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ORIGINAL

HIGH INTENSITY INTERVAL TRAINING IN YOUNG RUGBY PLAYERS FROM ARGENTINA

ENTRENAMIENTO INTERVALADO DE ALTA INTENSIDAD EN RUGBISTAS JUVENILES DE ARGENTINA

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ABSTRACT

The aim of the present study was to evaluate the influence of a High Intensity Interval Training protocol with straight running on the aerobic performance on male rugby players between 15 and 16 years old. Thirty three subjects voluntarily participated in the proposed training. Anthropometric measurements and estimates of maximal oxygen uptake (VO_{2max}) were taken to characterize the subjects in the initial physical state. Subsequently, the maximal aerobic speed was estimated to set the training distances for each subject. The protocol was organized in six sessions divided in three weeks, consisting of two rounds of twelve repetitions with work intervals of ten seconds and ten seconds of passive pause. After six sessions estimates of VO_{2max} were taken again. In the statistical treatment, non-parametric tests were used. The experimental group achieved a significant increase in VO_{2max} of 12% ($p < 0.01$), while the control group increased its yield by 6.8% ($p < 0.05$).

KEYWORDS: Teenagers; Interval Training; VO_{2max} ; Endurance; Maximal Aerobic Speed; Rugby.

RESUMEN

El objetivo del presente estudio ha sido evaluar la influencia de un protocolo de entrenamiento intervalado de alta intensidad de carrera lineal en el rendimiento aeróbico de rugbistas varones de 15 y 16 años. Treinta y tres sujetos participaron voluntariamente. Se tomaron mediciones antropométricas y estimaciones del consumo máximo de oxígeno (VO_{2max}) para caracterizar el estado físico inicial. Se estimó la velocidad aeróbica máxima para programar individualmente las distancias de entrenamiento. El protocolo se organizó en seis sesiones divididas en tres semanas, consistentes en dos bloques de doce repeticiones con intervalos de trabajo de diez segundos de carrera lineal y diez segundos de pausa pasiva. Luego de las seis sesiones se tomaron nuevamente las estimaciones de VO_{2max} . Se utilizaron pruebas no paramétricas para el tratamiento estadístico. El grupo experimental logró un incremento significativo del VO_{2max} del 12% ($p < 0,01$), mientras que el grupo control incrementó su rendimiento en 6,8% ($p < 0,05$).

PALABRAS CLAVE: Adolescentes; Entrenamiento Intervalado; VO_{2max} ; Resistencia; Velocidad Aeróbica Máxima; Rugby.

INTRODUCTION

There are several research works that have documented the cardio-respiratory capacity about young population, largely through maximum oxygen uptake

(VO_{2max}), unfortunately, only one describes a sample of Argentine school population (Secchi, García, España-Romero, & Castro-Piñero, 2014). This study has documented a low physical condition level in school children compared to other populations (Beets & Pitetti, 2004; Huerta Ojeda et al., 2017; Léger, Lambert, Goulet, Rowan, & Dinelle, 1984; Matsuzaka et al., 2004; Ortega et al., 2011; Silva, Aires, Mota, Oliveira, & Ribeiro, 2012; Slinger, van Breda, & Kuipers, 2009). This low physical condition is related mainly to high body mass index (BMI), low muscular fitness and low cardio-respiratory capacity. There are studies that show a positive relationship between the frequency of weekly physical activity and better levels of condition (Logan et al., 2016; Torres-Luque, Carpio, Lara Sánchez, & Luisa Zagalaz, 2014), being that the most active subjects have sport activity parallel to the school physical education class. In relation to cardio-respiratory capacity, it has been demonstrated that early stimulation guarantees a higher VO_{2max} in adulthood, which is related to better life standards, among other reasons, preventing cardiovascular diseases (Buchan, Knox, Jones, Tomkinson, & Baker, 2018; Catley & Tomkinson, 2013; España-Romero et al., 2010; Moreira et al., 2011; Ortega et al., 2008; Ortega et al., 2005; Secchi & García, 2013).

Based on this, different possibilities of stimulating aerobic capacity have been studied. High Intensity Interval Training (HIIT) is one of the most used and efficient proposals. However, in most of the studies, the training prescription was made in a unified way for the experimental group and due to the low physical condition, a large number of sessions were considered (Baquet, Berthoin, Gerbeaux, & Van Praagh, 2001; Logan et al., 2016; Urzaiz, 2007). In order to program the HIIT is recommended the use of the Maximum Aerobic Speed (MAS) (García & Secchi, 2013), variable that is estimated through the final speed reached in a continuous running test with changes of direction and progressive increase in speed, known as 20metre-ShuttleRunTest (20m-SRT), which is also a predictor test for the VO_{2max} (Léger, Mercier, Gadoury, & Lambert, 1988).

The aim of this study is to evaluate the influence of a HIIT protocol on a group of young males, rugby players between 15 and 16 years old, monitoring the changes in aerobic performance through VO_{2max}. The MAS was estimated to program the working distances for each subject. An organized training was carried out in two weekly sessions during three weeks. After six sessions the physical conditions of all subjects were re-evaluated.

MATERIAL y METHODS

Population and sample

The proposed experimental protocol was implemented between the months of February and March of the year 2018, with rugby players from Tucuman Lawn Tennis Club of M15 and M16 categories (under 15 and 16 years of age, respectively). The sample population (SP) consisted of 33 subjects who

participated during the entire process, which was divided into two working groups: the control group (CG) made up with the subjects that did not reach a minimum attendance of 80% of the sessions ($n = 9$), and the experimental group (EG) that accomplished at least 80% of the training ($n = 24$).

