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Issues concerning the use of strength and power practice, during the preparatory period, for U19 youth football players

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Abstract. The aim of this study is to see if the strength and power type exercise, applied to young professional football players to increase active muscle to optimal values, may be used during the preparatory period without adverse affect on physical fitness (agility, speed, explosive power, anaerobic capacity, aerobic endurance)

Keywords: football, physical training, young football players, strength and power practice

Introduction

Modern football requires balanced muscle development to withstand all the stresses to which a football player is subjected, mainly due to the repetition of specific actions and exercises of this sport and various "shocks" such as: violent contact with the ball (huge amount of shots taken), contact with the pitch (falls, tumbles, fouls received, jumps to the ground) and tackles (collision with the opponents feet, body).

Strength and power practice trainings are addressed to junior football players by respecting mandatory fundamental principles: general musculation must precede specific musculation, unloaded musculation must precede loaded musculation, prior introduction to specific technique, individualization programme and gradual increase of loading used (Aubert, 2002).

In the specialty literature we find numerous references related to the age at which musculation training with load for young players can be started. Most specialists opinions (Weinek, 1996; Thiebault, 1998; Commeti, 2002; Turpin, 2002)

converge towards 15-16 years old as it is thought that until then the secretion of testosterone does not increase significantly (after puberty), possible mass gains are insignificant compared to the risks the subjects are exposed to.

As a result of specific measurements (waist, weight, percentage of body fat), performed by the team physician to players of a 2nd division football team in Romania, there was a deficit of muscle mass in all subjects. This can be explained to some extent by the fact that they are very young (19.8 ± 1.73 years), many of them are still in junior age. In order to eliminate such shortcomings and the idea to prevent muscular and joint accidents or injuries, it was agreed at the preparatory period, to implement a programme oriented to increase muscle mass to the subjects in this matter.

During adolescence, soccer players presented significant differences in terms of body composition and physique. Thus, these findings could be employed by coaches and fitness trainers engaged in soccer training in the context of physical fitness assessment and talent identification (Dumitrescu, 2010; Pantelis & Nikos, 2011).

It is widely diffused in literature that the resistance training allows strength and hypertrophy gains (Goto et al. 2004; Harris et al. 2004; Ganea et al. 2005; Sooneste et al. 2013). To allow optimal gains, the training should be performed with loads between 65-80% 1RM (one repetition maximum) and frequency of training between two and three times per week, at least (American College of Sports Medicine.; 2009). Moreover, larger volumes of training appear enable better muscle adaptations in comparison with low volumes (Sooneste et al. 2013). Opinions on the time requires to obtain a significant muscular hypertrophy in young football players is between 3 weeks (American College of Sports Medicine, 2009) and 7 weeks (Ozmun et al., 1994; Faigenbaum et al., 2000; Garcia et al., 2005). We decided for a classic version (Weineck, 1997; Wilmore & Costill, 2002; Bompa, 2003), about 4-6 weeks working to achieve a significant improvement in active muscle mass.

As such, we proposed a decrease in the percentage of fat for our subjects, with decreased body weight by achieving an increase in muscle mass. The concentration of fat in professional footballers' body is usually comprised between 9 and 19% (Reilly & Williams, 2003; Bandyopadhyay, 2007; McArdle et al., 2007) as per population age comparable with the subjects of this work meet values: 11.3 (Hazir T. (2010, young Turkish players in the 1st division), 12.6 (Dunbar, 1997, football players in the Portuguese 1st division) or 12.3 (Brewer, 1990, the first and second English football league).

We consider useful the implementation of practices with this kind of objectives during the preparatory period and from the point of view of body composition regulation, because in the off-season, regardless of the level in which they perform, they tend to gain fat (White et al., 1988). Ostojic and Zivanic (2001) found that body fat percent of Serbian professional football players decreased significantly during the race season and increased out of season. Burke et al., (1986) and Reilly (2003) pointed out that fat in the body of football players may accumulate out of season and players may lose more weight during pre-season training than other periods.

Hypothesis

Strength and power training type, aimed to increase active muscle mass for young professional football players to optimal values, can be successfully addressed during the preparatory period, without adverse affect on physical fitness level (agility, speed, explosive power, anaerobic capacity, aerobic endurance) during that period.

Material and methods

Subjects and groups

The experimental group: 15 players from 2nd division club FC Bihor Oradea, age 18.4 ± 1.15, 178.5 ± 5.44 cm. size, weight: 69.3 ± 5.63 kg., conducted training for 8 weeks before the start of the 2011/12 season, under the lead of a football coach and a strength & conditioning coach.

Control group: 15 players (FC Liberty Salonta U19), age 18.2 ± 1.04, height: 176.4 ± 4.78 cm., weight: 70.1 ± 4.25 kg., have conducted training during the same period of time, under a specialised football coach, as it was intended. The number of training sessions conducted weekly was comparable to that of subjects in the experimental group, the only change regarding the strength practices used predominantly in circuit training.

The administration of nutritional supplements (protein, vitamins, minerals) was made by the medical team, in the same way to both groups.

The number of subjects in both groups is lower than the number of the entire roster for good reason, as not all of them could support the two tests.

Method

Targeted training sessions to develop muscle mass (musculation) were planned during the 8 weeks of the experiment under the form of 2 modules of 4 weeks each, being performed 4 training sessions in the power gym each week.

