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Nutritional and water needs

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ABSTRACT

Tennis is a sport with high liquid and nutrition requirements. A correct nutritional - dietetic approach assures health as well as an optimal performance for the tennis player. All approaches must be based on the determination of those factors that reduce sport performance, in order to set a number of targets based on those factors, and then set the most appropriate strategies to achieve the targets proposed.

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INTRODUCTION

An athlete's health and performance are closely related to appropriate nutrition (Kondric, Sekulic, Uljevic, Gabrilo, & Zvan, 2013), also very relevant for injury prevention and recovery (Moran et al., 2012).

A tennis player has to combine high levels of strength and muscular power, speed, agility, coordination and decision making, in fatigue and mental stress conditions, over long periods of time (Lacoboni, 2001), since a tennis match may last 90 minutes, or even 4-5 hours (Kondric et al., 2013). Besides, a tennis point lasts an average of 7-10 seconds, with recovery periods between 10 - 90 seconds, depending on whether there is a change over or not (O'Donoghue & Ingram, 2001).

It is of utmost importance to provide the right nutrition, to control those factors that limit performance, facilitating a good recovery after matches and training sessions, to create better physiological adaptations for the best performance of the tennis player.

LIMITING FACTORS IN TENNIS PERFORMANCE

It is key to identify those tennis performance limiting factors and to set nutrition targets that take these limiting factors into account (Maughan, 2003).

The decline in performance due to the lack of strength or a sustained motor control, as a result of fatigue, and tennis physiological demands, has some limiting factors which are shown in Figure 1.

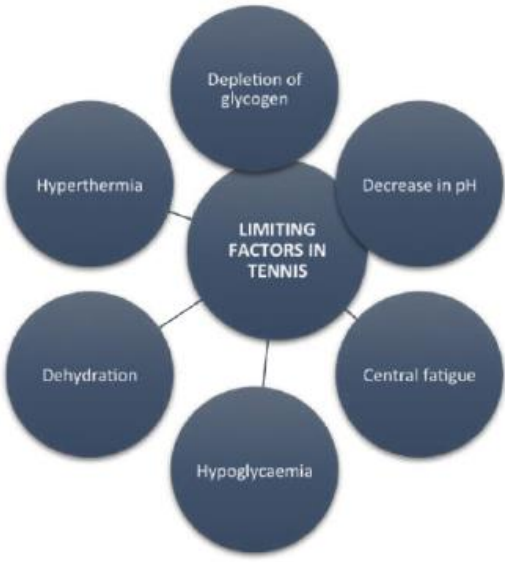

Figure 1. Limiting factors in tennis performance.

Muscular and liver glycogen stores may deplete in high demand matches, or great volume training sessions (Ferrauti, Pluim, Busch, & Weber, 2003), impacting on performance due to energy disability (Hornery, Farrow, Mujika, & Young, 2007). There can also exist a decrease in blood glucose, which decreases physical and mental performance, together with

catabolic processes (Kovacs, 2008). Besides, a decrease in pH during exercise can bring about a decrease in energy through the phosphagen system and muscle contraction (Wallimann, Tokarska-Schlattner, & Schlattner, 2011), and an increase in the subjective perception of effort. (Price & Moss, 2007). This can lead to the use of branched chain amino acids as energetic substrate in what is called central fatigue (Blomstrand, 2006).

The loss of body liquid is another limiting factor in tennis. This decreases the thermoregulatory capacity of the organism (Binkley, Beckett, Casa, Kleiner, & Plummer, 2002), the cardiac output (González-Alonso, Mora-Rodríguez, & Coyle, 2000), and increases the anaerobic glycolysis (Ranchordas, Rogersion, Ruddock, Killer, & Winter, 2013) and the appearance of cramps (Sawka et al., 2007). Hyperthermia correlates with the duration of matches (Morante & Brotherhood, 2008) and with the degree of dehydration (GonzálezAlonso et al., 2000), which can have vital consequences.

ENERGY NEEDS

To maintain a certain body weight all along the season is one of the challenges in tennis, considering the great variability in energy demands, depending on the training phase the player is in, or on the different rounds in a competition (Ranchordas et al., 2013).

The diet, apart from meeting the daily needs in vitamin and mineral requirements, must meet the tennis player demands in macronutrients and time of intake, so as to reinforce health and sport performance (Tavío & Domínguez Herrera, 2014).

Hydrocarbons (HC)

Replenishing glycogen stores is the main target in HC intake, it is also important to avoid over-training, and for the right functioning of the immune system. The decrease in resistance is intimately linked to the reduction of glycogen reserves (Domínguez, 2012), and produces an increase of cytokines and cortisol (Nieman, Zwetsloot, Lomiwes, Meaney, & Hurst, 2016).

In order to palliate this, and depending on the recovery times between effort and their intensity and duration, a tennis player needs 6-10 g/kg/day (Ranchordas et al., 2013). This HC intake must take place before, during and after, in relation to what was stated above (figure 2).
The low glycemic index HC is key for the previous intake, assuring a glycemic stability, and is recommended at least 2 hours before (Fernández, Miranda, & Jiménez, 2008), since a decrease in performance has been recorded when taking high glycemic index food during the previous 45 minutes. (Sousa et al., 2010).

