

# Can the rate of perceived exertion and fatigue of one professional basketball player be modified through a long term nutritional intervention?

Noelia Bonfanti\* and Alberto Lorenzo\*

*CAN THE RATE OF PERCEIVED EXERTION AND FATIGUE OF ONE PROFESSIONAL BASKETBALL PLAYER BE MODIFIED THROUGH A LONG TERM NUTRITIONAL INTERVENTION?*

KEYWORDS: Rate of perceived exertion, Fatigue, Nutrition, Professional basketball

ABSTRACT: The rate of perceived exertion of one session (S-RPE) and fatigue of an intermittent exercise can be decreased by carbohydrate ingestion during that specific session. In addition, certain nutritional interventions (NI) improved dietary intake (DI) of athletes, but the effects on long term S-RPE and fatigue are unknown. Our aim was to assess whether a long term NI could modify the RPE-S and fatigue of one professional basketball player in training and matches during competitive season. NI (2 months) was carried out with one professional basketball player who recorded daily (1 month pre NI; 2 months during NI) S-RPE and fatigue of training and matches as well as mood state, sleep hours and quality of sleep. Before and after intervention, DI (food diary, 7 days) and body composition (anthropometry) were evaluated. Nonparametric comparison of mean (Wilcoxon) was performed between pre and post/during NI data. Carbohydrate intake increased post NI (3.7 g vs. 5.1 g/Kg weight/day;  $p < .05$ ). Training S-RPE decreased during the NI (5.3 vs. 5.0 ball; 4.9 vs. 4.4 physical; CR-10 scale) as well as all the variables of fatigue. Matches S-RPE increased during NI (7.5 vs. 8.0; CR-10 scale) as fatigue in the morning and at bedtime but not post-match, which was decreased. The S-RPE and fatigue of training of one professional basketball player could be decreased by a long-term nutritional intervention that leads to the compliance with the recommendations.

The rate of perceived exertion (RPE) represent the level of effort experienced for a subject during physical exercise, expressed through a specific scale (Borg, 1998) and it has been validated against objectives markers (Noble and Robertson, 1996). The CR-10 scale (Borg, 1982) can be used to quantify the intensity of one global exercise session (Session-RPE (S-RPE)) and it has been validated in intermittent exercises such as basketball (Foster et al., 2001) and other team sports (e.g.; Cuadrado-Reyes, Chiroso Ríos, Chiroso Ríos, Martín-Tamayo and Martínez-Aguilar, 2012; Gomez-Díaz, Pallarés, Díaz and Bradley, 2013).

On the other hand, there is a clear consensus of the crucial role of nutrition in sports performance, recovery and fatigue (e.g.; International Olympic Committee, 2004). However, several studies have shown an inadequate intake of elite athletes regarding daily nutritional recommendations (NR) (e.g.; Paschoal and Amancio, 2004; Ziegler, Jonnalagadda and Lawrence, 2001) as occurs in Spanish professional basketball players (Schroeder, Navarro, Mora, Seco, Torregrosa and Tramullas, 2004).

Several studies have shown a decrease in RPE during endurance exercise in subjects supplemented with carbohydrates (CHO) compared with a control group (e.g.; Utter et al., 2004) and similar results were found in different researches carried out with intermittent exercise (e.g.; Alghannam, 2011; Byrne, Lim, Chew and Ming, 2005). Furthermore, scientific evidence shows that fatigue also can be modified by nutrient intake during

exercise (Davis et al., 1997; Nybo, 2003; Phillips, Sproule and Turner, 2011). Therefore, this relationship would suggest that the adequacy of dietary intake (DI) to NR could attenuate the RPE and fatigue of an athlete throughout the competitive season. Thus, if RPE and fatigue can be decreased by consuming certain nutrients (especially CHO) during exercise, it might be thought that S-RPE and fatigue related to training and matches could be attenuate by the adequacy of nutritional habits of the players according to NR. In this sense, it have been found in the scientific literature some long term nutritional intervention (NI) that improved nutritional intake in sport team athletes (e.g.; Valliant, Emplaincourt, Wenzel and Garner, 2012), but none of them was conducted with elite athletes nor with basketball players at any performance level. Moreover, none has analyzed the effects of these dietary changes on long term S-RPE and fatigue during the competitive season. Therefore, our aim was to assess if S-RPE and fatigue of trainings and matches during competitive season of one professional basketball player can be modified by a long term nutritional intervention in order to meet nutritional recommendation.