The basic anthropometric data (age, body weight, body height) of the SP were evaluated before the beginning of the training process according to the standardized measurement protocol and validated by the International Society of Advances in Kineanthropometry (ISAK). The body weight measurements were made with a digital scale Camry of 0.1 kilograms precision, while the body height was determined with a stadiometer Calibres Argentinos of 1 millimeter precision.

Because the test subjects were minors, the consent of the tutors was requested, and the work was carried out under reservation of identity. Players who did not present the approved medical aptitude were excluded.

Evaluation protocols

At the beginning of the annual training calendar, known as the pre-season period, an evaluation was made to estimate the individual $VO_2\max$ of the players using the 20m-SRT proposed by Léger et al. (1988). To obtain the MAS of each subject the formula proposed by García y Secchi (2013) was used. At the end of the training protocol, the test was repeated. In addition, the attendance of all participants was registered.

Training protocol

The protocol under study was applied at the end of each session, after the regular rugby training. The HIIT consisted of six sessions, organized into two weekly stimuli. The interval protocol consisted in 2 series of 12 repetitions of 10 seconds of linear running with 10 seconds of passive pause for all sessions. The pause time between the series consisted in a passive rest of 2 minutes. The distance that should be covered in 10 seconds was individually programmed with the following criteria: sessions 1 and 2 at 90%, sessions 3 and 4 at 100% and sessions 5 and 6 at 110% relative to the MAS.

Statistical analyses

The statistical treatment for the analysis of the variables was carried out using the SPSS Software (Statistical Product and Service Solutions) version 17.0. Due to the size of the sample, non-parametric tests were used: the Mann-Whitney U test to check the intergroup differences hypothesis, and the Wilcoxon test for intragroup differences.

RESULTS

The anthropometric characteristics of the groups did not show significant differences between them. The variables are shown in Table 1.

Table 1: Anthropometric characteristics of the groups

Variable	Group	Mean	SD
Age (years)	CG	15.13	0.62
	EG	14.98	0.52
Body weight (Kg)	CG	69.48	6.05
	EG	67.56	12.56
Body height (cm)	CG	173.36	5.29
	EG	169.94	5.68

The results of the VO_{2max} evaluation performed before and after the training process were analyzed (Table 2). Both groups started from a similar value in the previous evaluation. While in the subsequent evaluation the EG reached a higher value than the CG. The intergroup comparisons (for both moments) did not show significant differences.

Table 2: VO_{2max} values, before and after training for both groups

Variable	Group	Mean	SD
VO_{2max_pre} (mL/Kg/min)	CG	40.18	7.09
	EG	40.09	6.82
VO_{2max_pos} (mL/Kg/min)	CG	42.58	5.99
	EG	44.64	6.56

Finally, we analyzed the differences in the VO_{2max} variable between the previous and the post evaluation for each group (Table 3). The applied training achieved a statistically significant increase of 6.77% ($p < 0.05$) in the CG, while in the EG it was 11.96% ($p < 0.01$).

Table 3: VO_{2max} comparison

Group	VO_{2max_pre} (mL/Kg/min)	VO_{2max_pos} (mL/Kg/min)	Difference (%)
CG	40.18	42.58	6.77% *
EG	40.09	44.64	11.96% **

* $p < 0.05$ ** $p < 0.01$

DISCUSSION

The attendance variable was used for the division of the work groups at the moment of the results analysis because the option of establishing a CG that did

not train at all was not viable. The improvements registered in the CG can be explained by the physical stimulus that the subjects had through their own rugby training, however, it is important to remark that the increase in the VO_{2max} values of the EG close to 12% is considerably greater than the 6% of the CG.

The improvements in aerobic performance in this work are high for the low quantity of training stimuli, which we believe can be explained by the subject history of sports practice. It is possible that the HIIT has to be applied with every progressive increments of intensity in sedentary populations, due to the fact that it requires a greater number of sessions to reach a considerable improvement. In support of this idea, in other studies with non-athletic groups that used a similar dosage of the HIIT, specifically, a working interval of 10 seconds, a greater number of sessions have been used. In the study of (Huerta Ojeda et al., 2017) were used 16 sessions on a group of sedentary young people and approximate increases of 5% were registered, starting from an initial level of VO_{2max} (39.65 ± 5.96 mL / Kg / min) similar to the present work. (Urzaiz, 2007) registered an approximate increase in the final speed of 20m-SRT from 2.5 to 4% in schoolchildren with 20 training sessions. (Baquet et al., 2001) registered an increase in the performance of 20m-SRT of 3.8% in 10 sessions on a male and female group aged 11 to 16 years.

CONCLUSIONS

With the application of a HIIT protocol, easy to apply individually and to measure, both groups of young athletes significantly increased the VO_{2max} , however, the EG increased it approximately twice than the CG. The increases achieved in the aerobic performance in the present study, with a minimum amount of stimuli compared to other published works, implies an advantage for the planning of the preseason, because in general there are 6 to 8 weeks of work before starting the competitive season in the youth categories of this sport.

It opens up future lines of research in other sports populations of different age groups applying this practical and effective HIIT protocol.

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