

Rodríguez Pérez, M.A., Casimiro Andújar, A.J.; Sánchez Muñoz, C.; Muros Molina, J.J. y Zabala Díaz, M. (2012). Hábitos alimentarios de los jóvenes pilotos de motociclismo de élite internacional / Feeding habits of young international elite motorcyclists. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol.12 (46) pp. 195-207 [Http://cdeporte.rediris.es/revista/revista46/arthabitos289.htm](http://cdeporte.rediris.es/revista/revista46/arthabitos289.htm)

## ORIGINAL

### FEEDING HABITS OF YOUNG INTERNATIONAL ELITE MOTORCYCLISTS

### HÁBITOS ALIMENTARIOS DE LOS JÓVENES PILOTOS DE MOTOCICLISMO DE ÉLITE INTERNACIONAL

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**Código UNESCO / UNESCO Code:** 3206 Ciencias de la Nutrición / Nutritional Sciences

**Clasificación Consejo de Europa / Council of Europe Classification:**

6 Fisiología del Ejercicio / Exercise Physiology

11 Medicina del Deporte / Sport Medicine

**Recibido** 2 de agosto de 2009 **Received** August 2, 2009

**Aceptado** 23 septiembre de 2010 **Accepted** september 23, 2010

#### ABSTRACT

Feeding is crucial to perform at the highest level in elite sport. So, to offer feeding patterns to the next Moto GP pilots, we have analyzed the feeding patterns of 27 elite young worldwide motorcycling pilots coming from the 5

continents, selected after a rigorous process developed by the organizers of the world motorcycling championship (Moto GP).

It has been found that although pilots give a big importance to their weight and feeding, their feeding habits are not adapted to the standards and recommendations for athletes. There are no big or meaningful differences for any of the macronutrients in the training sessions and the period before a competition. Regarding hydration, there are significant differences between a training day and a competition one ( $p=0,008$ ).

Results suggest that feeding habits of the elite young motorcyclists should be clearly improved, establishing patterns that involve athletes, parents, and coaches, all of them taking care about the nutrition.

**KEY WORDS:** Nutrition, Young, Motorcycling.

## **RESUMEN**

La alimentación es fundamental para rendir en el deporte, ya que una dieta inadecuada puede limitar el resultado. Por ello, el objetivo de este estudio ha sido conocer los hábitos nutricionales de 27 jóvenes pilotos de motociclismo de élite internacional a través de un cuestionario. Los resultados muestran cómo un 96.2% de los pilotos se alejan de las recomendaciones nutricionales de cinco comidas al día, así como de la recomendación de 3 raciones diarias de cereales y pan, que son cumplidas por 15,4% y 30,8% respectivamente. No existen diferencias estadísticamente significativas para ninguno de los macronutrientes entre los momentos de entrenamiento y justo antes de una competición. Respecto a la hidratación, existen diferencias significativas entre un día de entrenamiento y un día de competición ( $p= 0,008$ ). Los resultados sugieren que los hábitos alimentarios de los jóvenes pilotos de motociclismo deberían ser mejorados, estableciéndose pautas de actuación e implicando a los deportistas, familias y entrenadores.

**PALABRAS CLAVE:** Nutrición, Jóvenes, Motociclismo

## **INTRODUCTION**

From the physical activity and sport sciences point of view, research about motorcycling is behind other sports research. The progress of motorcycling is focused in technological improvements of the motorcycle developed by engineers and mechanics. However, we should not forget that there is an individual sportsman who controls the motorcycle and, as a sportsman, must be studied.

Performing at the highest level is not only based on mechanical aspects. As well as it is needed to design or to incorporate the last technological advances, it is also important to study the sportsman.

It is widely known that diets have a basic role in competitive sports. In order to play a sport it is essential to have a well trained and well-nourished body, so a sportsman's diet is a basic aspect of their training. Although an adequate diet cannot guarantee success, there is no doubt that an inadequate one can limit the performance and hinder the logical progress that an effective training implies<sup>1,2</sup>. Regardless of the type of exercise or sport practised, it is possible to improve the level of performance through an adequate diet. In addition, nowadays nobody argues that the nutritional status has a direct influence on health and welfare<sup>3,4,5</sup>.

