kcal/kg/BW.

Table 2. Energy and nutritional intake.

	Energy		***Protein***		***Carbohydrates***		***Lipids***		***Alcohol (g)***		***Water (ml)***
	Kcal	**Kcal/ kg**	**g**	**g/kg**	**g**	**g/kg**	**g**	**%EI**	**(g)**	**%EI**	
Mean	2708,6 (±498,7)	38,1 (±7,7)	98,2 (±23, 2)	1,4 (±0,4)	315,7 (±74,1)	4,4 (±1,1)	101,4 (±32,3)	33,7 (±8,8)	17,8 (±23,8)	4,5%	1366,6 (±495,8)
Minimum-Maximum	2049,3-3780,9	29,3-58,6	59,6-148,5	0,8-2,3	201,3-457,0	2,6-6,1	52,6-146,6	20,5-55,6	0,0-73,4	0 - 19,8	478,4-2055,9

The protein mean intake was 98,2g corresponding 1,4 g/kg/BW, reaching a minimum of 0,8 g/kg/BW and a maximum of 2,3 g/kg/BW.

In this study the mean intake of carbohydrates (CHO) was 4.4 kcal/kg/BW, getting a minimum of 2,6 g/kg/BW and a maximum of 6,1 g/kg/BW.

The fat intake was 33,7% of the total energy, with 20,5 and 55,6% of minimum and maximum, respectability.

Alcohol mean intake during 1st day competition was 17,8g with a maximum of 73,4g.

The water intake in **table 2,** mean 1366,6 refers to total water intake (in form of water and in food).

Micronutrient intake

Table 3 shows the mean intakes of vitamins and minerals in 1st day of competition, the percentage of individuals who was able to reach the Dietary Reference Intake (DRI) and above the tolerable Upper Intake Level (UL). In cases that doesn't exist RDA it was considered the Adequate Intake (AI).

Table 3. Intake of vitamins and minerals on the 1st day of competition

	Mean (± standard deviation)	*% athletes reaching RDA's*	*%UL*
Vit A (µg_ERA)	187,6 (±101,9)	0	-
Vit VitE (mg) alpha tocopherol	4,4 (±5,6)	7,7	-
Vit C (mg)	60,6 (±43,4)	23,1	-
Thiamine (mg)	8,3 (±11,4)	53,8	-
Riboflavin(mg)	2,9 (±2,4)	61,5	-
Niacin(mg)	37,0 (±24,8)	84,6	38,5
Vit B6 (mg)	160,8 (±246,3)	69,2	30,8
vit B1 (µg)	6,7 (±4,5)	76,9	-
Folate (µg) DFE	213,3 (±141,5)	7,7	-
Calcium (mg)	784,0 (±428,2)	23,1	-
Iron (mg)	13,6 (±3,1)	100	-
Sodium (mg)	2890,0 (±1016,2)	100	61,5
Potassium (mg)	3309,8 (±1093,9)	7,7	-
Magnesium (mg)	253,9 (±96,0)	7,7	-
Phosphorus (mg)	1155,0 (±295,2	15,4	-
Zinc (mg)	13,7 (±7,7)	38,5	-
Selenium (µg)	74,2 (±44,3)	15,4	-

It was observed that only iron and sodium intake achieved the recommended requirements in all surfers. Moreover, none of the athletes has achieved the RDA

of Vitamin A [19]. Other vitamins that deserve attention by low percentages of adequacy (7,7 and 23,1%) were Vitamin E and Vitamin C, respectively [20].

Minerals stands out a large percentage of inadequacy for calcium with 23,1%, selenium with 15,4% and folate, potassium and magnesium with a percentage of adequacy 7,7% [21-23].

Weight changes

In **Tables 4.1** and **4.2** are compared the average of weights at different times and days of the competition. Non-significant differences were found between days ($p < 1.33$), but the average of the weights before and after the heat shows significant differences ($p < 0.007$).

Table 4.1.Weight variation between two days. P for difference of means

	Competition				
	N	**1º day**	**2º day**	**p**	**% weigth lost**
Weight (kg)	13	71,3 (±6,3)	70,3 (±6,7)	0,33	1,4

Tabela 4.2. Weight variation between two heats. P for difference of means

	Competition				
	n	**Before**	**After**	**p**	**% weigth lost**
Weight (kg)	8	70,3 (±6,7)	69,6 (±6,6)	0,007	1

Discussion

The main findings of this study were the low energy and carbohydrate intake by surfers and their high fat ingestion, which appeared inadequate to meet the demands of competition.

