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THE EFFECTS OF THE GAME FORM TRAİNİNG METHOD (7V7 MATCH) ON STRENGTH PARAMETERS OF SOCCER PLAYERS

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Abstract: *The aim of this study is to determine the effects of the game form training method on strength parameters of soccer players. Fourteen male soccer players were used as subjects. The players studying in the Physical Education and Sports College at Selcuk University were 18-26 years old. The average age of them was 22.56 ± 1.29 years and the average height of the subjects was 1.80 ± 0.07 cm.*
Trainings have been performed for 8 weeks and three days a week (Monday-Wednesday-Friday) and each of them lasted for 30 minutes in the olympic soccer field ground of BESYO (Physical Education and Sport Collage). Subjects were allowed to play football match 30 minutes with 7x7 game form training method between two goal post. The subjects were tested in pre and post training season. The following parameters were tested and measured; height and weight, percent body fat, hand grip strength, leg strength, back strength and vertical jump. The differences between pre and post training were calculated with "t" test at the 0.05 confidence level. There were significant differences at the 0.05 confidence level between pre and post training in body weight, percent body fat, relative hand grip strength, leg and relative leg strength, relative back strength, anaerobic and relative anaerobic power, 30m sprint and vertical jump (P<0.05). There were no significant differences at the 0.05 confidence level between pre and post training in hand grip strength and back strength (P>0.05). As a result, it could be concluded that the applied game formation training had positive effects on strength parameters of soccer players.

Keywords: *Soccer, Game Form Method, Strength.*

1. Introduction

Soccer is the most popular sport in the world, neuroperformed by men and women, children and adults with different levels of expertise. As with other sports, soccer is not a science but science may help improve performance [2]. Technical and tactical

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skills in soccer are highly dependent on the player's physical capacity. More than 90% of a game is performed by aerobic metabolism and the average intensity is around the anaerobic lactate threshold (80–90% of maximal heart rate [2,18]. Soccer performance depends upon many factors pertaining to technical, tactical, physical, physiological and mental areas [16]. Usually, during an 11-on-11 soccer match, top level field players cover a distance of about 10–12 km, and goalkeepers cover about 4 km [32]. Sprinting constitutes 1%–11% of the total distance covered during a match, corresponding to 0.5%–3.0% of the effective play time. Additionally, each player performs 1000–1400 short activities, which change every 4–6 seconds. Activities performed are: 10–20 sprints; high-intensity running approximately every 70 seconds; about 15 tackles; 10 headings; 50 involvements with the ball; about 30 passes and many other movements to maintain balance and control of the ball against defensive pressure [13,32]. Professional Soccer players perform approximately 50 turns during a game, sustaining forceful contractions to maintain balance and control of the ball against defensive pressure [39].

Most of these activities are power activities, with critical energy requirements to the alactacid anaerobic system. During a 90-minute soccer match, Professional soccer players make numerous explosive bursts, such as kicking, tackling, jumping, turning, sprinting, and changing pace [3]. Strength and power together with endurance are important in terms of basic physiological capacities in soccer play. Maximal strength is one basic quality that influences power output. An increase in maximal strength is usually connected with an improvement in relative strength and therefore with improvement of power abilities. A significant relationship has been observed between one-repetition maximum and acceleration and movement velocity [8]. Speed strength, also known as power, is crucial for performance in sports inwhich changes in direction, acceleration, and jumps are important [28]. Soccer players, as well as many other athletes on the field and the court, execute multiple sprints during the course of a match [27]. Hence, strength and power in leg muscles are important for soccer players. By increasing the available force of muscular contractions in the appropriate muscle groups, acceleration and speed in skills critical to soccer, such as turning, sprinting and changing pace, may be improved [4]. Increasing the force of the lower limb muscles may help improve acceleration and speed, and thus have positive effects on skills which are critical in soccer, such as turning, sprinting and accelerating [2, 32].

Strength training has been adopted in almost all sports that require high acceleration as part of performance [37]. It is well acknowledged that maximal anaerobic power of the lower limbs can be measured by assessing jumping ability, a technical capacity which can also be considered crucial for soccer performance. Vertical jump is a complex movement that greatly depends on limbs coordination, muscle fibre type, musculotendinous stiffness and maximal strength, and is related to the athlete performance [23].

To our knowledge, in current scientific literature, anaerobic strength data are only available for 11 on 11 soccer players, whereas no data are avalable for 7 on 7 players. There fore, the aim of this study was to evaluate the strength capacity in soccer player with the game form training application.

2. Materials and Methods

2.1. Participants

Fourteen adolescent team soccer players of average (SD) age of 22.56± 1.29 years,

height 1.80± 0.07 cm, body mass 68.64 ± 5.25 kg years of training volunteered to be subjects for the study. Fourteen non-professional male soccer players who are the student of physical education and sport collage at Selcuk University volunteered to participate in this study. None of the subjects reported any health or muscular problem, nor was recently injured.