A proper ingestion of macro and micronutrients, as well as the proper distribution of them, can establish their better assimilation and use. These aspects lead to an adequate recovery of the cellular deposits and get the organism ready for later efforts<sup>2,6,7</sup>. The use of carbohydrates during physical activity is extremely important, since their deposits are limited, so it is essential for the sportsman to have a good nutritional strategy. In addition, carbohydrates make possible the regulation of the use of other energy substrates. Nutritional strategies can also increase muscular glycogen deposits that may offer significant benefits to the sports performance<sup>1,4,5,7,8</sup>.

Therefore, it is important to know the nutritional status of the sportsman in order to prevent a possible deficiency of certain substances in the organism that may lead to a decrease of energy reserves in terms of cells. In addition, the sportsmen's nutritional needs and caloric ingestion will vary depending on the season and the period of time they are<sup>2,9,10</sup>, since it is not the same a period of competition and a period of transition, for instance.

Hydration also plays an essential role in speed motorcycling, due to the duration of the competition itself (over 30min). In that sense, the decrease of water, a basic element for our life, in the organism, can severely affect to our health and performance. In fact, the intracellular medium needs a great amount of water for its running in order to maintain its osmolarity and, as a result, its operating capacity. In addition, body water intervenes in the heat dissipation produced during the physical activity, since water in gaseous state (sweat) helps the organism to lose part of the excess of temperature, which limit the sports performance.

If we do not introduce these fluids to the body and we maintain the heat production during training sessions, it could damage health<sup>1,11</sup>. During exercise, thirst is not the only factor to prevent dehydration, especially amongst young people, because before feeling thirsty, dehydration has already significantly developed. If losses continue, there is a risk of reducing cardiac output as well as the plasmatic volume and this could cause a decrease of aerobic capacity, muscular endurance and the ability to develop physical activity. It could also affect mental abilities. In addition to all this, in many cases, physical activity is performed in warm environments and wearing uniforms and protective equipment, which can affect dehydration<sup>1,5,8,11,12</sup>.

There are several studies made with young people and elite sportsmen that show the need to train them in specific concepts and basic rules of nutrition in

order to guarantee a better diet<sup>2,13,14</sup>. In that sense, sportsmen are able to acquire good nutritional habits that will let them perform at the highest level during competition and will provide them with the most suitable recovery. Nevertheless, in speed motorcycling we have not found scientific literature where motorcyclists' dietary habits are analyzed.

The aim of this study is to establish the international elite motorcyclists' dietary habits in order to determine the aspects that could be improved.

## **METHOD**

### *INDIVIDUALS*

A sample of 27 motorcyclists ( $15.3 \pm 1.11$  years old) was analyzed during Red Bull Moto GP Rookies Cup official training sessions, which took place the 2<sup>nd</sup> and 3<sup>rd</sup> of May 2009 in the Jerez Race Track (Spain).

In the Red Bull Moto GP Rookies Cup the 27 best young motorcyclists in the world compete. They are chosen after a rigorous process of screening and talent selection carried out by DORNA (organizer of the Motorcycle World Championships) and Red Bull (the sponsors), in different places of the world, amongst 1100 sportsmen from 60 different countries. Over the course of several days, candidates to the final selection of motorcyclists have to time 20min. of training in order to choose the fastest ones or the ones with more projection, according to the criteria of those responsible for this talent selection. The final sample comprised a total of motorcyclists from 15 different countries of the 5 continents.

### *MATERIAL AND METHODS*

The data collection tool was the questionnaire of Friederes et al., previously validated in a similar study<sup>15</sup>, which was adapted to the motorcycling context (see appendix). Researchers explained the questionnaire to each of the motorcyclists. It was translated into several languages and there were always people available to answer their queries.

The questions were about the motorcyclists' habits regarding the following issues:

1. Number of meals a day and periodic control of their body weight.
2. Food ingested.
3. Differences in macronutrients ingestion between training sessions and the periods before a competition.
4. Water consumed.
5. Level of knowledge about their diet.

The questions were arranged in sections depending on the variable, from general to specific, in order to make them clear and to avoid misunderstandings.

The SPSS version 15 was used for the statistical analysis of data, calculating descriptive statistics (frequencies and percentages) and the possible difference between variables through Wilcoxon test and Chi-square test in each case. A value of  $p < 0.05$  was determined significant.

