

THE INFLUENCE OF A STRENGTH TRAINING PROGRAMME ON THE PHYSICAL AND KICK PERFORMANCES OF YOUNG SOCCER PLAYERS

G. Cometti, B. Tyrode and M. Pousson

Unité de Formation et de Recherches en Sciences et Techniques des Activités Physiques et Sportives, Université de Bourgogne, Dijon Cedex, France.

1 Introduction

Exercises aimed at developing soccer players' strength are often used with utmost caution in training programmes. Fixture lists are often so full that one hesitates planning muscle strengthening exercises during the season as they require a lot of effort. The solution most frequently opted for consists of arranging for strength development outside competition periods, particularly at the beginning of the season. Possible strength gains thus acquired are thereafter maintained by sprinting, jumping and kicking exercises and possibly plyometrics performed throughout the season.

The aim of our study was to analyse the influence of a four weeks muscle development programme for young soccer players designed to gain maximal lower body strength.

2 Methods

2.1 Subjects

The experiment was carried out on 8 young players of the professional team of Sochaux (age $15,75 \pm 0,71$ years; body mass $69,62 \pm 7,56$ kg; height $178.3 \pm 5,93$ cm).

2.2 Training programme

The programme was solely aimed at improving the lower body strength. We plan to sessions a week :

- a specific strength training session. (fig. 1)

This session was made up of three parts :

- squatting exercises
- triceps surae exercises
- leg swinging exercises.

Each specific strength training session was based on the model in Fig.1 and each participant does the sequence 3 to 6 times.

- the second session was based on endurance and strength, we call it "intermittent session".

The sequence of the session was as follows (fig. 2):

- 15 seconds running, 15 seconds rest, 15 seconds hoops and benches, 15 seconds rest...during 7 minutes and 30 seconds

The sequence was repeated 2 times.

2.3 Performance tests

In order to evaluate the relevance of this programme and some possible progress made by the players, a number of tests were set up.

2.3.1 Kick performance

The test took place facing a wall upon which there was a chalk drawn square target (100 cm x 100 cm). The ball was placed 10 metres from the wall, just behind the beam of a photo-electric cell (TAG HEUER HL 2- 11 TM) which triggers off a stopwatch as soon as the ball crosses it. The stopwatch is stopped by a microphone (TAG HEUER HL 556 TM) situated at

the foot of the wall. The average ball speed is calculated by a SPEEDMETER 510 (TAG HEUER™) from the time elapsed between the two impulses.

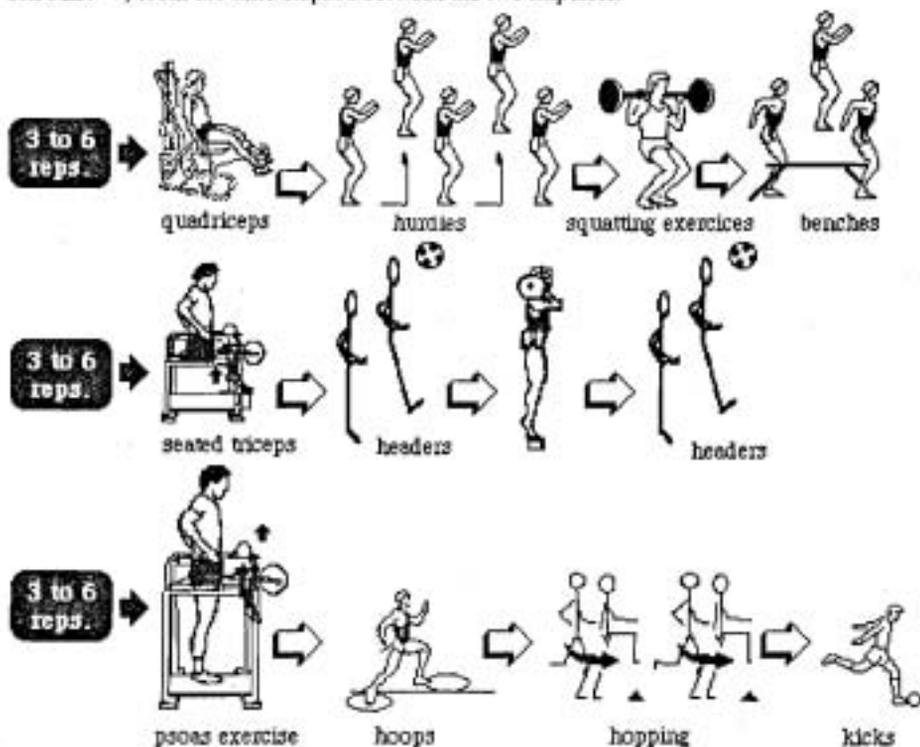


Fig. 1. Example of a session of specific strength training in soccer (Cometti, 1989).

