

## Original Article

### Preliminary study on effects of hiit-high intensity intermittent training in youth soccer players

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#### Abstract:

Soccer is a sport about situation, subject to many dependents variables like field, adversary, teammates, presence of ball and more. Aspects that significantly affecting the training in this sport are: conditional aspect, psychological and technical-tactical.

This study is about the periodization, it means the division of training season in specific periods in order to clearly defined goals. Part of this periodized training was characterized by High Intensity Intermittent Training (HIIT), such important in soccer as many team sports, characterized by phases of high oxygen consumption alternate by recovery series. The research was conducted on a sample of 20 male Soccer players of  $16.8 \pm 1$  years old members of a Sub-18 team of Italian National League "Beretti". The athletes were divided into two groups according to their results of aerobic power detected by the Cooper test carried out at the beginning of the preparatory period: a group working with a higher internal load (90% HR), and another group performing the same, but holding a lower one (80% HR.). That division was made in such a way as to obtain the desired adaptations and improvements in both groups, because having different characteristics, and in such a manner as to not create high overloads that, producing lactate they would prevent the adaptations and improvements sought. This study shows us how the intermittent training leads to a significant increase in  $VO_{2max}$ .

The data collected were subjected to a statistical study that showed improvements in physical performance of the different athletes thanks to the use of Periodization method integrated to High Intensity Intermittent Training. Significant, according to the method of periodization, the gradual increase of the applied load which allows the central nervous system (CNS) to adapt and achieve improvements. The aim of this study was to compare effects and improvements of an HIIT in two groups of Youth Soccer Players with different fitness characteristics, monitoring the Maximum Oxygen Consumption ( $VO_{2max}$ ) as parameter of internal load.

**Key Words:** VO2 max, Periodization, Cooper test

#### Introduction

Soccer is an high-situational sport with an high agonistic engagement such to require the development of all the conditional capacities.

Is common knowledge that a certain athlete, after years of training, despite continuing to practice, reaches a stabilization of performance and certain cardiovascular parameters, such as maximum oxygen consumption ( $VO_{2max}$ ). Then, the work of the fitness coach becomes even more complex, to obtain a further increase in performance, will be necessary to maximize the modifications obtained through training with an optimal modulation of the loads, that is, reach the maximum level tolerable by the organism without getting "overtraining".

The intermittent exercise determines an improvement of  $VO_{2max}$  in athletes who already have good aerobic fitness as it is a good training means to maintain high levels of aerobic power, especially in reference to the stimulus that it determines to the central components; the increase of aerobic enzyme, as reported in some studies, seems to be caused by the necessity of the fibers to metabolize lactate and by a flow increase of pyruvate within the mitochondria (Hill-Hass, et al. 2009). This would explain the increase of oxidative capacity measured in type II fibers observed in the past study of many authors; intermittent drills can result in increased glycolytic characteristics and ability to perform maximum efforts (Randers, et al. 2010).

This study is based on the method of Periodization Training that refers to two important aspects: Periodization of the Season Plan, which allows players to split and manage the training program and to achieve maximum fitness for the most important games, Periodization of Motor-Conditional Skills which allows players to lead to an optimal level of conditional skills, such as strength, speed and endurance. Periodization according to Tudor Bompa and Haff Gregory G (2009) in team sports come divided as follows:

1) Introductory/Preparatory period that focus on strong organic valence and muscular for the recovery of overall efficiency. In this period we carried out an initial test for the division of the two training groups.

2) Key/Load period where the working volume prevails on the intensity of that. At this stage, we carried out the Cooper test once again in order to estimate the improvements caused by IT.

3) Special/Transformation period to increase the intensity of drills and to develop a increasing technical work.

4) Competitive Period where there is the achievement and maintenance of maximum fitness at the time of most important games.

5) Transition period is the long break between two seasons that allows the organism to regenerate.

The aim of this study was to compare effects and improvements of an HIIT in two groups of Youth Soccer Players with different fitness characteristics, monitoring the Maximum Oxygen Consumption ( $VO_{2max}$ ) as parameter of internal load.

## Method

The research was conducted on a sample of 20 male Soccer players of  $16.8 \pm 1$  years old members of a Sub-18 team of Italian National League "Beretti".

The athletes were divided into two groups according to their results of aerobic power detected by the Cooper test carried out at the beginning of the preparatory period, during the Pre-season.

The players who were included in the 1st group of work (Cooper Test =  $2850 \pm 150$  meters) were 12, then subjected to an higher internal load training (90% HR), also the remaining 8 members of 2nd group of work (Cooper Test =  $2500 \pm 100$  meters) were subjected to a lower internal load training (80% HR).