## **RESULTS**

Regarding the number of meals, just 3.8% of the sample eat 5 times per day, 38.5% have 4 meals a day, and the great majority, 53.8%, have 3 meals a day.

As far as how frequently they weighed themselves to know their body weight, 69.2% did it once a week. However, none of the motorcyclists had ever had an anthropometric assessment of nutritional status before.

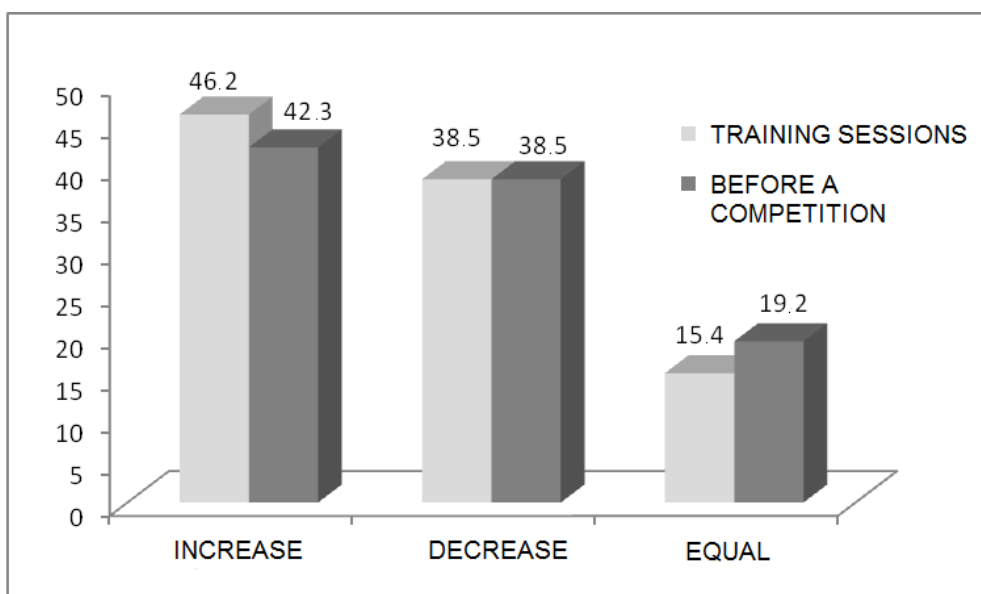
The analysis of food ingested by the motorcyclists shows the percentages and frequencies in Table 1.

**Table 1**  
Frequency of food consumed

	Several times a day	Once a day	3-5 times a week	1-2 times a week	Some times a month	Rarely or Never	Doesn't know, didn't answer
<b>Milk</b>	38.5% (10)	34.6% (9)	3.8% (1)	11.5% (3)	0	11.5% (3)	0
<b>Yoghurt</b>	15.4% (4)	15.4% (4)	23.1% (6)	23.1% (6)	15.4 (4)	7.7 (2)	0
<b>Cheese</b>	7.7 (2)	11.5 (3)	38.5 (10)	15.4 (4)	3.8% (1)	23.1% (6)	0
<b>Butter/ Margarine</b>	11.5% (3)	23.1% (6)	11.5% (3)	23.1% (6)	11.5% (3)	19.2% (5)	0
<b>Meat</b>	11.5% (3)	23.1% (6)	46.2% (12)	11.5% (3)	7.7% (2)	0	0
<b>Cold meat (chorizo, black pudding...)</b>	0	11.5% (3)	19.2% (5)	19.2% (5)	26.9% (7)	23.1% (6)	0
<b>Hamburgers or sausages</b>	3.8% (1)	0	0	15.4% (4)	34.6% (9)	46.2% (12)	0
<b>Fish</b>	3.8% (1)	0	30.8% (8)	23.1% (6)	26.9% (7)	15.4% (4)	0
<b>Eggs or omelette</b>	3.8% (1)	7.7% (2)	23.1% (6)	23.1% (6)	30.8% (8)	11.5% (3)	0
<b>Fruits</b>	38.5% (10)	46.2% (12)	0	7.7% (2)	7.7% (2)	0	0
<b>Vegetables</b>	19.2% (5)	46.2% (12)	0	15.4% (4)	7.7% (2)	7.7% (2)	3.8% (1)
<b>Legumes (chickpeas, lentils...)</b>	3.8% (1)	19.2% (5)	19.2% (5)	11.5% (3)	26.9% (7)	15.4% (4)	3.8% (1)
<b>Cereals (pasta, rice, wheat, maize...)</b>	15.4% (4)	42.3% (11)	26.9% (7)	3.8% (1)	7.7% (2)	3.8% (1)	0
<b>Bread</b>	30.8% (8)	46.2% (12)	15.4% (4)	0	3.8% (1)	0	3.8% (1)
<b>Biscuits, cakes, pastries...</b>	19.2% (5)	11.5% (3)	15.4% (4)	7.7% (2)	38.5% (10)	7.7% (2)	0
<b>Precooked (fast food)</b>	7.7% (2)	3.8% (1)	7.7% (2)	38.5% (10)	38.5% (10)	0	3.8% (1)
<b>Nuts and dried fruits</b>	7.7% (2)	3.8% (1)	7.7% (2)	34.6% (9)	15.4% (4)	23.1% (6)	7.7% (2)
<b>Snacks (crisps bags, cheese puffs...) / Sweets</b>	0	15.4% (4)	19.2% (5)	7.7% (2)	19.2% (5)	19.2% (5)	19.2% (5)

