

The Effect on Improvement of Maximal Aerobic Strength and Anaerobic Performance with Young and Adult Footballers

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Abstract

Training of modern football are related to complex trainings, which have at the center of attention the connectivity of exercises for the preparation of physical qualities with proprioceptive ones. Abilities of orientation and coordination are improved through practice of proprioceptive exercises, which realize in a fast and precise way the connectivity of conceptual and exercise intelligence. In the present study physical and functional indicators measured before and after the experimentation incurred changes up to sensitive ones. In percentage form these changes are: for adult footballers from 3.2 – 8.6%, whereas for the footballers of 16-17 years of age from 3.8 – 9.3%. The indicators that have a direct connection with proprioceptive exercises have had the highest percentage of improvement, which shows that the programming with such exercises is a demand of time and that our practice is stationary without such trainings. Besides the above conclusions, the group of authors thinks that after the approval of this study it becomes necessary the realization of a workshop with all the experts, science advisors and trainers in general, to clarify the concepts that showed up in this study

Keywords: maximal aerobic strength, proprioceptive, footballers.

I. Introduction

Two groups of footballers voluntarily accepted to take part in this 10-week study: 12 footballers of ages 16-17 years old and 12 footballers of indoors. The physical characteristics of subjects are shown in Table nr.I. All subjects were in good health and didn't take medicaments that influence the metabolism. The subjects were trained every day for 70-80 min. daily and 6 times a week. The subjects subscribed their acceptance with the respective guidance created by the group of authors. The training program to be followed was changed in its essential part, which would be covered by a 30 min. proprioceptive training. Thus, after the warm-up there would be practice of 30 min. in programmed proprioceptive training. The workouts' condition was running with change in direction, by aiming the equilibrium of footballers and their attention. The training in proprioceptive exercises lasted 30 – 35 min.

Every subject completed 2 tested sessions. In the first session, they were tested three days before the experiment. Anthropometrical measures were taken, of body height and weight, and BMI. Consecutively, they were tested in speed tests, lactate stability and aerobic strength. In the second session, the subjects were tested at the end of the 10-week experiment of proprioceptive exercise that took place from 5th of March until 16th of June 2012. The measurements were taken on an athletic track, with a progressive chronometer at the 100th of a second. Final tests were taken on 17th of June and continued on the 18th of June.

2. Track measurements

In track measurements the three authors participated, which were taken only once for 30m., 50m. and 10 * 5 m high individual start, whereas the 20m. distance was realized with preliminary acceleration 30m. Afterwards, the test of 250m. was realized with change in direction. In the measurement of speed of oxygen consumption (VO₂) the Cooper test (1968) was used. Besides the evaluation of the test, the matching of VO₂ based on the equations of K.H.Cooper was taken.

3. The subjects

12 adult subjects and 12 other from ages 16-17 voluntarily participated in this study. 3 subjects of indoor football and 1 subject of outdoor football initially had problems in keeping up with the loads, so with these subjects was used a gradual lifting of volume of exercises. Only one subject was overweight, whereas the others had a normal weight. The BMI was used for classifying the participants, where obese subjects had values of BMI ranging from 30-40 kg/m². All subjects were in good health and didn't take medicaments that are known for affecting the metabolism.

4. The experimental protocol

Every subject completed 2 sessions of testing. During the first session, the subjects undertook the physical examination and measurements of body composition. The second session involved the same physical examinations of 30 m., 50m. high start, 30 m with acceleration, 250m. with change of direction and the Cooper test, 1968. The measurement of body weight and height was done with standard measures. The rule of tests progressed from the lowest to the highest speed. So, the first day the Cooper test '68 was taken, in the afternoon was done 10-step from starting position and the complex test of 250 m. During the second day the speed tests were realized.

5. Anthropometric indicators of footballers

A leading direction during the experimentation was: measurement, analysis and the study of general anthropometric indicators of footballers. For that purpose, the indicators of body height and weight were measured and the data of BMI were prepared, which evaluates the interdependence of the general anthropometric data. This is the data results in experimental groups.

Table 2 Physical characteristics of young and adult footballers

Physical characteristics	Adult (12)		16-17 years (12)	
	Before	After	Before	After
Average age (years)	26.42	26.52	16.67	16.77
Average body height (cm)	177.83	177.83	177.00	177.59
Average body weight (kg)	76.72	74.84	72.33	68.80
Average BMI (kg/m ²)	24.26	23.67	23.09	21.81

The above data show that a group of footballers with different data were considered, which was more relevant for the adults. In the experimentation were taken a group of footballers with different traits and abilities, up to big differences. If we analyze the footballers separately we will find out changes not only in body height, but bigger changes in weight and especially the BMI index. These differences have been bigger before the experimentation, while after the 10-week experimentation the differences were greatly reduced. For example, the adult footballers have a difference of 2.4% between the two measures, whereas those of age 16-17 have a 9.9% difference in the direction of BMI index. At the end of the experimentation these figures were reduced to 2.4% and 9.9%, a reduction that shows weakness in the training of the two groups of footballers, especially the young ones, and tells us about the dedication and seriousness that these footballers showed during the experimental phase.