*Why this division?* The division was done in such a way as to obtain the desired improvements and adaptations in both groups for two reasons:

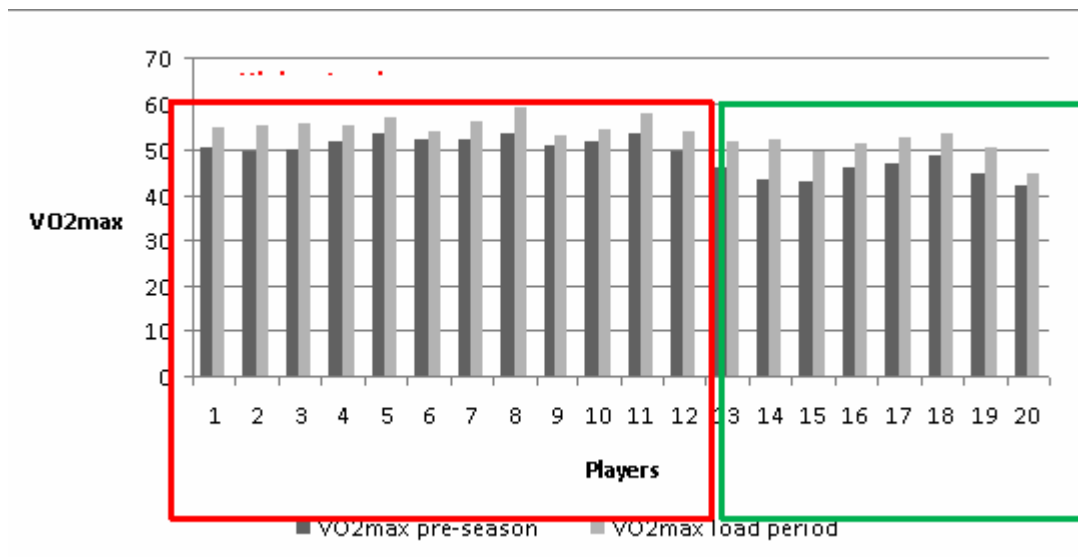
1) The members of 1st group of work, if they had worked at about 80% HR of internal load they probably would have done just a maintenance drill  $VO_{2max}$  without getting increase of it.

2) The members of 2nd group of work, if they had worked at about 90% of internal load, they would have obtained an lactate hyperproduction that would have prevented the beneficial adaptations of HIIT.

The High-Intensity Intermittent Training was applied during the Load period equivalent to 8 weeks of Season Plan. At the end of the Load period was carried out the Cooper once again test to estimate the improvements obtained through this methodology.

## Results

This study shows us how the intermittent training leads to a significant increase in  $VO_{2max}$ . From the results obtained is noted as there are no large improvements achieved by both groups, but the most marked improvements were recorded 2° group who performed with a lower external load.



## Discussion

The data collected were subjected to a statistical study that showed improvements in physical performance of the different athletes thanks to the use of Periodization method integrated to High Intensity Intermittent Training.

Significant, according to the method of periodization, the gradual increase of the applied load which allows the

central nervous system (CNS) to adapt and achieve improvements. Probably, the players of 1st group had a higher lung volume to endure and achieve certain levels of  $VO_{2max}$ .

The players of the 2nd group, performed HIIT drill in a lower speed than the 1st group, therefore resulted also a lower external load in terms of distance covered and maximum speed reached.

### Conclusion

The objective of this study was to give more credit to the HIIT, as this drills produces adaptations of aerobic system useful to bearing match efforts and the correlation on skill son qualitative aspects about technical skills (Raiola 2011ab, 2012ab, 2014). This research sets the stage for future new investigations that they can research new methodologies in quantitative terms for the improvement of aerobic fitness, to be complemented with technical and tactical drills, thereby integrating, also qualitative contained.

### References

- Tudor O. Bompa & Haff Gregory G., (2009). *Periodization. Theory and Methodology of Training*, 5th Edition, Human Kinetics, USA
- Hill-Hass S., Dawson B., Coutts A., Roswell C. (2009). Physiological responses and time-motion characteristics of various small-sided soccer games in youth players. *Journal of Sport Sciences*, 27(1): 1-8.
- Randers B., Nyb L., Nielsen J., Christiansen L., Bendiksen M., Bangsbo J., Krstrup P. (2010). Activity profile and physiological response to football training for untrained males and females, elderly and youngster: influence of the number of players. *Scand J Med Sci Sports*
- Raiola, G. (2011a). Study between neurophysiological aspects and regulation documents on preschool in Italy *Journal of Physical Education and Sport 11 (1)* pp. 42 – 47
- Raiola, G. (2011b). A study on Italian primary school rules: Neurophysiological and didactics aspects in physical education and sport *Journal of Physical Education and Sport, 11 (2)* pp. 43 – 48 DOI:10.7752/jpes.2012.01005
- Raiola G (2012a). Didactics of volleyball into the educate program for coaches/trainers/technicians of Italian Federation of Volleyball, *Journal of Physical Education and Sport*, 12 (1) pp. 25 – 29
- Raiola G (2012b). Motor learning and didactics into physical education and sport documents in middle school-first cycle of education in Italy, *Journal of Physical Education and Sport*, 12 (2) pp. 157 – 163 DOI:10.7752/jpes.2012.02025
- Raiola .(2014). Teaching method in young female team of volleyball, *Journal of Physical Education and Sport, (14) 1* pp. 74 – 78 DOI:10.7752/jpes.2014.01012;