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INCREASING THE MUSCLE CONTRACTION STRENGTH AFTER THE INDIVIDUALIZED TRAINING IN FOOTBALL

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Abstract

The purpose of this paper is to highlight the increase in strength of muscle contraction following the individualized training of athletes, designed after determining the maximum strength for five muscles: quadriceps, hamstrings, deltoids, pectorals and biceps brachii. Research hypothesis: The systematic use of individual programs allows increasing the maximum strength following the recruitment of a greater number of motor units. Work method: The program was applied during the competitive phase for one month, meaning that eight training sessions were held as part of further action on the aforementioned five muscle groups. It was used the flat pyramid method based on three different work intensities in order to obtain higher neuromuscular adaptation. Ten professional football players aged between 18 and 30 years participated in the designed program, working into the circuit training, therefore alternating one exercise for the upper body and one for the lower body. Conclusions: The maximum load with few repetitions leads to substantial adaptations of the nervous system, better synchronisation of the involved muscles and an increased ability to recruit fast fibers. The results of individualized strength training have increased the contraction strength by 40% after eight workouts and by more than 5% after every workout. In this regard, the research hypothesis is confirmed.

Keywords: Strength of muscle contraction, individualized training, football.

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1. Introduction

The maximum load method is the only type of strength training that recruits all motor units.

Strength increases as a result of the involvement of as many motor units as possible, so the players do not have to grow in weight to become stronger.

Malo (2014) thinks that maximum loads with few repetitions lead to significant adaptations of the nervous system, better synchronisation of the involved muscles and an increased ability to recruit fast fibers (p. 146).

1 RM – One Repetition Maximum – represents "the maximum amount of weight that a person can lift in a single repetition for a specific training exercise" (Williams, Groves, & Thurgood, 2009, p. 248).

Some experts (Fleck & Kraemer, 1998) have found that strength is tested by one to ten repetitions, and over twelve repetitions test the muscle endurance (p. 87). In this regard, there are some warnings that the personal coach should know in 1 RM testing.

2. Purpose of the Study

The purpose of this paper is to highlight the increase in strength of muscle contraction following the individualized training of athletes, built after determining the maximum strength.

3. Research hypothesis

The systematic use of individual programs allows increasing the maximum strength following the recruitment of a greater number of motor units.

4. Subjects

Ten professional football players aged between 18 and 30 participated in the designed program.

5. Research Methods

It was determined the maximum strength for five muscles: quadriceps, hamstrings, deltoids, pectorals and biceps brachii.

Maximum strength was determined according to Brzycki formula:

(load x number of repeats x 0.33) + load

Once the maximum potential for each player and each muscle group has been determined, we designed an individual training program for increasing the contraction strength.

This type of calculations may not always produce accurate results, but can be used as starting points (Brzycki, 1998, p. 92). The weight can then be changed as needed to perform the number of reps called for by the training protocol.

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6. Findings

A one-month program was organized, with 8 training sessions (2 training sessions per week in the gym, aiming for work at intensity of over 80%, going ever closer to 100%).

Table 01. The pattern of training

Series/Exercises		I	II	III	IV	V
Pectorals		39-42	48-51	57-60	57-60	57-60
Deltoids		28-30	34-37	41-43	41-43	41-43
Quadriceps	Right	49-53	60-64	71-75	71-75	71-75
	Left	57-61	70-74	83-87	83-87	83-87
Biceps brachii		26-28	32-34	38-40	38-40	38-40
Hamstrings	Right	33-36	41-43	48-51	48-51	48-51
	Left	27-29	34-36	40-42	40-42	40-42

The pattern of the proposed load is the flat pyramid. This type of load pattern starts with an intermediate series of 80-85%, then 3 series with a stabilisation load of 95-100% (Figure 01).

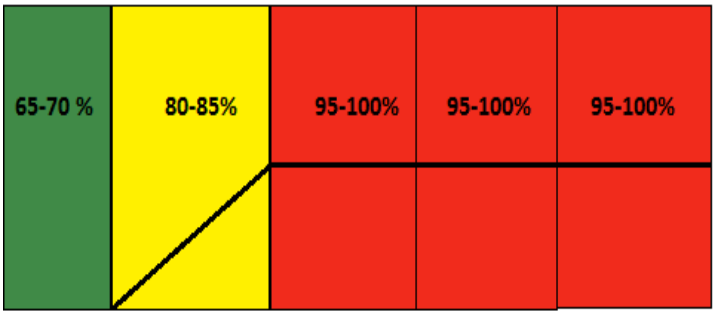

Figure 01. The flat pyramid

Each player worked according to the individual file designed after the data interpretation. The designed program was applied in the competitive phase, and the training took place as an additional part.

Players who followed the designed program have evolved less or at all in the recent games. The individual file was divided into three workloads:

- 65 to 70%, 12 to 15 repetitions are performed as a series of transition between general warm-up and the work to be done;
- 80-85%, 6 to 8 repetitions are performed and the goal of this area is to have an intermediate series and get closer to the maximum area, and the involvement of motor units is valid. When some units get tired, others get into action;
- 95-100%, 1 to 3 repetitions are performed, and the involvement of motor units is total.

Table 02. The appropriate intensities for 1 RM

Intensity/Repetitions Exercises	100% 1 RM	**95-100% 1-3 Maximum strength**	**80-85% 6-8 Muscle hypertrophy**	**65-70% 12-15 Muscle tone**
Pectorals	60	57-60	48-51	39-42
Deltoids	43	41-43	34-37	28-30

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Quadriceps	Right	75	71-75	60-64	49-53
	Left	87	83-87	70-74	57-61
Biceps brachii		40	38-40	32-34	26-28
Hamstrings	Right	51	48-51	41-43	33-36
	Left	42	40-42	34-36	27-29

Players worked into the circuit training. It alternated one exercise for the upper body and one for the lower body. Only after all five exercises were performed, the following series was executed. The rest between exercises was 1 minute and a 3-minute rest between series. The interval between the two exercises in the week was at least 48 hours.

Table 03. The progress sheet

Intensity/Repetitions Exercises		1 RM		**PROGRESS**	
		28.10	30.11		
Pectorals		60	115	+ 91%	
Deltoids		43	62	+ 44%	
Quadriceps	Right	75	129	+ 72%	77%
	Left	87	159	+ 82%	
Biceps brachii		40	65	+ 44%	
Hamstrings	Right	51	65	+ 27%	51%
	Left	42	74	+ 76%	
Upper body				+ 60%	62%
Lower body				+ 64%	

7. Conclusion

In the final testing - after achieving the average for the 6 muscle groups, each player had a general progress. The results of individualized strength training have increased the contraction strength by 40% after eight workouts and by more than 5% after every workout. In this regard, the research hypothesis is confirmed.

The physiological advantage of using the flat pyramid is that, by using a load for a single intensity level, it is achieved the best neuromuscular adaptation (Kenney, Wilmore, & Costill, 2015, p. 117). The maximum load with few repetitions leads to substantial adaptations of the nervous system, a better timing of the involved muscles and an increased ability to recruit fast fibers.

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