It is important to notice that more than half of the sample (61.6%) has the recommended serving of dairy products provided by the Food Guide Pyramid<sup>16</sup>: 3-4 a day. Regarding fruits and vegetables, just 38.5% and 19.25% of the motorcyclists respectively have the recommended serving of them according to the Food Guide Pyramid<sup>17</sup>. As far as cereals and bread are concerned, we find that 15.4% and 30.8% of the motorcyclists respectively follow the recommendations of 3 servings a day. In addition, 38.5% of the motorcyclists have a healthy and nutritious breakfast whereas 15.3% of them have a quick and light breakfast (fruits, dairy products or juices) or do not even have breakfast. Nevertheless, it is surprising the fact that meats, fish and eggs are consumed several times a day: meats for 11.5% of them and fish and eggs for 3.8% of them.

There are no significant differences between the carbohydrates ingested ( $p = 0.56$ ) for training sessions and the times before a competition. We can see that in Figure 1.



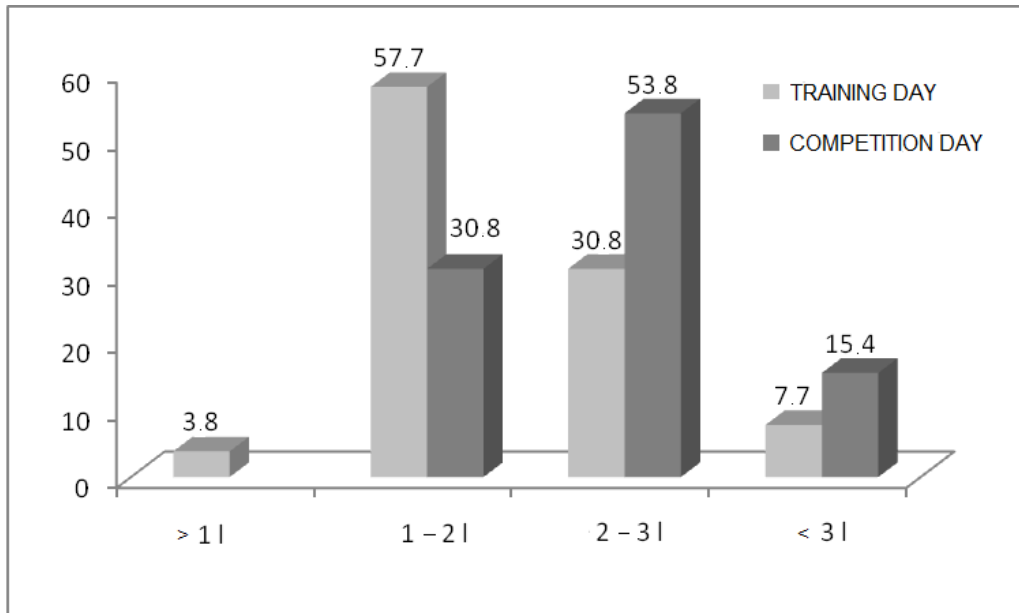
**Figure 1.** Differences in macronutrients ingestion between training sessions and the periods before a competition (%).