## Method

A single-case design study was carried out with one healthy professional basketball player (Spanish ACB League), center, English, 24 years. A personalized NI was conducted (2 months) to adapt their DI to NR (Gatorade Sport Science Institute, 2013).

Alberto Lorenzo. Facultad de Ciencias de la Actividad Física y del Deporte (INEF). Ciudad Universitaria de Madrid, C/ Martín Fierro, 7. 28040 Madrid (España). E-mail: alberto.lorenzo@upm.es.

\* Facultad de Ciencias de la Actividad Física y del Deporte (INEF). Universidad Politécnica de Madrid.

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The player recorded daily S-RPE (at the end of each training and match) (CR-10 scale) (Foster et al., 2001) and fatigue (before and after each training and match and at morning and at bedtime) (1-10 scale) (Del Campo, 2004) during 3 months (1 month pre-NI (PRE) and 2 months during NI (INT)). The player also recorded daily sleep hours and mood and sleep quality (1-5 scale) (Del Campo, 2004).

Before and after NI: DI was assessed by a food diary (7 days; weighing food) (Deakin, 2008), nutritional knowledge (NK) were tested with Reilly and Maughan (2007) questionnaire and corporal composition (CC) was evaluated by an anthropometric study according to ISAK protocol (Marfell-Jones, 2013).

Data are presented as the mean for the different phases of the study. DI, KN, CC and S-RPE, fatigue, mood, sleep hours and sleep quality, were analyzed by a non-parametric comparison of mean (Wilcoxon test) between pre and post NI and pre and during NI (INT) respectively (software IBM SPSS 22.0). Statistical significance was established at p-value < .05.

**Results**

Pre NI CHO intake was low in comparison with NR (3.7 g vs. 7-12 g/Kg weight (W)) but it was increased post NI to 5.1 g/KgW/day (p< .05). Protein consumption was always adequate (1.4g vs. 1.4 - 1.7 g/Kg W/day). Total fat intake was at the upper limit of the recommended range (35% vs. 20-35% of total energy

intake (TEI)) but it was decreased post NI to 26% TEI (p< .05). Saturated fat (SF) and ethanol (Eth) intake were above NR (11% vs. < 10% SF of TEI; 43g vs. 20g Eth/day) and both showed a decrease post NI in compliance with NR (8% SF of TEI; 10 g Eth/day (p< .05). NK were improved with an increment of correct answers (+ 7%) and a decrease of incorrect answers (- 5%) (p< .05). Post intervention, muscle mass of the player showed an increment (+ 2.3 Kg).

The S-RPE and the different moments of fatigue decreased during intervention for both types of training as shown in Figures 1 and 2 respectively.

In match days S-RPE showed an increase (7.5 PRE vs. 8.0 INT) as well as fatigue at the morning (5.2 PRE vs. 5.7 INT) and at bedtime (8.0 PRE vs. 8.2 INT). Instead, post-game fatigue decreased during NI (8.2 PRE vs. 7.7 INT) while before the match remained stable at a value of 5.5. All this changes did not reach statistical significance. Regarding the sleep hours and sleep quality and mood, there were not statistically significant differences for any of them.

**Discussion**

Before NI, DI of our case did not meet NR, coinciding with other studies performed with professional players (e.g; Schröder et al., 2004). The changes induced by the NI were similar to previous works that significantly improved food intake of sport team athletes as well as NK (e.g. Valliant et al., 2012). The initial inadequate DI and its significant improvement after NI, allowed

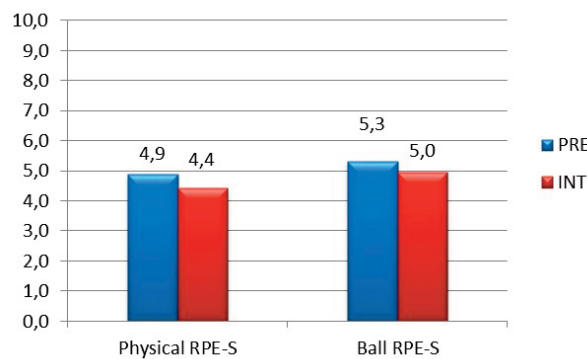


Figure 1: RPE-S of physical and ball training before (PRE) and during intervention (INT).