This study used a DR 3 days, often used to assess the intake of athletes. These records are of relative precision for individual or group studies, although always present an error (flat-slope syndrome)[16].

Due to external factors such as weather, waves and wind, among other competition is constantly changing the schedule. Because the number of athletes competing for 3 days to be only 4, was decided to make the evaluation of a larger sample of only one day, since the increase in the number of subjects evaluated decreases the variability[16]. For athletes it is important to identify the pre, during and after competition moments, however, due to the above conditions and the nature of competition, would not be right to compare/quantify these periods of a competitive surfer who competed at 7:00 a.m. in the morning with another that did it at 13.00 or even at 17.00 p.m. In these cases were quantified the total daily values. The comparison of our results with other studies must be done with careful because different procedures were applied. Thus one finds that there is a lack of baseline studies in this sport to allow a comparison of values in a context of realization of protocol as close as possible.

In what concerns age, this sample was similar to other studies[4] and compared FM% and SF with other studies both are slightly above [4, 7].

The FM% is indicated for the measurement of body composition (BC) athletes, but of course is subject to errors in estimating the percentage of fat among others. So

it is more correct to establish a range of FM% or pick for the sum of skinfolds (SF) [10, 24]. The FM % and consecutively weight can influence the ability endurance, speed and agility [10] and may influence their technical skills of surfing [7].

As earlier mentioned, nutrition plays an important role in sports performance. Athletes who play multiple training sessions or competitions in the same day(s) must have special consideration in nutritional recovery, not only to restore the muscle glycogen as well to repair muscle damage and to be ready to the next event [25, 26].

Achieving energy needs is the first priority of the athletes not only to optimize the performance, but also to maintain lean body mass and immune function [10].

The sample mean energy intake (EI) was 2708,6 kcal per day similar to that found in other studies [27]. This value must be appropriate to each individual, since varies according to heredity, body composition, age, sex, intensity, duration and frequency of physical activity [28]. For an endurance athlete (70 kg) is estimated that the daily energy requirements are 3000-5000 kcal/day [10].

The protein mean intake was consistent within the recommendations (1.2 to 1.4 g/kg/BW[10], but lower than other studies [27], however it is important to note that the physiological stress caused in athletes that fasting purposely (surfers who compete at 07h00 / 08h00) increases the use of protein as energy substrate, in addition to their other roles in repair, maintenance and muscle synthesis [29].

The carbohydrates (CHO) are the main fuel used by athletes to surf itself. So it becomes of particular importance to ensure a proper intake of this nutrient, so that they can store it in the form of muscle glycogen and even to strengthen the immune system [10, 13, 15, 30]. The ingestion of CHO was far below the recommendations 7-10g/kg/BW [10, 28] but, assembly with other studies [27].

Regarding to fat intake, should be between 20-25% of total caloric value in order to provide essential fatty acids, liposoluble vitamins as well as provide fuel [27]. In this study, the high fat intake can limit the intake of carbohydrates, conditioning the health and performance of athletes [10].

In this study the alcohol average intake of the surfers was 17,8g (Table 2). It is common practice to ask the athletes to avoid any alcohol intake during the 24 hours preceding the event. This intake, may also directly affect the performance for many hours after ingestion, also delaying the process of re-hydration and tissue repair [31-33].

Exercise can increase the turnover of vitamins and minerals, so, beyond their importance to general health, they also have impact on athlete's performance [10, 34]. However if they have a proper energy supply (quantitative and qualitative) and is not restrictive in certain food groups there will be no need for supplementation [35]. In this sample the percentage of the athletes who managed to achieve the RDA of vitamin C, E, calcium and potassium was very low. Vitamin C is involved in important biochemical pathways and as protective antioxidant that are important to the exercise and the health of the athlete. Other vitamin linked to performance is vitamin E, described as it may have a protective effect against oxidative damage and changes in the immune response induced by exercise. Calcium is essential role in blood clotting, muscle contraction, nerve transmission, and bone formation. Potassium is a electrolyte involved in the maintenance of bodily fluids and the loss of potassium in skeletal muscle has been related to settle down fatigue [20, 23, 36].

During the days there are 2, 3 or more competitive moments and it is necessary to correct hydration. This should be monitored before and after each heat in order to benefit from weight loss, but not adversely affected by a dehydration than 2% in

order to delay the onset of fatigue, as well as preventing muscle damage [37-39]. In the present study, it was found that there was a dehydration of 1% by heat. This value is not likely to cause loss in performance [37-39]. However during competition may be 2, 3, 4 or more heat by day and “accumulation” of dehydrated can be impair the surfer performance.