Results show how just 15.4% of the motorcyclists in training periods of time maintain the same diet and do not change the quality of their food. Amongst the reasons for the increase of carbohydrates ingested we highlight that they help to increase the energies needed to face a specific situation of debilitation such as training sessions or competitions. However, most of them justify the decrease of their ingestion due to the “*need to feel lighter*” on the motorcycle and “*nerves, that don’t let you eat normally*”.

Concerning the quantity of food ingested, all of the individuals demonstrated they keep the same pattern all the time.

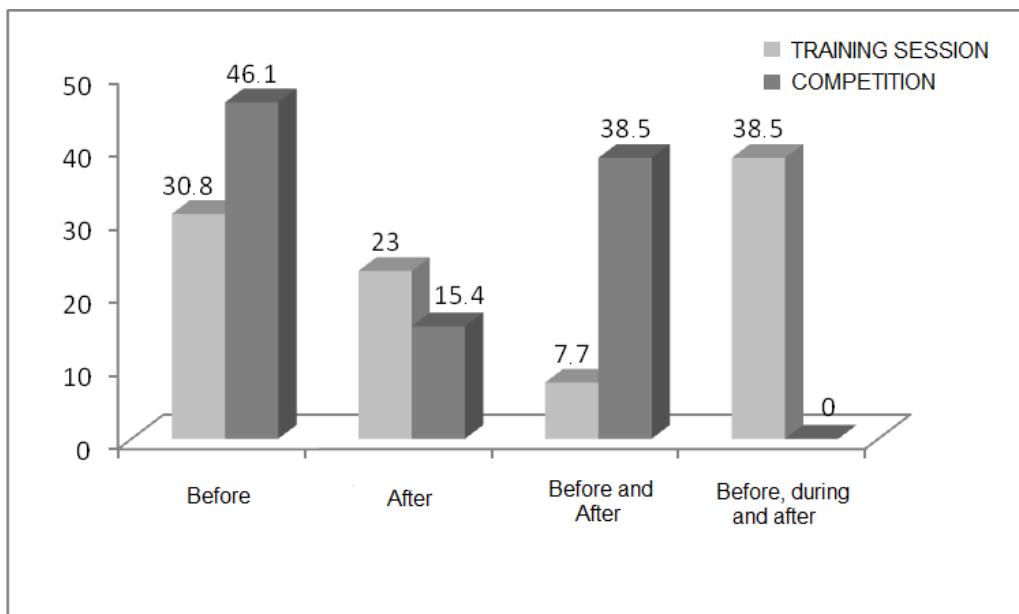
As happens with carbohydrates, there are no significant differences in the ingestion of other macronutrients between the two situations studied, during the training sessions and before a competition (proteins:  $p = 0.26$ ; lipids:  $p = 0.32$ ).

In the matter of water ingestion during a training day compared to a competition day there are significant differences ( $p = 0.005$ ), more water being consumed the competition day as we can see in Figure 2.



**Figure 2.** Water consumed during a training day and a competition day (%).

In the same way, we also find significant differences ( $p = 0.008$ ) between water ingestion during the competition compared to training sessions, as we can see in Figure 3.



**Figure 3.** Distribution of water during a training session and a competition

As regards the level of knowledge of their diet, 80% of the motorcyclists declared their diet as good or very good. In another vein, 70% gives great importance to diets and they feel their knowledge of dietary habits are enough.



87% of the sportsmen follow a special diet, recommended in 25% of the cases by a specialist.

## DISCUSSION

The results obtained in our research show that almost 70% of the motorcyclists control their body weight at least once a week, which indicates their concern about keeping a healthy weight. However, it would be convenient to control their body composition in order to give more relevant data for a better performance on the motorcycle. In fact, they can maintain their weight or they can even put on some weight and it would mean an improvement in their body composition and, as a result, in their sports performance<sup>18</sup>. It is clear that motorcyclists are aware that a lower body weight has an influence in a competition since motorcycles are identical in this cubic capacity (125 cc with power limited and 40 cv [39.44 hp]). In order to observe the influence of weight, we found motorcyclists who distribute the 40 cv of engine power amongst 72 kg the heaviest or 50 kg the lightest (0.55 cv [0.54 hp] / kg vs. 0.80 cv [0.79 hp] / kg). In this sense, the speed increase of the motorcycle in the second case will be higher, with all the consequences it has on the motorcycle and on the final performance during competition.

