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Original article

FUNCTIONAL TRAINING AND ACTIVE FORCE TRANSFER SPECIFIC TO THE GAME OF FOOTBALL

COJANU FLORIN ¹, NAIBA GEORGE ¹, VIȘAN VERONICA ², NICOLAE RAMONA ELENA ²

Abstract:

Aim. The aim of this paper is that functional training is intended to create exercises that emulate continuous movement: movements that usually use muscle synergies and develop in a combined way in planes and axes. Functional strength training is much more complex than training the strength of a muscle or muscle group: it requires a greater commitment to increase the connection between the nervous system and the muscles.

Method. The method in which functional training uses complex movements involves an increase in strength, which in turn directly influences the quality of execution, so it is easier to move in everyday life.

Results. The results is to made the goal of functional training is to ensure that the specific results obtained by training one movement can consequently improve the performance of another, acting on the entire nervous system! This is known as "transfer potential." In functional training, it is crucial to train the specific movement as well as the training of the muscles involved in the movement: the brain, which controls the movements of the muscles, thinks in terms of continuity, the whole movement, not the separate muscles.

Conclusion. In conclusion mono-joint isolation exercises train muscles, not movements, therefore they are less suitable for a functional program instead, multi-joint exercises will be optimal. A knee bend, for example, has a high pulling potential compared to the lifting movement of a chair, which is not suitable, for example, for the abduction of a thigh.

Key words: functional training, soccer, plyometrics.

Introduction

Functional training uses cardioexercises (HIIT type - High Intensity Interval Training), muscle toning exercises performed with high intensity with very short breaks at longer intervals, static or moving cardioexercises, exercises with your own weight and various accessories. It is the kind of training practiced by military operational units and performance athletes such as athletes, great martial arts champions. (Cometti, G., 2004)

Who can practice functional training? Any person (regardless of gender or age) who aims to develop their physical condition, the ability to cope with daily tasks or desired sports activities, to improve their physical appearance by bringing the body to normal weight and to maintain their condition. health of the cardio-respiratory-circulatory system. (Cometti, G., 2005)

The main purpose of functional training is to improve your ability to perform daily activities. Think of it as training an entire movement - not just a certain muscle. When jumping, don't just use your leg muscles. It is a coordinated effort between the nervous, cardiovascular, respiratory and musculoskeletal systems that allows fluid movement. (Sapto W. et. al., 2021)

The key to effective functional training is to simulate the actual activity you want to improve. The main focus should be on achieving similar types of contractions (eccentric, concentric or isometric), speed, range of motion and level of coordination. The closer the exercise is to the actual activity, the more efficient the training. For example, if you are an active person who spends a lot of time cycling, functional training includes exercises that simulate movements and strengthen the muscles used in cycling. (Eliane A. F., Pechnicki dos Santos L., Oliveira Alberico C., Simão R., and Fermino R.C., 2021)

The goal of the preliminary experimental approach

The main goal of the preliminary experimental process is that of bringing a much coherent argumentation of the importance of using the plyometrics in the training of youth footballers, with preliminary initial exemplifications of the effects expected from the training on the dynamism of acts and triggering actions specific to the soccer game. The practical experimental goal is that of identifying the muscular training programs with predominant content of plyometric exercises adapted for the level of the Romanian A youth footballers, with a role in optimizing the force specific to the technical and tactical motions composing the soccer game.

The objectives of the preliminary experimental approach

The objectives of the preliminary experimental studies are distributed over the entire preliminary practical process, being a structural part of the so-called practical experimental guide standing at the foundation of the Ph.D. dissertation. Identifying the models of the muscular training programs with predominant content of plyometric

exercises based on the technical and tactical motions comprising the soccer game with the goal of optimizing the explosive force specific to the A youth footballers;

Identifying the general and specific physical trials and tests for the A youth footballers, to prospect data concerning the specific physical training level for the A youth footballers, but also tests specific to the muscular, which have the role of highlighting the value of the explosive force.

Interpreting the initial results to the measurements, trials and tests initially applied on both patterns, experimental and witness, drawing the conclusions of the released information.

