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INFLUENCE OF SPECIALLY DESIGNED FUNCTIONAL TRAINING IN IMPROVING BASIC MOTORIC ABILITIES WITH SENIOR FOOTBALL PLAYERS PLAYING IN DIFFERENT POSITIONS

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Original research:

Abstract

A survey was conducted on a sample of 50 football players aged from 17 to 30 aiming to establish quantitative transformation changes in tests of assessing basic motoric abilities and agility when influenced by specially designed functional training with top football players in different game positions in the team. In order to meet the research aims, six tests for assessing basic motoric abilities were applied as follows: 30-meter running, Lifting the tors in 30 seconds, Push-ups to full body-workout, Squat jump (SJ), Counter Movement jump (CMJ), and Counter-movement jump with arm swing (CMJA). The experimental program was applied within six work weeks with four trainings each week. The trainings were applied by a circular method of work, and the respondents were arranged into sets of groups of two players. The research results indicate that the six-week experimental training program of a functional training has a positive influence on improving the average results in all of the six tests. On the base of the numeric values of the arithmetic means and the percentage differences, there can be concluded that, within the six-week period, the whole sample of respondents has gained improvement with the tests: Lifting the tors, Push-ups to full body-workout, Squat Jump, Counter Movement Jump, Counter Movement Jump with Arm Swing.

Keywords: football, motoric effect, measurement, functional training.

Introduction

Modern soccer requires players to demonstrate a high level of functional abilities, technical-tactical efficiency, in a word, a morpho-functional universality so that they could act in different situations of the game, often in circumstances such as lack of time, limited space and active interference by the opponent. Hence, only a good level of motor and functional abilities provides an appropriate physical condition of soccer players who effectively act in conditions of high psychophysical load during the entire period of 90 minutes of the match. Lately the functional training adapted for a specific sport is becoming increasingly popular for such preparation of soccer players. Functional training is the opposite of a classical training with devices in the gym. There are no devices in a real functional training. The props that are being used for the training include Russian kettlebells, medical balls, gymnastics hoops, ropes, elastic straps, tires, etc. Functional training also encompasses a great range of exercises that are performed only with the weight of one's own body. Functional training programmed for soccer players is considered to be the most complete way of training, because they work on all important motor characteristics: power, fitness, explosiveness, speed, and endurance. It can be said that the most useful one was taken from all sports and it is completed in a very diverse concept. In all exercises, the idea is to include as many muscle groups as possible at the same time. Functional training is a powerful weapon that, with a good combination of exercises, activates all muscles

in the body, specifically because of the combination of exercises that activate all muscles in the body, including minimum rests. This way of training is very exhausting, physically and mentally. The entire training can last from 30 to 60 minutes, and this is more than sufficient time to spend the power reserves because this method exhausts all three energy compositions (2 anaerobic and 1 aerobic).

Within the concept of a soccer game, the specially programmed functional training contains the key situational activities during the match which include anaerobic type of work, with a large number of sprints, aggressive and powerful duels of explosive character.

The general aim of the present research is to establish quantitative transforming changes of the tests of assessing basic motoric abilities and vertical jump performances under the influence of specially designed functional training with top football players playing on different positions in the team.

Materials and Methods

Subjects

The research was carried out on a sample of 50 soccer players between 17 and 30 years of age, who play in the Football Club "Sileks" from Kratovo. The sample was also classified according to the positions of the soccer players: goalkeepers (n = 5), defenders (n = 15), midfielders (n = 15) and strikers (n = 15). Before the start of the measurement in accordance with the Helsinki Declaration, the respondents were informed about the research objectives and the possible risks of injuries. The participation in the research was interrupted if some of the respondents reported certain health problems.

Motoric tests

In order to assess motoric abilities, the following tests were applied: 10-meter running (TRC_10), squat jump (SJ), counter movement jump (CMJ), counter movement jump with arm awing (CMJA), jumps for 15 seconds (SJ_15_SEK), lifting the body (STOMA), deep bend from sitting position (FLEKS), push-ups (SKLEK).

Experimental training program of functional training for soccer players

The experimental program was applied within a period of six working weeks, with four trainings per week. The trainings were applied with a circular method of work, and the respondents were placed in stations, divided into groups, each of two players.

During the first two weeks, three rounds were performed at each station, with a duration of 20 seconds per station, and a break between the stations of 90 seconds. The following exercises were carried out at the stations: single leg balance on a balance panel, and with the other leg – soccer ball strike with the inner side of the foot passed by a team mate with a hand at a distance of 2-3 meters; repetitive lifting with arms of TRX straps from a semi-supine position (back); rope jumps; alternating stepping with the left and the right leg forward, under the load of an elastic strap, placed around the hips with a length of 3 meters; repetitive lifting with arms of TRX straps from a semi-supine inclined position (biceps); TRX hamstring curls; overturning a tractor tire with a weight of 70 kg from a kneeling position (quadriceps); push-ups with elevated legs while holding a big exercise ball; navy rope - movement of the rope alternately with both hands upwards, downwards and in the shape of an eighth; box jumps with a height of 30-60 cm.