6. The calculation of loads

All subjects were in good health and didn't take medicaments that influence the metabolism. The subjects trained for 90 min. 5 times a week and 1 match a week, and the body mass was fluctuating in 1 year (up to 10% change). During the 10 weeks of experimentation, subjects accepted to respect the according instructions of the group of authors, which were related to the regularity of training and the preciseness of the execution of the exercises. The group of young footballers made an agreement with the according trainers to continue their training regularly, whereas the experimentation

would be realized 3 times a week (Monday, Wednesday, Friday) and the group of adult indoor footballers practiced training during the 10 week period. So, the group of authors trained the group of footballers for 10 weeks with no interruption. The program was supported in this categorization:

- 10 weeks overall
- 28 sessions were programmed for aerobic strength, related to proprioceptive exercises with moderate intensity. The volume in one session was 2200 m – 4000 m. By the end of the training proprioceptive exercises were programmed from 15 to 22 minutes. The overall intensity was 75-90% of the maximal aerobic strength.
- 30 sessions for the general development of strength. This training was done in two parts. 12 sessions for the muscles and 12 sessions for the development of strength with proprioceptive exercises. The duration of training ranged from 45 – 70 minutes.
- 15 sessions for the development of lactic stability. The overall volume varied from 1100 – 2000 meters. The number of series was 4 and the number of repetitions was 5. The second part of training involved proprioceptive exercises, which were developed with high intensity.
- Complex exercises were also used for orientation and coordination. These exercises were used from time to time, with maximal intensity and duration up to 20 seconds. The number of training sessions was 2-3 times a week and for the last 3 weeks they practiced 5 times a week.
- The overall practice with adults was 64 training sessions, whereas the 16-17 years old practiced 30 sessions in 10 weeks. Complete detachment from training with the team wasn't used for the young group. They trained with their team, while they trained at this program at 8 pm for 3-4 times a week. Indoor footballers trained 6-7 times, with 1-2 matches a week by the program group.

The training of footballers was done in these indexes:

- a) Circuit training
- b) Complex training
- c) Base stability
- d) Stability training
- e) Training of heart pulse
- f) Training in hills

- g) Ideal weight
- h) Ability in image
- i) Conceptual intelligence
- j) Exercise intelligence
- k) Tests of performance
- l) Pliometrics
- m) Exercise techniques
- n) Speed training
- o) Training programs
- p) Training with weights
- q) Stretching training
- r) Stability training in the gym
- s) Literature and other articles published for this purpose

7. Quality of speed

Quality of speed has been measured twice and with two chronometers. The testing was realized at the start of the experiment and at the end of the 10-week training. Exercises for the development of quality of speed have been programmed 1-2 times a week with a total of 13 sessions in 10 weeks. For the measurement of the test of 50 meters few testing sessions were done with a programmed high start and very precise measurement with chronometer. The movement of the leg backwards was evaluated with the test of 50 meters realized by measuring it in two levels. From these two measures have come out measures about the average speed, reaction time and maximal speed. Also, three groups of exercises were programmed for the preparation of quality of speed, exercises for the density of steps, exercises for the development of muscular strength and proprioception exercises. It should be highlighted that the connectivity with proprioception exercises has been our main focus and because of this connectivity the dynamic experiment was taken, which was hard to plan and follow. The average level of these speeds is as follows:

Table 3

Speed	Futbollers	Level of quality of speed and differences		
		Before experiment	After experiment	Change
Average	Adult	50 m = 6.34	50 m = 6.22	1.93%
	16-17 years	50 m = 6.63	50 m = 6.49	2.16%
Reaction	Adult	30 m = 4.05	30 m = 3.99	1.50%
	16-17 years	30 m = 4.15	30 m = 4.08	1.72%
Maximal	Adult	20 m = 2.26	20 m = 2.21	2.26%
	16-17 years	20 m = 2.48	20 m = 2.41	2.91%

An interesting topic for us was the measurement and evaluation of the indicators of speed with change in direction (10 * 5 meters). This indicator was evaluated in two directions; initially this indicator is related to the quality of the result and later on it is evaluated in relation to the average speed in 50 meters. Thus, we have measured and evaluated either speed in m/sec and the improvement of this speeds in relation to each other. This analysis has served us so we can see the effectiveness of proprioceptive exercises, exactly because we have hypothesized that they make the connection, better than any other exercise, of the maximal speed and not only, with the speed in match conditions. Independently of these, we have to reason by giving the average results of these measures and then analyze the differences between the two measured tests.