Conclusion

Regarding the athletes’ nutritional intake, it was verified that they don’t realize any special diet which could promote a better performance. Surfers’ low energy and CHO as high fat intake are inadequate to meet the demands of competition.

These results indicate the need for continued monitoring of athletes by nutrition professionals, so they can enhance sports performance.

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Appencices Index

Index 1

INSTRUÇÕES PARA O PREENCHIMENTO DO DIÁRIO ALIMENTAR DE 3 DIAS

Por favor anote tudo o que comer ou beber durante 3 dias seguidos, a começar na próxima sexta-feira. Faça descrições pormenorizadas de alimentos e bebidas como, por exemplo, tipo de pão (trigo, mistura, integral, etc.) ou tipo de leite (magro, meio-gordo ou gordo). Mencione também o tipo de confeção culinária como, por exemplo, carne de vaca guisada, ovos estrelados, costeleta de porco frita em margarina, etc..

Quando comer fora de casa, por favor anote tudo o que comer ou beber, imediatamente após o consumo. Não se esqueça de apontar tudo o que for comido ou bebido no intervalo das refeições como, por exemplo, cachorros, bolachas, café, açúcar, etc.

Como fazer o registo:

Inicie o registo com a página correspondente a esse dia; por favor assegure-se que preencheu as partes correspondentes a: HORA, LOCAL, ALIMENTOS E QUANTIDADE.

Quanto às quantidades e aos tamanhos das porções:
Mencione o tamanho dos alimentos e a quantidade das bebidas. Para tal, use medidas caseiras como, por exemplo, 1 colher de chá de manteiga, 9 colheres de sopa cheias de arroz, 3 conchas de massa, 1 tigela de sopa, 1/2 chávena almoçadeira de leite (ou 1/2 chávena de chá, se for mais pequena), 1 copo de cerveja, etc. Seguem-se alguns exemplos:

Bebidas
Use copos ou chávenas e refira o tipo como, por exemplo, chávena almoçadeira, de chá ou de café. Quando misturar leite com café, mencione as quantidades de cada uma das bebidas (por exemplo, 1/4 de chávena almoçadeira com leite magro e o restante com café).

Sopas
Use tigelas (semelhantes à da cantina), número de conchas ou pratos (cheio, meio prato).

Molhos
Para cada molho (de fritos, guisados, maionese, etc.) use colheres de sopa ou de chá.

Carne, pescado, aves e pizza

Indique as quantidades consumidas especificando os alimentos e classificando as porções em pequenas, médias, grandes, fatias, unidades, cubos de carne, latas (de atum, por exemplo), ou medidas caseiras (colheres de sopa, chávena almoçadeira, etc.).

Hortaliças e legumes
Use rodelas (por exemplo, tomate, cebola, pepino), parte do prato (meio prato, um quarto de prato) ou chávenas almoçadeiras (meia chávena de alface, por exemplo).

Arroz, massa, feijão, ervilhas ou grão
Indique o número de colheres de sopa.

Batatas
Se forem cozidas, indique o número de batatas do tamanho de um ovo; em puré, diga o número de colheres de sopa. Se forem fritas, indique a que parte do prato corresponde (meio prato, um quarto de prato); em pacote, diga se é pequeno, médio ou grande.

Óleos, manteiga e margarina
Use colheres de sopa ou de chá

Açúcar, cacau, chocolate, mel
Use pacotes de açúcar ou colheres de chá

Pão, pastelaria e doces
Use o número de pães ou fatias e mencione o tipo de pão se não for corrente (de trigo).
Bolos: 1 unidade ou 1 fatia

Fruta
Refira o nome da fruta e indique o número de porções médias; se forem uvas, a unidade é 1 cacho.

NOTA 1: Se conhecer o peso do alimento pode referi-lo, como por exemplo, 80g de um determinado chocolate, ou 0,33L de água.

NOTA 2: Se usa algum tipo de suplemento nutricional, indique também a hora/local/suplemento/quantidade do mesmo

Sexta-feira **25/05/2012** **Código____**

Horas	Local	Alimento	Quantidade

Sábado **26/05/2012** **Código____**

Horas	Local	Alimento	Quantidade

Domingo 27/05/2012 Código____

Horas	Local	Alimento	Quantidade