During the third and the fourth week, three rounds were made at each station, with a duration of 30 seconds, and a break between the stations of 90 seconds. The following exercises were carried out at the stations: lifting a Russian kettlebell of 10 kg, from a standing position with two hands in front of the head; skip in place under the pressure of an elastic rope with a length of 5 meters; lifting a Russian kettlebell of 8 kg, from a base above the head with one hand; repetition of a push-up and then a high jump under load with an elastic strap; striking a medicine ball of 10 kg with two hands from the base; bands on a hanging bar; lifting the legs attached to a TRX strip from the position of a push-up towards the chest; kicking a tractor tire with a 12 kg hammer; towing in a sprint of a sledge with a weight of 40 kg at a distance of 30 meters; alternative stepping forward with the right and the left leg and twist to the left and right with a medicine ball of 10 kg in a hand.

During the fifth and the sixth week, three rounds were performed at each station, with a duration of 40 seconds per station, and a break of 90 seconds between the stations. The following exercises were carried out at the stations: kneeling with a kettle bell of 10 kg; bench jump with a height of 80 cm and with a vest of 20 kg, twist with a medicine ball of 10 kg in a sitting position with half-twisted legs; push-up hold with the legs leaned on an exercise ball, alternate pulling of the knees towards the chest and backwards; sprint at 5 meters with touching a cone in different directions under the load of a 5-meter long elastic strap; jumps with two legs over obstacles with a height of 80 cm; wall bars folds; side strike from a wall of a medicine ball with a weight of 10 kg; pulling an elastic rope backwards with an alternate stepping with the left and the right leg; push-up hold of an exercise ball, knee

to chest stretch, inward twist and rotation of the hips and side leg stretch.

Statistical Analyses

After a test for the normality of distribution, data were expressed as the mean ±SD. Univariate differences in the analyzed variables between the initial and final measurements were tested by T-tests for small dependent samples.
Partialization of the results in the final measurement was completed through the univariate analysis of co-variance (ANCOVA), according to the model of applying co-variances. In order to establish what subsamples, differ mutually statistically significant, LSD Post Hoc test was also applied in the variables where statistically significant difference exists. All data was analyzed using the Statistical Package for the Social Sciences (SPSS) (SPSS Inc., Chicago, IL, USA, version 22.0).

Results

In order to establish the changes in the motoric tests of assessing basic motoric abilities and vertical jump, after the applied six-week training treatment univariate level of testing was applied (T-test of dependent samples). The results of T-test about the tested groups of respondents are presented in Table 1.
The results in Table 1 show that statistically significant differences between the initial and final measurement with the whole sample of respondents are established in the following motoric tests: TRC_10, SJ, CMJ, CMJA, FLEKS and SKLEK. In order to establish if the groups differ, the analysis of co-variance was applied in the final measurement. Table 2 presents the analysis of the co-variance in the final measurement of the motoric tests with the three groups of respondents (football players playing in the defense, middle field and attack.

Table 1. Differences in basic motoric abilities and vertical jump with football players between the initial and final measurement

	Initial		Final		r	%	t	df	Sig
	Mean	SD	Mean	SD					
TRC_10	1.64	0.08	1.19	0.07	0.21	-27.4	26.88	33.00	0.000
SJ	36.05	5.20	42.60	7.00	0.80	18.2	-8.87	31.00	0.000
CMJ	34.91	4.92	38.05	6.31	0.83	8.99	-4.38	23.00	0.000
CMJA	38.67	7.10	45.86	6.32	0.28	18.59	-3.76	17.00	0.002
SJ_15s	48.83	24.78	49.68	8.53	0.54	1.74	-0.23	31.00	0.824
FLEKS	25.13	6.55	26.25	7.05	0.96	4.46	-3.07	31.00	0.004
SKLEK	50.18	13.46	56.41	13.67	0.79	12.42	-4.10	33.00	0.000
STOMA	33.53	3.65	39.59	5.83	0.36	18.07	-6.24	33.00	0.000

Table 2. Univariate differences in variables of assessing the motoric abilities between the three groups of respondents playing in different positions in the final measurement