The experimental work hypothese

If in order to coach the youth footballers we will predominantly use muscular specific training programs with a predominant content of combinations of plyometric exercises, we believe that we will be able to identify much easier the muscular training models, but also the ones for planning the specific force trainings at A youth level, being able to increase the performance efficiency during the respective game, the optimum specific force potential and, inferentially, the technical and tactical potential of playing of the team.

We believe that if we introduce in the planning programs with a predominant content of combinations of plyometric exercises at A youth level, rethought and remodelled according to aspects of modern football, we can contribute to increase the specific force potential optimum for the youth player and, inferentially, to increase the technical and tactical playing potential, by shaping the muscular training form drillings on the implied movements when executing certain technical methods, the rhythm and the tempo during the official games, all these processes finally leading to an increase of the performances for the youth football teams level.

Material and Methods

Methods of research used within the experimental process: The study of the national and international professional literature method; The observation method; The testing and measuring method; The method of testing the football specific explosive force parameters with the help of the Platform for the measurement of force *Quattro Jump tip Kistler 9290AD*; Statistical mathematical method; Experimental method; Graphical and tabular method.

Tests specific to the explosive force parameters related to the technical and tactical motions composing the football game:

- a) *Squat jump (SJ)* – the test implies executing a vertical jump from a semi-squatted position of the knees, 90 degrees or entirely, squat, without supplementary push against the ground, arms bent, palms on the hips. The lack of action on the arms makes the performance drop at least 10 cm, thus the results given as guidelines are apparently weak but justified, between 24 and 38 cm for females and between 26 and 45 cm for masculine. The performance of the SJ describes: the ability to jump and the explosive force (maximum) of the feet, the potential of neuromotor recruitment, the mass of fast fibres.
- b) *Counter Movement Jump (CMJ)* – the test implies executing a vertical jump exactly as in the Squat Jump test, but starting from a sit-up position. A dynamic flexing movement is executed, followed by an extension and a vertical jump. The differences between the two tests represent the “tensile” aptitudes of the athletes. The CMJ performance describes: evaluation of the explosive force FV (maximum) of the feet and the quality of reusing the muscular flexibility, the potential of neuromotor recruitment, the capacity of using the viscoelastic force of the muscular tissue.
- c) *Continuous Jump with Bent legs Reference (CJbref)* – series of 5 to 7 jumps with bent knees at the contact phase used as reference for CJb 15-60 seconds.
- d) *Continuous Jump with Bent Legs (CJb)* – jumps with bent knees at the contact phase on 15 to 60 seconds. The CJb performance describes: the mechanical power of the inferior train.
- e) *Continuous jump with straight legs (CJs) (responsiveness test)* – series of 5 to 10 maximal jumps with stretched knees (short flexible contact with the ground). The CJs performance describes: the evaluation of the muscular flexibility of the feet expanders, the jump technique and the tolerance at tense impact, the mass of rapid fibres.

The Bosco protocol can evaluate by means of its components:

- explosivity testing, tension release, non-plyometric (SJ) and plyometric (CMJ);
- strength testing (CJbref, CJb);
- responsiveness tests (CJs).

The choice of the experimental batch according to the recommended standards

The experimental batch is composed of the A youth players from the Children and Youth Centre FC Sporting Pitești, under the direction of coaches Telu Stancu, Lucian Diaconescu and Prof. Tănase Dima.

In the experimental research, the control batch is composed of the A youth players from the Children and Youth Center “International Curtea de Argeș”, under the direction of coaches Marius Țicu, Liviu Bănică and Nicolae Staicu.

As we have intended for the doctoral research project, the practical experimental part is carried out according to the classic corporative structure with experimental batch for whom the content of the muscular training programs is

applied through plyometric exercises, and control batch at the same performance level, carrying out its training program according to its own structure planned by the respective technical staff.

The place where the experiment is carried out and the recommended research methods:

The athletic ground of the CS Sporting Pitești sports club, with the areas rented by the technical staff, respectively the Pitești Olympic Pool and the gym inside the Olympic Pool;

The sports facility within the International Curtea de Arges Club with all the state-of-the-art endowments used for performance, of which a first league team have to dispose of and the training facility for the youth batches.

