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The Effects of Core Trainings on Speed and Agility Skills of Soccer Players**

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Abstract The aim of this study was to examine the effects of core trainings on speed and agility skills of soccer players. 20 subjects in experimental group (age = 23,17 ± 1,86 years, weight = 72,11 ± 3,75kg, height = 174,7 ± 5,04 cm) and 20 subjects in control group (age = 22,03 ± 0, 50 years, body weight = 73,11 ± 6,12 kg, height = 176,7 ± 7,04 cm), summing up 40 amateur licensed soccer players were voluntarily participated in this study. In the study, the speed skills of subjects and control groups were measured by the 30-meter Sprint Test (30mST) and the agility skills were measured by the Illinois Agility Test (IAL) and the T-Drill Agility Test (TDAT). The soccer players in the control group and experimental groups took the pre-test before trainings and post-tests after trainings as speed and agility tests, twice for 8 weeks. After taking the first plot tests, both groups continued their normal training program for 4 days a week for 8 weeks. The subjects in experimental group also took 30 minutes tertian core training program after warm up exercises on 2 training days of the week and then continued the normal training program with the control group in other training days. The paired sample t test analysis was performed between the pre-test and post-test values obtained from the speed and agility tests of the experimental and control groups, and the results were interpreted at a significance level of 0.05. There was no significant difference between the pre-test values of the speed and agility tests of the experimental and control group (p> 0,05). Although the speed and agility post-test scores of the control group showed an improvement compared to the pre-test scores, no significant difference was found between them (p> 0.05). It was found that there was significant differences between the 30mST pre-test (4,53 ± 0,33 sec) and the post-test values (4.44 ± 0,11 sec) (t=0,102; p=0,044), IAL pre-test (16,34±1,15 sec) and the post-test values (14,89±2,84 sec) (t=0,172; p=0,000), TDAT pre-test (9,51±0,17 sec) and the post-test scores (8,11±1,20 sec) of the experimental group (t=0,136; p=0,000). Previous studies have shown that core training has positive effects on the strength development of athletes. According to the results of this study, core trainings which were applied additionally to soccer trainings can contribute positively to the development of players' speed and agility skills.

Keywords Soccer player, Core training, 30 m. sprint, Illinois agility, T-drill agility

1. Introduction

Soccer is a high level performance sport where all bio motor skills are affected that require aerobic and anaerobic strength and that includes physical performance such as “agility, speed, strength and power” [16, 23]. Soccer is also a branch of sport where there are; fast strength, sprints, jumps, tackles and locomotor movements.

Agility is identified as changing direction rapidly in performance sports. In other words, it can be identified as body changing position as a reaction to stimulating phenomenon [41, 51].

Speed is an important performance component in soccer as it is in many branches of sport [33]. It is thought that; acceleration, maximal speed and agility features have common specifications such morphological and biochemical determinants as muscle fibril type [23, 33] that is related to speed and agility at a great extent.

Core training has positive effects on developing power and condition [16, 22, 25]. Many researchers found that core training has positive effects on sportive performance [11, 35, 37, 45].

Core area is composed of muscle groups that require cooperation of upper and lower extremities by supporting each other. Core training on the other hand is the combination of movements to support development of major and minor muscle groups.

Speed and agility among conditions and features of soccer players play a significant role in determining sportive performance. In order to improve these skills, it is thought that specific activities should be put into practice.

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In order for players to conduct the combined movements (with / without opponent, with / without ball) in optimal levels, it is necessary to develop their speed and agility performances. Thus, this study is important for the reason that it is applied for a period of 8 weeks in core training to improve speed and agility performances of the players.

2. Research Methodology

20 players of experimental group (age=23,17±1,86 years of age; body weight=72,11±3,75kg; height=174,7±5,04 cm) and 20 players of control group (age=22,03±0,50 years of age; body weight =73,11±6,12 kg; height =176,7±7,04 cm); totally, 40 voluntary amateur soccer players participated in the study. Speed and skills of both experimental and control group are tested by 30 metres Sprint Test (30m ST) where their agility skills are tested by Illinois Agility Test (IAT) and T-Drill Agility Test (TDÇT). Prior to the 8 weeks training of both experimental and control groups, pre-tests and post-tests are applied twice. Upon application of first tests, both groups resumed their programmed regular trainings for 8 weeks 4 days a week. However, experimental group is applied additional 30 minutes tertian core training after warm up for 2 days a week. Upon this, they resumed their regular training with control group.

3. Application and Means of Measurement

Before pre-test measurement of both groups, groups are informed about the tests. Pre-test measurements are conducted at the same day and hours. Experimental group is informed about 8 week core training programme. Upon the completion of 8 week training, post-test measurement regarding both groups is received and the data is uploaded into the computer.

30 Metres Speed Tests: Players run on 30 m determined area with high sprint and maximal speed for 20 m. The duration run is recorder by chronometer in terms of seconds. The participants repeated the test twice and the most appropriate result is recorded [52].