	Defensive		Midfields		Attackers		F	Sig.
	Mean	SD	Mean	SD	Mean	SD		
TRC_10	1.22	0.04	1.23	0.06	1.12	0.02	25.28	.000
SJ	38.91	5.22	39.04	5.47	50.78	4.17	23.10	.000
CMJ	36.70	7.08	33.73	4.77	43.08	2.25	6.77	.004
CMJA	43.48	5.95	46.80	4.40	54.20	0.00	3.68	.047
SJ_15_SEK	47.16	8.60	50.98	6.36	57.05	7.70	5.53	.008
FLEKS	27.36	7.00	25.88	8.97	25.00	3.46	0.39	.678
SKLEK	55.13	14.15	56.17	13.68	56.83	12.35	0.06	.945

Analyzing Table 2 reveals that there are statistically significant differences in 5 out of 7 motoric tests. Differences between the groups are established in the following motoric tests: TRC_10 (F=25,28; P=,000), TRC_20(F=48,81; p=,000), SJ (F=23,10; p=000), CMJ (F=6,77, p=,004), CMJA (F= 3,68;p=,047) и SJ_15_SEK (F= 5,53; p=,008).

Discussion

Recent researches suggest that the motoric abilities can be influential in selecting athletes in many sports (Hasan et al., 2007). To be successful in a given sports discipline, it is very important for the athlete to have the suitable morphologic-functional profile (Ziv and Lidor, 2009). In modern football trends are more and more focused on improving performances of all players playing in all positions, which is aimed to provide greater movement of both attack players and those in defense.
Selection and recruitment of talented players is important in sports that require high performances. Therefore, in selecting talented athletes, it is necessary to make use of objective criteria, norms and standards based on the anthropometric, motoric and physiological indexes. There should be also provided proper instructions based on the individual differences in growth and development on the level of functional and motoric abilities (Orhan et al., 2013).
Within the present research, the explosive power of legs was assessed by applying the tests Squat Jump – SJ, Counter Movement Jump – CMJ and Counter movement Jump with Arm Swing – CMJA. The research results suggest that the six-week experimental training program of functional training had a positive impact in improving the average results of the three tests. Basing on the numerical values of arithmetic means and percentage differences, it can be concluded that during the period of six weeks the whole sample of respondents demonstrated an improvement with test Squat Jump of 18,20%, with test Counter Movement Jump – an improvement of 8,99% and with

test Countermovement Jump with Arm Swing – an improvement of 18,5%. Football players playing in the attack position achieved in the final measurement significantly better results with the three motoric tests of assessing the vertical jump (SJ, CMJ and CMJA) in comparison with the players in midfield and defense positions. As for the comparison between the players in midfield and defense positions, statistically significant differences were not established in the motoric tests. Analysis of Table 1 presents that the whole sample of Macedonian football players, who were treated during the research, achieved lower results in test Countermovement jump as in comparison with top adult players.

Within the research of Sporiš et al. (2009), the established fact is that players playing in the defense have the highest level of explosive abilities as compared to those in all other players in the field. In another research, Lago-Peñas, Lago-Ballesteros and Rey (2011) establish that with young football players aged 15,63±1,82 goalkeepers and central defenders achieve best results in vertical jumps. Boone, Vaeyens, Steyaert, Vanden Bossche and Bourgois (2012) established that with the adult players from six teams of the Belgium Pro League it is the goalkeepers and central defense players who achieve best results in the vertical jumps as compared to the group of defence players, connection players and attack players, which is compatible with the results of the research of Lago-Peñas et al. (2011). Haugen et al. (2012) have measured Norway players, covering both senior and junior National Teams within the period of 1995-2010 years, and established that with the vertical jump the group of players in the midfield position achieved lower results compared to the rest groups divided according to their positions in the team, and it corresponds with the results of the present research. Wisløff, Helgerud and Hoff (1998) established that the players of top leagues had higher level of explosive abilities in the group of defense and attack players rather than those in the midfield position (connection players). Mujika, Santisteban, Impellizzeri and Castagna (2009) did not establish differences in the height of the vertical jump between senior and top football players. Wong and Wong (2009) established that Asian young players achieve lower results in vertical jumps as compared to European and African players. When it comes to the requirements of the game, the high level of explosive abilities proves to be an advantage in the individual duels in the air and additionally in running, which is also established in the researches of Wisløff et al. (2004), where a significant correlation is established between the fast running in 10 and 30 meters and the vertical jumps with top football players of international rang. The ability of acceleration within short distances is a very important characteristic of the football player. It is said that 96% of the sprints during a game are within less than 30 meters, 49% of which are within less than 10 m (Valker et al., 1993). Basing on this published data, the tests of sprint in 5, 10, 20 and 30 m are usually used for assessing the sprint abilities of a player (Kolad and Kweid, 1993; Stradwick et al., 2002; Hals et al, 2005). The protocols of sprint tests include starts on the spot and "flying" starts (Doson, 2003). Svenson and Drast (2005) point that the "flying" start is more realistic and valid, since most of the sprints in football are preceded by walking, smooth running or wide pacing. The research results suggest that the six-week experimental training program of a functional training had a positive influence in improving the speed in 10-meter running. Basing on the numerical values of the arithmetic means and percentage differences, it can be concluded that within the period of six week there was an improvement of 27,4 % in the test. The football players in the attack position achieve better results in the motoric test of 10-meter running (they are faster) in comparison with the players in defense and midfield position. Statistically significant differences in the motoric test 10-meter running are not established between the players in the midfield and defensive positions.