1. The indicator of 10 * 5 meters for adults was 18.82 sec. and at the end of the experiment it became 17.33. So, a change of 1.49 sec. or 8.6% and for the age group of 16-17 years it was 20.10 sec. and became 18.39 sec. So, a change of 1.81 sec. or 9.3%.
2. The improvement of quality of average speed was; for the adults 1.93% and for the 16-17 year old group 2.16%. The indicator of 10 * 5 meters was improved for adults by 8.6% and for the 16-17 year old group with 9.3%.
3. Differences in percentage are very sensitive, showing the fact that proprioceptive exercises play a key role not only in the improvement of physical indicators, but also the change in indicators that are special and respond to the conditions of football, especially indoor football, but not only.

Aerobic and anaerobic stability

Stability has been evaluated through measurements of two tests. The 3000 m run for the evaluation of aerobic stability and the test of 250 m for the change in direction and measurement of anaerobic stability or the special stability of footballers. So we have

used these tests to evaluate training with aerobic exercises, anaerobic and strength related to proprioceptive exercises. The measures were done at the start of the process of training and at the end of the 10 – week training. Let’s see the data of the average indicators with footballers of the two age groups in the quality of stability (aerobic and anaerobic).

Table . 4

Indicators	Age (years)	250 m fitness test		3000 m run	
		Before	After	Before	After
Best result	Adult	49.88	47.31	11:39,4	11:18,7
	16-17	52.14	49.66	12:30,7	11:35,7
Average result	Adult	52.49	49.57	12:17,5	11:39,2
	16-17	56.77	52.77	12:57,3	12:08,3
Weakest result	Adult	57.80	54.62	13:20,7	12:36,5
	16-17	58.66	54.98	13:40,9	12:47,0

The systematic training with clear demands and objectives brings sensitive improvement to the overall physical and functional indicators of footballers and the intertwining of training workouts with connectivity to exercises for the training of physical with proprioceptive qualities guarantees better quality, by making a better connection of the physical qualities to the orientation abilities and coordination in space and time.

Speed – Power

For the measurement of this quality, we have practiced, trained and measured the index of 10 step from starting position. Then, we coordinated this index with proprioceptive exercises in small distances. If an exercise with outside and inside rotations coordinated with crossing of legs could be done at maximal or near-maximal speed for the development of qualities of speed and the ongoing of quality of speed – strength we practiced the same exercises, but now the basic demand is to do them in bigger amplitude in distance and height. So, the change rests in the format of movements. Also, for the development of this quality were used exercises for the muscular strength, especially for the lower back and the waist region, without leaving out other parts of the body. This training was programmed during the 8 weeks because the first two weeks weren’t programmed for the effect of the learning of movements, which are hard to conceptualize and execute.

Table. 5

10-step from starting position	Adults of indoor football			Footballers 16-17 year old		
	Before	After	Change	Before	After	Change
Best one	30.20	32.10	6.3%	26.50	27.20	2.6%
Average	26.86	27.73	3.2%	24.46	25.38	3.8%
Weakest	22.50	23.20	3.1%	23.40	24.38	4.2%

Based on table nr.5 we see the improvements in the direction of speed – strength, which are of acceptable level and this evaluation shows that the volume of training would be raised more, especially for the young group. So, the quality of speed – strength is a basic one for the young group and very demanded in the advanced European football, and not only. Independent of the change of 3.2 – 3.8 % is an optimistic figure and should be accepted that the volume of the loads in this quality can and should be raised. Also, the jumping exercises in their classical form are developed only a little, whereas the proprioceptive exercises have been determinant in this 8 week program. The first two weeks were not practiced in these exercises for the development of speed – strength.

8. Conclusions

1. Training of modern football are related to complex trainings, which have at the center of attention the connectivity of exercises for the preparation of physical qualities with proprioceptive ones. Abilities of orientation and coordination are improved through practice of proprioceptive exercises, which realize in a fast and precise way the connectivity of conceptual and exercise intelligence. Without such a connection the understanding between trainers and footballers would be weak and misunderstanding would come forth.
2. 10 – Week trainings, planned for the first time in our country, realized with a group of footballers who achieved in a correct and a serious manner the demands of the group of authors.
3. Physical and functional indicators measured before and after the experimentation incurred changes up to sensitive ones. In percentage form these changes are: for adult footballers from 3.2 – 8.6%, whereas for the footballers of 16-17 years of age from 3.8 – 9.3%. The indicators that have a direct connection with proprioceptive exercises have had the highest percentage of improvement, which shows that the programming with such exercises is a demand of time and that our practice is stationary without such trainings.

4. Besides the above conclusions, the group of authors thinks that after the approval of this study it becomes necessary the realization of a workshop with all the experts, science advisors and trainers in general, to clarify the concepts that showed up in this study.

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