Illinois Agility Test: 5 m wide, 10 m long test track is prepared by placing 3 cones with 3.3 m distance among them on a straight line. Test is composed of; 40 m straight part with 180 º turns in each 10 meters and; 20 m slalom run between the cones. After the test track is made ready, two door photocell electronic chronometers with 0.01 sec precision are placed in start and finish of the track. Before the test, the subjects are given information about track and they are let to make 3-4 trials in law speed. Afterwards, the subjects are let to make 5-6 min warm-up and stretch exercises in the speed they determine. Subjects start their sprint head down almost lying and hands on shoulder position and touching at the ground. Their track completion will be recorded in seconds. The test is repeated twice by applying complete resting and best score is recorded [13].

T-Drill Agility Test: In order to prepare the track, 4 cones are place on the track. When the participant is given the start command, the participant starts from cone “A” and runs until cone “B” by flat racing and touches at the cone with right hand. Then the participant runs to cone “C” by slide step and touches it with left hand. Afterwards the participant runs from there to cone “D” by side step and touches it with right hand. Then, the participant runs to cone “B“ by side step and touch it with left hand and the chronometer is immediately stopped as soon as the participant reaches at cone “A”. The test is repeated maximum three times by applying complete resting and best score is recorded [20].

Training Program: In this study, related literature is investigated and core training suitable for training group is prepared [2, 1]. 8 week program is prepared by including 10 core area improving action, duration and repetition. Training program is applied for a period of 30 minutes in two days additionally to the weekly program. Core exercises chosen for training program are arranged from easy to difficult and distributed to the weeks by applying fluctuating method. Details of core training are shown in Table 1. Control group on the other hand attended aerobic-anaerobic resistance and main strength training which is included in annual training program in 90-105 minutes for 4 days a week. They conducted all necessary soccer trainings for they were in match season.

Table 1. 8-Week Core Area Training Program

Action	1.-3. Week	4.-6. Week	7.-8. Week
	Action/ Repetition	Action/ Repetition	Action/ Repetition
Jump Squat	***20 sec x 3 repetition***	***35 sec x 3***	***40 sec x 3 repetition***
Alternate Legs Jump	*20 repetition*	*25 repetition*	*25 repetition*
Squat	***25** repetition*	***35** repetition*	***25** repetition*
Chunch	*30 repetition*	*35 repetition*	*30 repetition*
Lying Twist Trunk	***25 sec x 2 repetition***	***30 sec x 2 repetition***	***25 sec x 3 repetition***
Lunge	*30 sec x 3 repetition*	*35 sec x 3 repetition*	*30 sec x 3 repetition*
Side Plank	***30 sec x 2 repetition***	***40 sec x 2 repetition***	***35 sec x 3 repetition***
Burpee	*30 sec x 2 repetition*	*40 sec x 3 repetition*	*35 sec x 3 repetition*
Mountain Climber	***30 sec x 2 repetition***	***40 sec x 2 repetition***	***35 sec x 2 repetition***
Twist With Medicine Ball	*30 sec x 3 repetition*	*45 sec x 2 repetition*	*30 sec x 3 repetition*

4. Research Analysis

Data obtained in the study is uploaded to computer. First of all, pre-test values of both control and experimental

groups are taken into consideration and compared. Handling the data, descriptive statistics methods such as Average (X) and Standard Deviation (SD) are used. Upon the completion of 8 week training program, differences among and between the pre-test / post-test values of both experimental and control group are studied. For pre-test / post-test values analysis, Paired-Samples t-test is used. The findings obtained displayed 5% (0.05) significance with 95% confidence interval.

5. Findings

Age, height, weight, 30 m sprint, agility and speed measurement analyses about both experimental and control groups before and after the 8 week core training is listed in tables.

In control group, age 22,03±0,50 years, height 176,7±7,04 cm and body weight 73,11±6,12 kg is found between these values whereas experimental group's age 23,17±1,86 years, height 174,7±5,04 cm and body weight 72,11±3,75 kg is found between these values (Table 2).

In both experimental and control group participated in the study, taking values of; 30m sprint test (4,56±0,61; 4,53±0,33 sec respectively), Illinois agility test (16,65 ± 1,03; 16,34 ± 1,15 sec respectively) and T-drill agility test (9,74 ± 0,98; 9,51 ± 0,17 sec respectively) into consideration, no significant (p>0,05) difference is found between the results (Table 3).

In control group participated in the study of 8 weeks core training, taking pre-test and post-test values of; 30m sprint test (4,56±0,61; 4,51±0,11 sec respectively), Illinois agility test (16,65 ± 1,03; 15,89 ± 2,84 sec respectively) and T-drill agility test (9,74 ± 0,98; 9,02± 1,63 sec respectively) into consideration, no significant (p>0,05) difference is found between the pre-test and post-test averages (Table 4).