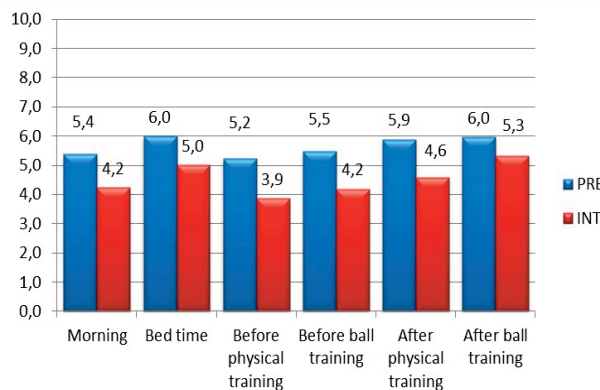


Figure 2. Different values of fatigue relation with physical and ball training before (PRE) and during intervention (INT).

to analyze the influence of the nutritional changes on the S-RPE and fatigue of training, showing first evidence that both could be reduced in the long-term with the modification of the food pattern of the player. These findings may be related to previous experimental studies that showed a significant decrease in S-RPE with the CHO intake during an intermittent exercise, compared to placebo (e.g.; Byrne *et al.*, 2005). Nevertheless, statistical significance was not found in our case, but this may be a consequence of the methodology of case study. At the same time, sleep hours, sleep quality and mood, did not vary significantly, what allows to assume that statistical significant changes of the intake could have conditioned the decrement of the S-RPE of training.

In addition, these results constituted a first evidence of the decline of long term fatigue of one professional player after the change of their eating habits. Given that fatigue depends not only of physical effort, but also of rest and recovery, might be

considered that, due to a decrement of S-RPE of trainings possibly related to dietary changes, coupled with the lack of statistical significance in the sleep, significant variation of the intake would be able to improve fatigue of the player. Even with the differences in type of study, these data can be related to previous researches that found a decrease in fatigue as a result of increased availability of HCO in the brain during exercise (Nybo, 2003; Welsh *et al.*, 2002).

Finally, it is necessary to emphasize that matches showed a different pattern than trainings, with positive variations of S-RPE and fatigue in the morning and at bedtime. This difference may be caused by the influence of other factors during matches, such as the psychological pressure.

It can be concluded that S-RPE and fatigue related to training of a one professional basketball player could be reduced through a long term personalized nutritional intervention that adequate his diet to nutritional recommendations.

#### ¿PUEDE MODIFICARSE LA PERCEPCIÓN DEL ESFUERZO Y LA FATIGA DE UN JUGADOR PROFESIONAL DE BALONCESTO MEDIANTE UNA INTERVENCIÓN NUTRICIONAL A LARGO PLAZO?

**PALABRAS CLAVES:** Percepción del esfuerzo, Fatiga, Nutrición, Baloncesto profesional.

**RESUMEN:** La percepción del esfuerzo de una sesión (RPE-S) y la fatiga de un ejercicio intermitente pueden ser disminuidas con la ingesta de carbohidratos durante dicha sesión. Además, ciertas intervenciones nutricionales (IN) mejoraron la ingesta alimentaria (IA) de los deportistas, aunque se desconocen los efectos sobre la RPE-S y la fatiga en el largo plazo. Nuestro objetivo fue valorar si una IN a largo plazo podía modificar la RPE-S y la fatiga de un jugador de baloncesto profesional en entrenamientos/partidos durante la temporada. Se intervino nutricionalmente (2 meses) a un baloncestista profesional, quién registró diariamente (1 mes pre IN; 2 meses durante IN) la RPE-S y la fatiga de entrenamientos/ partidos, las horas y la calidad de sueño y el ánimo. Antes y después de la IN se valoró IA (diario de alimentos, 7 días) y composición corporal (antropometría). Se realizó comparación de medias no paramétricas (Wilcoxon) para los datos pre y post/durante IN. La ingesta de carbohidratos aumentó post IN (3,7 g vs 5.1 g/Kg peso/día;  $p < .05$ ). La RPE-S de entrenamientos disminuyó durante la IN (5,3 vs 5.0 balón; 4,9 vs. 4,4 físicos; escala CR-10) al igual que las variables de fatiga. La RPE-S de partidos aumentó (7,5 vs. 8,0; escala CR-10) al igual que la fatiga al levantarse y al acostarse, pero disminuyó post-partido. El sueño y el ánimo no variaron significativamente. La RPE-S y la fatiga de entrenamientos de un jugador de baloncesto profesional podrían disminuirse a largo plazo con una intervención nutricional que adecúe su ingesta a las recomendaciones.

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