With regard to the number of meals, most of the motorcyclists have three meals a day (53.8%). These data are similar to those obtained by basketball players<sup>19</sup> and mountain bike riders of the Spanish national team<sup>2</sup>. In this last study, 76% and 60% of the two groups of bike riders studied (Elite/Sub23 and Cadet/Junior respectively), have three meals a day. In our study, most of the motorcyclists did not follow the nutritional recommendations of five meals a day either. It is surprising how, even though they are on the way to become international elite sportsmen, they have deferred from the dietary guidelines suggested by the Food Guide Pyramid for young people<sup>20</sup> and sportsmen<sup>14</sup>.

The analysis of the food ingested by motorcyclists show how there are deficiencies regarding the recommended daily servings of the Food Guide Pyramid adapted to the characteristics of sportsmen's nutrition. In this sense, at the base of the pyramid<sup>20</sup> three servings of cereals and bread a day are recommended and it is only followed by 15.4% and 30.8% respectively of the motorcyclists, even though these products are essential in every sportsman's diet. It happens the same with fruits and vegetables (base of vitamins and minerals), since they are indispensable to play a sport; so that we should pay special attention to these products<sup>14-19</sup>.

Regarding the modifications of macronutrients ingestion made by motorcyclists depending on the period of time they are, we find that almost half of them (46.2%) do not increase the consumption of carbohydrates during training periods and that even 9.5% decrease it. We find similar data at competition periods, since only 42.3% of them increase their ingestion of carbohydrates. After the competition we also find that only 35% of them increase it. These data are similar to the one obtained with tennis players<sup>21</sup>, since only half of the individuals of the sample consumed the recommended servings of carbohydrates. In a different study it was found that the dietary habits of the

Brazilian football team for people with disabilities needed to be improved, so people had to individually intervene to improve this issue<sup>22</sup>.

However, as this is a specific context of competitions where there are normally motorcycle tests every 2-3 weeks, sportsmen do not feel they have to restore and recharge their glycogen stores to face the race. It is not about sports like cycling a route where laps empty the glycogen stores and it is essential to recharge it every day in order to successfully face the competition, but about shorter competitions in time and more infrequent.

As for hydration, we can see how 61.5% of the drivers drink less than two litres of water on a normal training day. It changes for the best during a competition day, so we find significant differences between a training day and a competition day ( $p = 0.008$ ). Regarding the distribution of water intake during training sessions and competitions we also find significant differences ( $p = 0.08$ ). These differences can be due to the mental preparation for competitions, that includes a continuous hydration while they wait at the starting grid. In addition, sportswear (leather suits and helmet), environmental temperature at cycles and times when the competitions take place (normally in the middle of the day) can cause thirst, which implies a continuous hydration.

Despite the data found, 87% of the studied motorcyclists declare to follow a special diet, which would be important to revise since it is just controlled by a sports doctor or a physical trainer in one quarter of the cases. This fact shows how much importance they give to their diet and how concerned they are about the influence weight can have on their performance on the motorcycle even though they do not control their body composition.

It is surprising the fact that even though motorcyclists consider themselves to have good dietary habits and adequate knowledge about it, there are still relevant gaps on this issue. Despite the scientific advances there is still a phase lag between their knowledge of sports nutrition, the recommendations they get from experts and the dietary practices they actually follow.

## **CONCLUSIONS**

In this research we found that the dietary habits of young international elite motorcyclists could be improved. These motorcyclists have deficiencies in their diet both in training and competition periods, although they consider themselves to have enough knowledge about good dietary habits.

Motorcyclists normally attach importance to body weight due to its direct influence on their performance (power to weight ratio), but they do not pay enough attention to body composition.

Within motorcyclists' training, a balanced and adequate diet is relevant, since it guarantees their sports performance and good health, as well as a suitable hydration before, during and after the physical activity. Therefore, it is

necessary to work in a better nutritional training of young motorcyclists for their present and future career.

Eventually, we suggest to involve sportsmen, relatives and/or physical trainers in their diet, and to better control their adequate intakes during the whole season and during non-competitive periods.