Testing within the Research Centre with athletic performance issues from the Faculty of Physical Education and Sports from Pitești with the help of Reader, Ph.D. Crețu Marian.

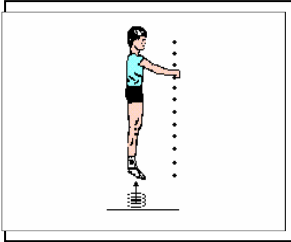

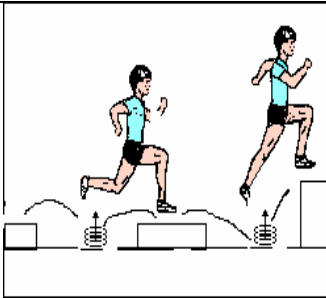

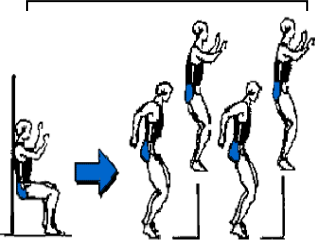

The personal contribution the development of the practical experimental research:

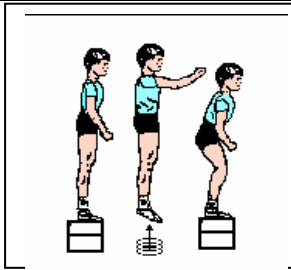

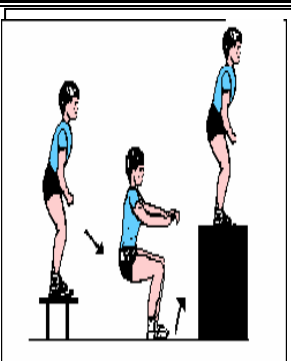

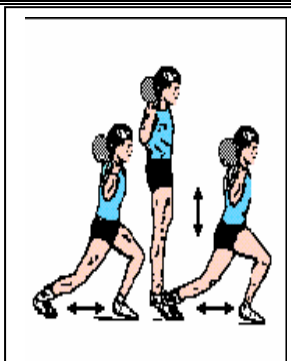
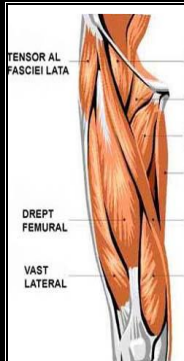
Model of muscular training programs through plyometric exercises specific to youth footballers.

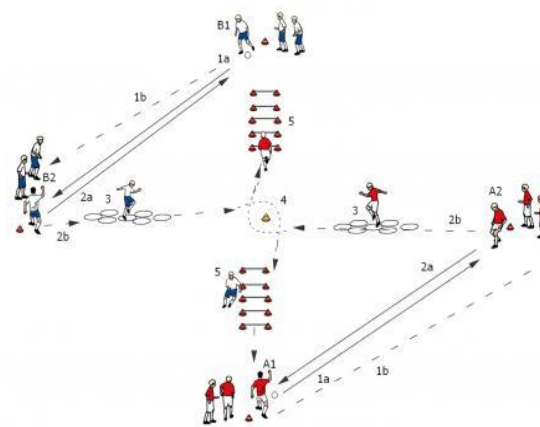
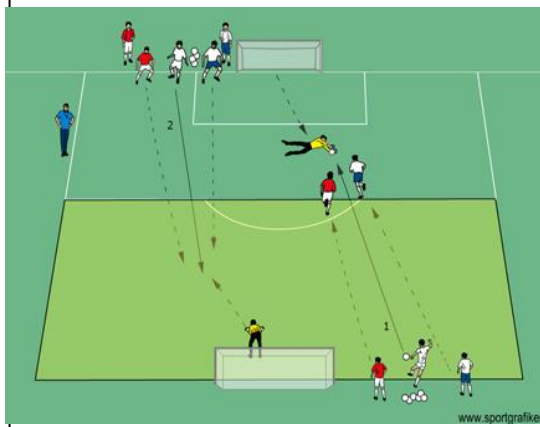
Operational objectives:

- The improvement of the specific shooting force within the game, but also crossing while running in a precise area;
- Improvement of the explosive force of the lower extremities was specific to the separation while running and jumping to the head, in conditions for shooting obstructed by the lateral pushing force in the feet on plunging of the goal keepers, but also for throwing the ball.