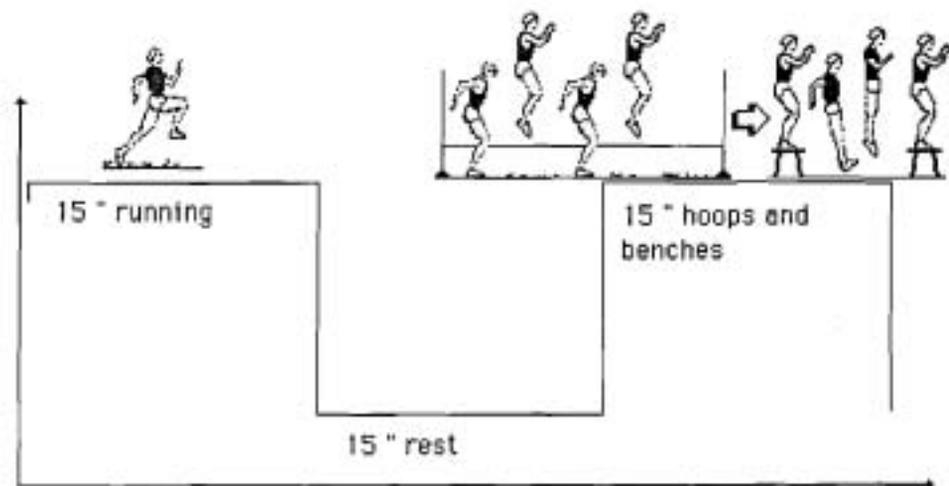


Figure 2 : the sequence of the "intermittent session".

The subjects took their run up as they wished so as to kick the ball as hard as possible and try and hit the target. They each had five kicks using whichever foot they wished. The results are displayed automatically in km/h.

2.3.2 Sprint test-

The subjects had to run a distance of 20+20 metres (changing direction after 20m) on a synthetic track as fast as they could wearing soccer kit. The start was given by photoelectric cells linked to a CHRONOPRINTER 500 (TAG HEUER™). The subjects rest 20 seconds and repeat the test 6 times.

2.3.3 Jump tests

Three performance tests according to Bosco et al. (1983) were included to evaluate the explosive power of the leg extensor muscles. An "ergojump" device (By Globus, Codogne, Italy) was used to obtain maximum precision.

In a Squat Jump (S.J.), the subject jumps vertically from a squatting position, legs bent at 90°, without using his arms.

In a Counter-Movement Jump (C.M.J.) the subject jumps vertically from a standing position, without using his arms.

In a "With Arms Movement Jump" (W.A.M.J.) he jumps vertically from a standing position, using his arms.

3 Results

3.1 Kick performance :

The subjects were tested twice. The average performance for the group was 88,73 km/h with a standard deviation of 4,58 km/h. These results are comparable to those obtained by Poulmedis (1985) with Greek First Division players.

After 4 weeks of muscle development exercises, all subjects had progressed. The average improvement for the group was 10.12 km/h (Table 1.). These improvements were significant ($P < 0.05$).

	TEST 1	TEST 2	progress
mean speed	88,73 ± 4,58	98,86 ± 2,62	10,12 ± 4,31

Table 1. Kick test results and progress achieved

3.2 Sprint test

All the subjects tested improved in the 6x 20m+20m metres. No increase was noted in sprint tests.

	TEST 1	TEST 2	progress
time en sec.	7,33 ± 0,15	7,59 ± 0,11	+ 0,27 ± 0,20

Table 2. Sprint test results and progress achieved

3.3 Jump tests

The performances obtained in the squat jump ranged from 42 cm to 48 cm. They are close to those obtained by Bosco (1985) using the ergojump apparatus with the Italian national team (31cm ± 5 cm).

The counter-movement jump (C.M.J.) performances range from 51 cm to 55 cm and are inferior to those obtained by Gauffin et al. (1989) with senior Swedish players (56.8 cm \pm 6.2 cm).

The C.M.J. -S.J. differences reveal, according to Bosco (1985), the elasticity potential of the subjects tested.

The With Arms Movement Jump (W.A.M.J.) performances ranged from 63 cm to 71 cm.

	TEST 1	TEST 2	progress
squat jump	36,67 \pm 2,85	38,11 \pm 3,92	1,44 \pm 2,90
counter Mvt jump	38,11 \pm 3,45	40,61 \pm 3,91	2,50 \pm 1,97
With arms jump	44,99 \pm 3,82	47,17 \pm 4,76	2,19 \pm 1,86
power test 15 s.	29,42 \pm 5,50	32,70 \pm 3,59	3,35 \pm 4,21
CMJ-SJ	1,44 \pm 1,36	2,50 \pm 0,92	1,06 \pm 1,69

Table 3. Jump test results and progress achieved

At the end of the muscle development programme of exercises, an appreciable progress in the countermovement jump (2,50 \pm 1,97, $p < 0,05$) and the With Arms Movement Jumps test (2,19 \pm 1,86, $p < 0,05$) was noted.

In the squat jump, progress was not significant.

The progress in power test (3,35 \pm 4,21) was interesting but not significant.

4 Conclusion.

The progress achieved was above all been obtained in the most explosive exercises and those which are closest to skills required in soccer. The whole group progressed significantly in the kick test : 10,12 \pm 4,31 ($P = 0.05$). The jump tests showed an interesting improvement. Only sprint tests are in decrease, perhaps of the consequences of the match two days before. The results of this study give new perspectives for future studies, with better experimental conditions (control group and more players)

5 References.

- Bosco, C.(1985) Elasticita muscolare é forza esplosiva nelle attivita fisico-sportive. Roma : Società stampa sportiva.
- Cometti, G.(1989) Les méthodes modernes de musculation: Données théoriques.et pratiques. Compte rendu du colloque de novembre 1988 à l'UFRSTAPS de Dijon. Ed : Université de Bourgogne.
- Poulmedis, P. (1985) Isokinetic maximal torque power of Greek elite soccer players. J. Orth. Sports Phys. Therapy, 5, 293-295.