## REFERENCES

1. Meyer F, O'Connor H, Shirreffs S M. Nutrition for the young athlete. *J Sports Sci* 2007; 25 (1): 73-82.
2. Som A, Sánchez-Muñoz C, Ramírez-Lechuga J, Zabala M. Estudio de los hábitos alimentarios de los ciclistas de la selección española de mountain bike. *Nutr Hosp* 2010;25 (1): 85-90
3. Delgado M, Gutiérrez A, Castillo M.J. Entrenamiento Físico-Deportivo y Alimentación. De la infancia a la edad adulta. Barcelona: Paidotribo, 1997.
4. Clark N. Nutrition support programs for young adult athletes. *Int J Sport Nutr* 1998; 8 (4): 416-425.
5. González-Gross M, Gutiérrez A, Mesa JL, Ruiz-Ruiz J, Castillo MJ. Nutrition in the sport practice: adaptation of the food guide pyramid to the characteristics of athletes diet. *Arch Latinoam Nutr* 2001 Dec; 51(4):321-31. Review Spanish.
6. Pérez-Guisado J. Importancia del momento en el que se realiza la ingestión de los nutrientes. *Rev.int.med.cienc.act.fís.deporte* 2009; 9 (33): 14-24.
7. Burke LM, Millet G, Tarnopolsky MA. Nutrition for distance events. *J Sports Sci* 2007; 25 (1): 29-38.
8. American College Sport Medicine. Dietetic Association, Dietitians of Canada. Nutrition and athletic performance. *Med Sci Sports Exerc* 2000; 32: 2130-2145.
9. Mataix J, Aranceta J. Valoración del estado nutricional. II conceptos y determinación de la ingesta de nutrientes. En: J Mataix. *Nutrición y Alimentación Humana*. 2002; (2). Madrid: Ergón.
10. Stellingwerft T, Boit M, Res P. Nutritional strategies to optimize training and racing in middle-distance athletes. *J Sports Sci* 2007; 25: 17-28.
11. Garcia-Roves PM, Terrados N, Fernández S, Patterson A M. Comparison of dietary intake and eating behavior of professional road cyclists during training and competition. *Int J Sport Nutr Exerc Metab*. 2000; 10: 82-98.
12. Hardt JJ, O'Rourke KD. Nutrition and hydration. The CDF response, in perspective. *Health Prog*.2007; 88 (6): 44-7.
13. Burke LM, Hawley JA. Fluid balance in team sports: guidelines for optimal practices. *Clin J Sport Med*. 1997; 24: 38-54.
14. Burke LM. A food pyramid for Swiss athletes. *Int J Sport Nutr Exerc Metab*. 2008; 18 (4): 430-437.
15. Friederes JE. Martín-Matillas M, Palao JM. Supervision program of weight, somatotype and nutrition in volleyball. *Coaching Volleyball*. 2005; 3: 14-17.
16. Zapata LB, Bryant CA, McDermott RJ, Hefelfinger JA. Dietary and physical activity behaviors of middle school youth: the youth physical activity and nutrition survey. *J Sch Health*.2008; 78 (1): 9-18.
17. Dapcich V, Salvador Castell G, Ribas Barba L, Pérez Rodrigo C, Aranceta Bartrina J, Serra Majem LI: Guía de la alimentación saludable. Sociedad Española de Nutrición Comunitaria. 2004.
18. Sánchez-Muñoz C, Sanz D, Zabala M. Anthropometric characteristics, body composition and somatotype of elite junior tennis players. *Br J Sports Med* 2007;41:793-799 doi:10.1136/bjism.2007.037119
19. Rodríguez M, García I. Nutrición y deporte. Aspectos básicos a tener presentes en jugadores profesionales de baloncesto. *Revista digital efdeportes*.

2008; 118. <http://www.efdeportes.com/efd118/nutricion-y-dieta-en-el-deporte.htm>. (27/01/2010).

20. González-Gross M, Gómez-Lorente JJ, Valtueña J et al. The “healthy lifestyle guide pyramid” for children and adolescents. *Nutr Hosp* 2008; 23(2):159-168.

21. Juzwiak CR, Amancio OM, Vitale MS, Pinheiro M, Szejnfeld V. Body composition and nutritional profile of male adolescent tennis players. *Journal of Sports Sciences*. 2008; 26: 1209-1217.

22. Da Silva AI, Goncalves Ribeiro B, Abreu E. Nutritional profile of the Brazilian Amputee Soccer Team during the precompetition period for the world championship. *Nutrition* 2006; 22: 989-995.

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