Ferro et al. (2014) examined kinematic variables that identify the quality of speed with football players participating in contests of different competitive levels and positions they take. The research results showed that the attackers were the fastest, then follow the central players of connection, the side players of connection and the central defensive players. Opposite to the results of the mentioned research, the study conducted by Pivovarniček et al. (2013) with the Slovakia football national team under the age of 21 years established that the players in the midfield (players of connection) achieved best time in sprinting abilities. Taşkin (2008) came to similar results that did not show significant differences between the groups of players divided according to the position in the game, and perform in professional football clubs in Turkey.

In addition, Rapinini and collaborators (2007) did not establish significant differences between the group of defensive players, connection players, attackers and the goalkeeper with the professional and amateur football players in the speed of 30-meter running. Nevertheless, in comparing results with other studies one needs to be very careful, since there are many differences in the design and methodology of researches.

Flexibility is a characteristic that provides free amplitude of movement in the joint. Though more than one factor influences the joint flexibility, one of most important is the elasticity of muscles surrounding the joint. Playing football does not require extremely developed flexibility of no joint in human body. It is

more important in football to have optimally developed flexy of the heap joint, knees, feet and the lower part of the spine. Insufficiently developed flexibility of mentioned joints in legs disables the optimum in performing fast movements, such as sprints, kicks on the ball and changing direction of movements. Researches show that the football players with less developed flexibility of the front and back side of the thigh more often suffer injuries of those muscles in comparison with the players of optimal flexibility development of muscles in that part. It is also established that additional training for flexibility during the preparational and competing period reduces the risk of injuries. On the other hand, excessive flexy in some joints (the foot for instance) can result in insufficient stability of the joint, which increases the risk of injuries during the training process and in a competition.

Within a period of six weeks, the whole sample of respondents made a significant improvement of flexibility with 4.46%. The research results show that no statistically significant differences are presented in the final measurement between the players playing in different positions.

The function of the torso is very important, since it is considered a "platform" that needs to be stable. Torso is the most significant part of the athlete's body. It includes the center of body weight and is responsible for the control of the whole power produced by the upper and lower extremities. If it is stable, it provides control over the inner and extern powers that have impact on athletes, and it provides correct explosive movement. In contacts with the rival competitor, it is the activity of the torso that matters. Having this in mind, in order to improve the coordination of the upper and lower body parts as well as the movement of the athlete, the torso needs to be stabilized and trained. Trainings are often held in a wrong way without taking into account the real function of the torso. Exercises of that kind can overstep dysfunction and flow into the space of pain. In general, exercises as flexy and extension, with the connection of the upper and lower segments, are not satisfactory (Defranco and Smith, 2011). Abdominal muscles are primary designed to stabilize and prevent from a movement.

During the period of six weeks, the whole sample of respondents made an improvement in the power of abdominal power of 18,07 %, whereas the strength of the hands and shoulders – of 12,42 %. The research results show that statistically significant differences are not established in the final measurement between the players in playing in different positions with the tests of lifting the body and push-ups.

In spite of the presented limitations, the research can be an inspiration for conditional and sports trainers in football teams to find and eliminate the faults in their players, especially during the condition training in the preparatory period and individual training in accordance with the results obtained through the diagnostic within the whole annual training cycle. Trainers must have a good knowledge of general and specific tasks that the player is to perform in the game. It is strictly recommended about the football game to be selected for particular positions players whose morpho functional characteristics are as much as possible compatible with the requirements of that particular game position. The presented data can serve also as some norms and standards for top football players from the point of view of researching the movement abilities.

Conclusions

Basing on the obtained results, it can be concluded that the six-week experimental training program of functional training had a positive impact on improving the average results of the three tests. On the ground of the numerical values of arithmetic means and percentage differences, it can be established that during the period of six weeks an improvement of the whole sample of respondents was registered in the following tests: TRC_10 of 27,4%, SJ of 18,2%, CMJ of 8,99%, CMJA of 18,59%, FLEKS of 4,46%, SKLEK of 12,42% and STOMA of 18,07%.

The research results are valuable material not only for scientists, but also for trainers, experts, as well as football analytics. Having in mind that football is one of the most popular sports in the world, in selecting talented players there should be used tests of assessing physiologic and motoric performances along with the anthropometric and somatotype researches, growth and development of the players must be observed.

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