Thus, training in the power gym has been applied during the 8 weeks in a total of 32 times, the dosing means used having been illustrated in the following table (table 1). Each training session (total duration of 60 minute per session) was preceded by a general warm up of 12-15 minutes and ended with a round of 8-10 minutes of muscle stretching, oriented mainly towards the targeted muscle groups in that training. The drills used were the kind with a concentric contraction, with submaximal exercise intensity (between 60% and 75% of 1RM) with a number of 8-12 repetitions/series.

Based on the initial testing results achieved, the players were divided into four value groups, so as the dosing for training loads to be accurate.

Test applied

The measurements conducted by us on the subjects can be grouped in two main categories: measurements in the doctor's office: size, weight and body composition (skinfold measurements, body fat percentage). Percent of body fat (BF) was calculated from the sum of 10 skinfolds (cheek, wattle, chest I, triceps, subscapular, abdominal, chest II, suprailiac, thigh and calf) using a skinfold calliper (Harpenden, West Sussex, UK), based on the formula proposed by Parizkova,1978.

(table 2) and measurements taken on the field in the following tests: 30 meter standing start, the shuttle 10-20-40-50 meters, long jump without momentum, estimating maximal aerobic speed (MAS) by means of the field Brikci-Dekkar test and the press oblique 45° test (table 3).

Table 1. Dosing used during the eight weeks of the experiment

	MODULE 1			MODULE 2		
Time	4 weeks			4 weeks		
Frequency	4 practices/ week			4 practices/ week		
Targeted muscular groups/practice	Legs	Trunk	Upper limbs	Legs	Trunk	Upper limbs
No. of exercises	3	3	3	3	4	4
No. de sets/ex.	4-6	4	4	6	5	5
No. repetitions/sets	10	12	12	8	10	10
Intensity	65% 1RM	60% 1RM	65% 1RM	75% 1RM	70% 1RM	75% 1RM
Break between sets	~1'	~1'	~1'	~1'30"	~1'30"	~1'30"
Break between exercises	2-3'	2-3'	2-3'	2-3'	2-3'	2-3'

Table 2. The arithmetic averages and the differences between them in terms of measurements taken in the doctor's office for the two groups (experimental and control) at each of the two tests (initial and final)

Group	Initial Testing (T.I.)			Final Testing (T.F.)			T.F.-T.I.	
	Weight	Fat percentage	Body mass index	Weight	Fat percentage	Body mass index	Mass muscle gain	Decrease of fat percentage
	(kg.)	(%)	(BMI)	(kg.)	(%)	(BMI)		
Experimental	69.3	14.6	21,9	69.8	12.1	22,2	+2,6 kg.	-2.5 %
Control	70.1	15.3	22,2	70.3	14.5	22,3	+0,7 kg.	-0.8 %

Table 3. The arithmetic mean of the results achieved in the control samples used by the subjects in the two groups at each of the two tests and progress registered between them (in percentage - % and through the effect size - ES)

Test	Experimental group				Control group			
	T.I.	T.F.	Progress		T.I.	T.F.	Progress	
			(%)	ES			(%)	ES
30 meters standing start (s.)	4,15	3,96	4,7	0,87	4,19	4,07	2,8	0,35
The shuttle 10-20-40-50 meters (s.)	43,11	41,21	4,4	0,95	43,82	42,55	2,9	0,48
Standing long jump (m.)	2,27	2,39	5,5	1,15	2,23	2,30	3,1	0,37

Maximal aerobic speed (MAS) km./h.)	17,14	18,19	6,1	1,08	16,61	17,16	3,3	0,58
Press oblique 45 ° (kg.)	123,55	137,76	11,5	1,24	121,24	126,94	5,4	0,62

Results and discussion

The experimental group's work resulted in an average gain of 2.6 kg of mass muscle together with a decrease of 2.5% in fat concentration. By comparison, the control group gained 0.7 kg of active mass muscle together with a decrease of 0.8% in fat concentration. The field tests used to evaluate efficiency of work during the preparatory period to improve the physical condition of the players of the two groups, conclude in all control tests a superior progress to those in the experimental group compared to those in the control group, so as shown in table no. 3. We chose to highlight the progress made between the two tests in each group involved in our research through two indicators:

- the difference between arithmetic averages of registered performances in the control samples used by the subjects in the two groups (experimental and control) in each of the two tests (initial and final), as a percentage (%) and
- through the effect size (ES) that (Thomas et al., 2010), represents the difference between the arithmetic averages of standardized performance over the control samples used by the subjects in the two groups in each of the two tests.

Conclusions

The results confirm the research hypothesis.

The results registered for the 5 tests performed during our experimental research underline the fact that the efficiency of the activity developed on the level of the experimental group was superior to that from the control group. The progress registered (expressed in percentages and by the size of the effect) in each of the 5 control tests used, was superior in favour of the subjects from the experimental group, which confirms the accuracy of the means and methods used.

Well integrated into the overall preparation of a football team during its preparatory period, strength and conditioning practice training can bring an increase in active muscle mass while lowering the concentration of the fat (table 2). All without adversely affecting the development of different forms of manifestation of physical qualities covered in that period (table 3).

Taking into consideration the above mentioned, we consider useful, for young players who are deficient in muscle mass, the introduction of training aimed to build muscle to optimal values. Depending on the needs of the subjects, this can be done over periods of 4-6-8 weeks, one or two times per year during the preparatory period. Of course, the implementation of such training for longer periods could harm (due to the intensity of submaximal loads, a relatively high number of repetitions and low speed execution) leading in the end to having players with well-defined musculation but slow.

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