Tabel no. 1: Light plyometrics program

No.	Technical description of the exercise	Kinogramic representation	Proper dosage of the exercise	Main muscular bands	Methodical dispositions
1	From sitting with the face towards the wall bars, explosive pushes executed only from the ankle joint and the leg muscles, the contact with the ground is as shortest as possible, the separation being executed higher and higher		20 vertical explosive separations with a 1 minute and 30 seconds break. Semi active type of break, light stretching exercises will be executed from sitting-up on the ground; 4 to 6 series		The contact with the ground will be accentuated on the sole and the knees joints will have been blocked strained.
2	Leaping step over 6 cases at a distance of 2 m one from another on a surface of loose sand in straight line; the player will execute altogether 12 leaping steps.		4 to 6 series of 12 lateral jumps from a semi-squatted position and leaning on the wall bars.		Accent will be laid on the pressure loading of the hips muscles by maintaining a semi-squatted position.
3	Maintaining 40 seconds in isometrics, in a backrest without seat position, upraise and immediately execute 8 consecutive jumps over 45 cm tall fences, with 1 m distance between them;		4 to 6 series of maintaining 45 seconds in isometrics, back against the wall + 8 jumps with the knees up to the chest over fences; 2 minutes of passive pause between the		The accent is laid on the fluidity of the execution after maintaining in isometrics followed at once by plyometrics;

			series;		
4	Repeated jumps over 30 cm obstacles and on the ground, the contact on the ground being executed only from the ankle joint, a light bent of knees joints is executed only when returning on the obstacle. 8 obstacles will be introduced in the structure of the execution.		4 series X jumps executed with speed in the rhythm of a rapid Skipping on both legs; the 2 minutes pause will be semi active, while the favourite stretching exercises will be executed.		The accent is laid on an explosive push with a very fast contact against the ground ahead for the next landing on the obstacle where it will be taken slow.
5	Diving jump from a 25 cm bench on the ground and fast on a 60 cm case, execution is made in series of 8 sets of jumps; the contact with the ground is controlled by the player in order to use the muscular stress in an overload.		4 to 6 series X 8 sets of jumps; 2 minutes and 30 seconds passive pause;		The accent is laid on the separation as explosive as possible from the ground taking into consideration the fact that the jumps are light as compared to the diving jump.
6	Leaping fairs with 30% of the each player's own body weight, combined with vertical separation, three leaping fairs, a vertical separation on a 25 m distance; the weight is maintained on the shoulders during the entire execution.		4 to 6 series X 25 m, with an accent on executing the leaping steps on the entire foot and forceful push of the legs when executing the vertical separation;		The fairs are controlled by maintaining the body as straight as possible on vertical, with a localisation of motion on the hip muscles;

7.	<p>Light plyometrics path: one leaves from the spot the transmission of the ball at 15 m, with the full lace on the game, 15 m sprint, bypass of range pole, followed by 8 leaping steps through circles staggered in zig zag, 12 steps of fast skipping over 12 sticks down the range poles (especially conceived), the course will be executed in parallel, two by two;</p>		<p>The course of light plyometrics combined with technical gestures will be executed 40-60 x with a 3 min semiactive break, while the favourite stretching exercises will be executed.</p>	<p>Execution of the course will be made in parallel, two by two like a race, accent being laid on kicking the clean ball with full lace and the fast skipping execution ;</p>
8	<p>On a 30 m delineated area, the players are separated into two groups, each group having a coach; two normal goals are in place, protected by two active goalkeepers. The execution will be triggered by the coach transmitting the ball and in parallel two players will try to finish;</p>		<p>Upon finishing the phase, the players will move by light running to the opposite side, where they will perform the same exercise; 8-20 executions with a 1 minute semiactive break;</p>	<p>Accent is laid on the 1 x 1 challenging for striking the ball from running, without setting it first, taking into consideration that he is twice uneasily, opponent from sprint/goalkeeper;</p>