In experimental group participated in the study of 8 weeks core training, taking pre-test and post-test values of; 30m sprint test (4,53±0,33; 4,44±0,11 sec; p<0,05 respectively), Illinois agility test (16,34 ± 1,15; 14,89 ± 2,84 sec; p<0,01 respectively) and T-drill agility test (9,51 ± 0,17; 8,11±1,20 sec; p<0,01 respectively) into consideration, significant difference is found between the pre-test and post-test averages (Table 5).

Table 2. Demographic features of Experimental and Control groups

Variables	Experimental Group (n=20) X±Sd	Control Group (n=20) X±Sd
Age (years)	23,17±1,86	22,03±0,50
Weight (kg)	72,11±3,75	73,11±6,12
Height (cm)	174,7±5,04	176,7±7,04

Table 3. Pre-test comparison analysis of experimental and control group

Variables	Control Group Pre-test X±Sd	Experimental Group Pre-test X±Sd	t	df	p
30 m Sprint Test (sec)	4,56±0,61	4,53±0,33	,507	38	,588
Illinois Agility Test (sec)	16,65±1,03	16,34±1,15	,954	38	,707
T-Drill Agility Test (sec)	9,74±0,98	9,51±0,17	,452	38	,454

Table 4. Pre-test and post-test comparison analysis of control group

Variables	Control Group Pre-test X±Sd	Control Group Post-test X±Sd	t	df	p
30 m Sprint Test (sec)	4,56±0,61	4,51±0,11	,382	19	,435
Illinois Agility Test (sec)	16,65±1,03	15,89±2,84	,253	19	,127
T-Drill Agility Test (sec)	9,74±0,98	9,02±1,63	,431	19	,102

Table 5. Pre-test and post-test comparison analysis of experimental group

Variables	Experimental Group Pre-test X±Sd	Experimental Group Post-test X±Sd	t	df	p
30 m Sprint Test (sec)	4,53±0,33	4,44±0,11	,102	19	,044*
Illinois Agility Test (sec)	16,34±1,15	14,89±2,84	,172	19	,000**
T-Drill Agility Test (sec)	9,51±0,17	8,11±1,20	,136	19	,000**

6. Discussion

In the recent years, researches have been made on effects of "core" trainings applied by athletes on aerobic and anaerobic capacity, some physiologic features, strength, speed, agility and development of some motoric features as explosive power [1, 2, 32, 46, 12, 24, 14, 34, 30, 9, 48]. In some of these studies, it is reported that core strength trainings contributed to development of aerobic and anaerobic performance. In both team sports and individual sports, core trainings are reported to develop sportive performance. [1, 2, 4, 44, 37, 6, 43, 8, 17, 3, 27, 21, 19, 38, 5, 34].

Spasic et al. [42] divided research groups into two as forward players and defensive players. Results of; T Drill agility test in defensive players is found 8,18±0,62 sec where the same is found 8,33±0,69 sec in forward players. The same test is applied by Şentürk [39] and results of T Drill agility test is found to be 8,89±,059 sec. Özdemir [26] conducted a study on 14-16 years old players and pre-test and post-test results are found to be 11,07±,046 and 10,39 sec respectively. Seth [40] conducted a study on 32 sportsman and T Drill agility test pre-test and post-test results of experimental group is found to be 9,63 sec and 9,19 sec where the same is found in control group as 9,51 sec and 9,53 sec respectively. In the end of our 8 week core training study, T Drill agility results are reported to be; pre-test:9,51 ± 0,17 sec and post-test: 8,11±1,20 sec. Taking training status and age factor of experimental group into consideration, the results found in this study are higher than the average found in the literature chosen for this study.

Imai et al. [15] conducted a study on player using core training and result of 30 m sprint test was; pre-test 4,73±0,18 and post-test 4,49±0,14. Doğan et al. [10] conducted a study on 8 week core training and result of 20 m sprint test was; pre-test 3,00±0,19 and post-test 2,80±0,14. Boyacı [7] conducted a study of 12 week core training on young soccer players and result of 20 m sprint test was; pre-test 3,45±0,33 and post-test 3,41±0,09. Wisloff et al., [49], conducted a study on elite players and result of 30 m sprint test was; pre-test 4.0±0.2 and post-test 3,89±0,21. Prieske et al. [42] conducted a study of 9 weeks core training on young soccer players and result of 20 m sprint test reported was 3% improvement. When the results of related literature are taken into consideration, it is found out that core trainings improve 20-30 m sprint performance in all age groups. 30 m sprint test pre-test and post-test results of players participated in our 8 week core training study are reported to be 4,53±0,33 sec and 4,44±0,11 sec respectively.

7. Conclusions

As a result, soccer players apply many training methods to obtain their aerobic and non-aerobic requirements. It is found that improved strength affects both agility and speed positively. In this 8 week core training study applied, it is found out that agility and speed performance of players is improved positively. In season preparation period or weeks so close to matches, it can be necessary to start speed and agility trainings after maximal strength trainings for the strength improvement of players. It is thought that; core trainings specially prepared for the specifications of the team in this period may improve physical performance of the players positively.

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