The oxidation of glycogen, the stability of glycemia and the economy in the glycogen stores will be favoured when ingesting HC during exercise (Ostojic & Mazic, 2002). The subjective perception of the effort and response of cortisol were lower in a tennis match in which there was an intake of 0.5 g / kg / hour of HC, in addition to maintaining stable glycemia(Gomes et al., 2013). It has recently been pointed out that the intake of HC during physical exertion can rise to 90 g / h, provided that the glucose-fructose ratio of 2: 1 is respected (Jeukendrup, 2013), which is above the classical of 60gr/h (Sawka et al., 2007).

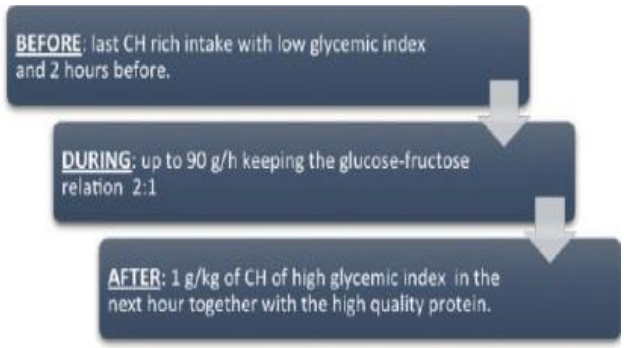

Figure 2. Tennis CH Recommendations.

The glycogen synthesis capacity is greater in the 30-60 minutes after the effort (Domínguez, 2012), it is recommended a 1 g/kg. high glycemic index HC intake over the next hour. Some authors suggest adding proteins, so as to enhance this effect, and add that the protein that accompanies HC should be a high value protein (Moore et al., 2008).

Proteins (PRO)

Although the PRO will only be used for energy purposes when there is a decrease in glycogen and an increase in cortisol, these are fundamental for the proper functioning of the organism (Aparicio, Nebot, Heredia, & Aranda, 2010). Since tennis players have a high percentage of lean mass, and because of their possible contribution to energy metabolism, needs are set between 1.6 g / kg / day (Ranchordas et al., 2013) and 1,8 g/kg/day (Phillips & Van Loon, 2011). Besides, it is

necessary to consider the time of the intake and the quality of the proteic sources (Ranchordas et al., 2013; Suárez López, Kizlansky, & López, 2006). Simultaneous ingestion of CH & PRO after exercise is fundamental for recovery, and to keep the lean mass (Stark, Lukaszuk, Prawitz, & Salacinski, 2012), 6 g of essential amino acids are recommended, which equal 20 g of high biologic value PROs (Borsheim et al., 2004), or 0,3 g/kg of high biologic value PRO, since higher values will not be used for the synthesis of new PROs (Moore et al., 2008).

Lipids (LIP)

Although there is no specific requirement for the ingestion of LIP in tennis, these are of great importance, since it is difficult to reach the minimum requirements of fat-soluble vitamins and essential fatty acids if they are not consumed (Robertson, Benardot, & Mountjoy, 2014). In addition, intramuscular triglycerides are an important source of energy in long-term exercises, playing an important role in tennis recovery periods (Horvath, Eagen, Ryer-Calvin, & Pendergast, 2000). Taking into account the daily energy expenditure and the demands in HC and PRO, daily calories in the form of fatty acids should represent between 20% -35% of the total, prioritizing the intake of polyunsaturated fatty acids versus saturated (Mozaffarian, Micha, & Wallace, 2010) and setting a 2 g/kg/day LIP limit in tennis (Ranchordas et al., 2013).

HYDRIC NEEDS

Dehydration is one of the most important limiting factors in tennis. The reduction of body mass due to dehydration during sports practice should not exceed 1.5-2% (Sawka et al., 2007), thus, a good hydration plan is important, both in training and competition (figure 3). Tennis players with high sweating rates may lose around 2,3- 2,7% kg/h (Bergeron, 2003); in order to avoids this, Kovacs (2008) suggests that a tennis player should drink 250 ml/h during practice.

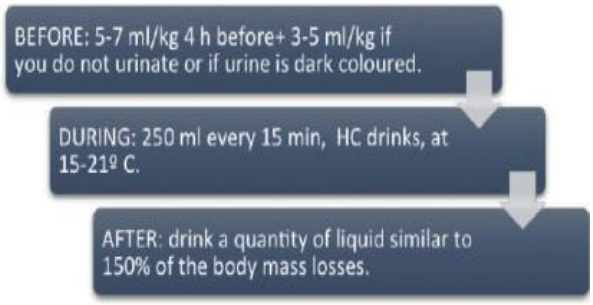

Figure 3. Water needs in tennis.

In addition, to ensure a correct state of hydration, the tennis player should ingest 5-7 ml / kg in the previous 4 hours, which will complement, if during this period the player does not urinate or the urine is dark, with 3 -5 ml / kg more (Sawka et al., 2007). The intake of liquids after exercise will be 150% of the loss produced, considering the drinks between 15o and 21o C with HC will stimulate thirst (Sawka et al., 2007).

CONCLUSIONS

Nutrition can have an important impact in tennis, it plays a key role in tennis players´ health and it positively impacts on their performance. Adopting the right nutrition strategies can help to improve the tolerance to exercise and to a better recovery after training and competition.

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