RESULTS

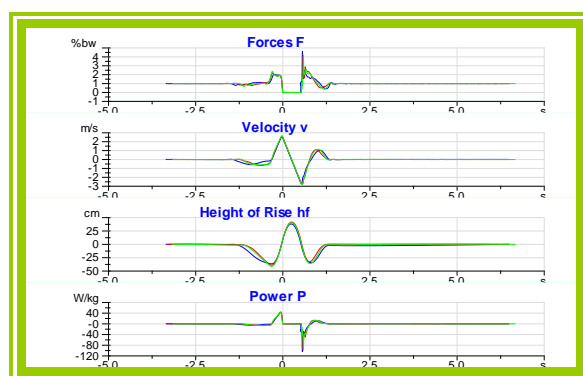
Analysis and interpretation of the results issued by a practical experiment concerning the explosive strength parameters by plyometric programs

TEST ASSESSED: SQUAT JUMP (SJ)

Assessment instrument: Kistler Quattro Jump Bosco Protocol Version 1.0.9.2

Experimental batch

Initial testing



Bilateral Deficit: n/a %

GRAPHIC no. 1 –Comparative evolution of the parameters in SQUAT JUMP (SJ) test– Experimental Batch initially

TEST ASSESSED: SQUAT JUMP (SJ)

Assessment Instrument: Kistler Quattro Jump Bosco

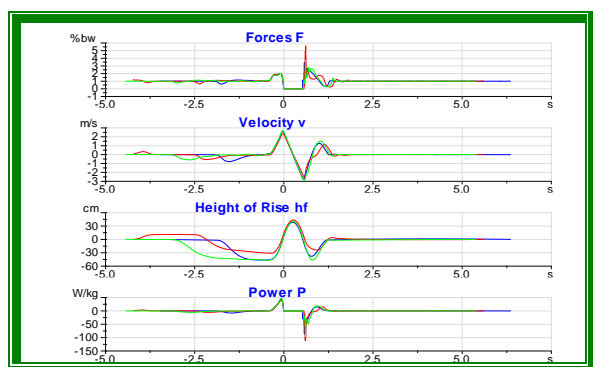
Protocol Version 1.0.9.2

Experimental batch

Final testing

Bilateral Deficit: n/a %

	Foot	Hf (cm)	Hc (cm)	Pavg [W/kg]
1	Both	38.1	36.3	20.3
2	Both	41.6	36.5	19.0
3	Both	40.3	38.8	19,5
Statistical indicators				
Arithmetic mean		40	37,2	19,6
Standard deviation		1,8	1,4	0,7
Variability coefficient		4,5	3,76	3,57



	Foot	Hf (cm)	Hc (cm)	Pavg [W/kg]
1	Both	38.5	-45,2	22,0
2	Both	43,5	-31,1	19,5
3	Both	40,4	-45,9	22,5
Statistical indicators				
Arithmetic mean		40,8	-40,7	21,3
Standard deviation		2,5	8,4	1,6
Variability coefficient		6,12	20,63	7,51

GRAPHIC no. 2 – Comparative evolution of the parameters in SQUAT JUMP (SJ) – Experimental batch initially
TEST ASSESSED: COUNTER MOVEMENT JUMP (CMJ)

Assessment instrument: Kistler Quattro Jump Bosco Protocol Version 1.0.9.2

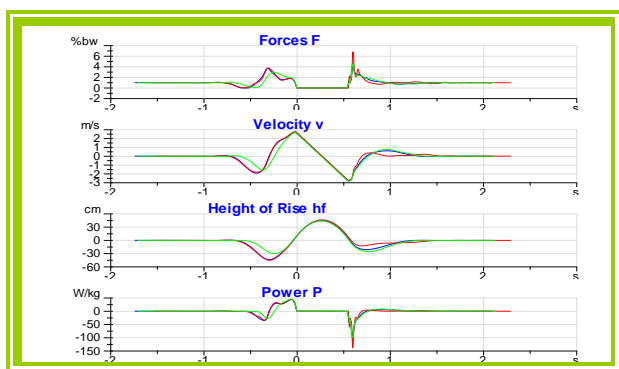
Experimental Batch

Initial testing

Bilateral Deficit (Pavg): n/a %,

Fast Twitch Fibres (est.): 40.9 %FT,

Effect of Prestretch: 11.2 % (reuse of elastic energy)



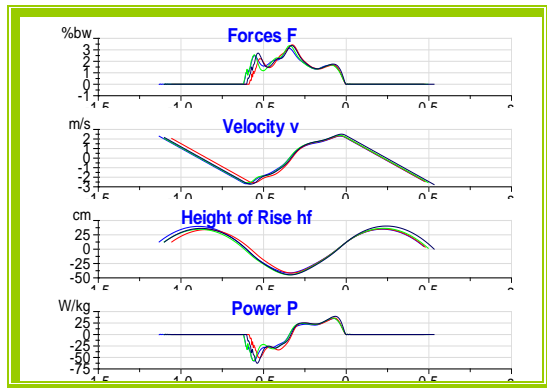
	Foot	Hf (cm)	Hc (cm)	Pavg [W/kg]	Fi [BW]
1	Both	44,7	-43,8	29,1	2,55
2	Both	46,3	-45,1	30,5	2,70
3	Both	44	-30,2	30,3	1,91
Statistical indicators					
Arithmetic mean		45	-39,7	30	2,39

Standard deviation	1,2	8,3	0,7	0,42
Variability coefficient	2,66	20,9	2,33	17,57

GRAPHIC no. 3 – Comparative evolution of the parameters in COUNTER MOVEMENT JUMP (CMJ) test – Control batch initially

ASSESSED TEST: Continuous Jump Bent Leg Reference (CJbref)

Assessment instrument: Kistler Quattro Jump Bosco Protocol Version 1.0.9.2



	Foot	Hf (cm)	Hc (cm)	Pavg [W/kg]	Fi [BW]
1	Both	34,8	-41,5	22,0	2,10
2	Both	35,4	-41,6	23,3	2,41
3	Both	36,4	-44,7	23,3	2,35
4		40,3	-44,7	25,2	2,34
Statistical indicators					
Arithmetic mean		36,7	-43,1	23,5	2,30
Standard deviation		2,5	1,8	1,3	0,13
C.V.		6,81	4,17	5,53	5,65

GRAPHIC no. 4 – Comparative evolution of parameters in CONTINUOUS JUMP BENT LEG REFERENCE (CJbref)) test – Control Batch final

Discussion

Of the specialty documenting studies made by foreign authors, but also from my personal professional experience, I have decided, by mutual agreement to the doctoral thesis adviser, to put in value the plyometric work in youth footballers ' practice, compensating for the measurements and the control tests proposed and applied in the previous experiment, to achieve the testing of the progress made for the explosive strength capacity, with specialty equipment, respectively with the help of the *Quattro Jump tip Kistler 9290AD* force measuring platform by and upon the agreement of the Faculty of Physical Education and Sports of Pitești, by which we assessed the level of training of the components of the experimental and control batches.



The way of assessing the training level by the testing method, by Bosco Protocol, which will be applied on the *Quattro Jump tip Kistler 9290AD* force measuring platform.

Planning the programs for muscle training by plyometric exercises plays a very important role over the effects expected in certain percentages within a competition, during the official match;

Conclusions

1. We consider that muscular training programs having a predominant content of plyometric exercises, conceived in order to transfer the explosive strength into technical tactical gestures specific to A youth footballers (17 -19 years old, the ideal age in the opinion of the specialists in the field for the application of the plyometric platforms specific to the sports games), as having a qualitative importance on the improvement of the specific strength capacity and implicitly, of the technical tactical game capacity.
2. As it results from the experimental part, by the practical experimental process, muscular training to the level of A youth footballers in Romania has a number of deficiencies in the practical applicability, reflected on the football performances at a national level, being confirmed by the conception and applying into practice of the plyometric programs, personal contribution, comparing the results partially obtained on the experimental batch to those of the control batch, who carry out their practice by the traditional concept;
3. The plyometric exercise in itself loads the muscle bands of connection to the body segments, specially lower limbs- trunk with maximum tension, issued by the nature of the muscle contractions given by the effects of

taking up from jumps, effects which, in specialists' opinion, store in the uptake luggage of the players, materializing if they are planned correctly in the technical tactical game gestures.

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