2.2. Testing

Participants were tested pre and post the 8 week training period. Before testing participants performed a 5-minute warm up protocol consisting of submaximal running, active stretching, and jump activities. This warm- up was chosen because of its positive effects on power production [40].

2.3. Weight and Height Measurement

Weight was measured to the nearest 0.1 kg in light indoor clothing using a digital scale (Angel mark). Height was measured using a wall-mounted stadiometer to the nearest 0.1cm. BMI was calculated as weight (kg) / height m [15,25].

2.4. Body Fat Measurement

Four skinfolds (biceps, triceps, subscapular and supra-iliac) were measured on the right side of the body. All measurements were standardized and carried out according to the Anthropometric Standardization Reference Manual [15]. Skinfold measurement was made to the nearest 1mm using skinfold caliper (Takei Mark). The logarithm of the sum of the four skinfolds was used in age and gender specific equations to obtain the body density from which percentage body fat was calculated using Siri's Formula [12].

2.5. Hand Strength Measurement

Grip strengths were measured using a standard adjustable handle dynamometer at standing position with shoulder adducted and neutrally rotated and elbow in full extension. Results were recorded as kilograms. For standardisation, the dynamometer was set at the second or third handle position of which the participant claims to be more suitable [19]. All measurements were performed for dominant hands. Subjects performed three maximum attempts for each measurement and the average value of these trials was recorded.

2.6. Back Strength

For testing back strength, use a back dynamometer. Stand upright on the base of the dynamometer with your feet shoulder-width apart, your arms straight, and your fingers extended downward as far as possible on the fronts of your thighs. The bar is then attached to the chain so that it is 1 to 2 inches below your fingertips. Then bend forward slightly and grasp the bar. The correct position to life is with your back bent forward slightly at the hips and keeping your legs straight. Your head should be held upright, and you should look straight ahead. Lift steadily, keeping legs straight and feet flat on the base of the dynamometer. At the completion of the test, your back should be almost straight. If it is perfectly straight, the test should be repeated with the bar slightly lower.

2.7. Leg Strength Measurement

The bar should be held in the center, with both hands together and with the palms facing toward the body. It should be at a level where the thighs and trunk meet. Your back must be kept straight as you pull as hard as possible on the chain and try to straighten your legs. Maximum

performance will result when your legs are almost straight at the end of the lift. This will usually occur if the bar is attached to the dynamometer when the knees are bent at about 120 degrees.

2.8. Vertical Jumping Measurement

Subjects performed a specific warm-up consisting of 3 to 5 submaximal series of horizontal jumps while alternating between the right and left legs. To begin the measure, we instructed each subject to stand next to a Vertec vertical jump tester .The vertical jump was performed from a fixed semi squat position with the hands free followed arm swing using a force platform. Each player performed three jumps with two minutes of rest in between, and the best jump was selected for analysis.

2.9. 30 m Sprint Measurement

This test allows the assessment of sprinting ability. After 10-15 minutes warm-up the player waits for the signal at the starting point. On the signal, he runs at maximum speed. When he reaches the finish point, the time between the starting and finish lines is measured with photocell or chronometer in terms of seconds.

2.10. Training Programme

Training method was undertaken three times a week for eight weeks on the Selcuk University Physical Education and Sport High Scholl Olympic Soccer Field. 7 on 7 players from 2 teams were played a soccer match duration of 30 minutes. Goalkeepers were included in the investigation. The participants were played like a soccer match organized with an official rules throughout the training sessions. Additionally, no particular training was given to the soccer players during the season.

Training Programme

Warmup period:		Warming (20 min.)
Base period	:	7v7 match (30 min.)
Finish period	:	Streching (10 min.)

2.11. Statistical Analysis

SPSS 13.0 statistical program was used for evaluation and calculation of the data. We summarized the data and evaluated the means and standard errors. To explain differences between measurements, paired t-test was used. P values equal to or less than 0.05 were accepted as significant ($p<0.05$).

3. Results

At the pre-test and post-test measurement following results were obtained:

66.91±0.61 / 65.07±0.60 kg/kg body weight, 19.74±0.67 / 17.35±0.69 % body fat, 47.79±1.40 / 47.94±1.41 kg handgrip strength, 0.71±0.01 / 0.72±0.01 kg (Rlt) handgrip strength, 106.78±1.84 / 120.10±1.80 kg leg strength, 1.59±0.01 / 1.81±0.03 kg rlt leg strength, 105.02±1.65 / 106.24±1.51 kg back strength, 1.56±0.01 / 1.60±0.03 kg Rlt back strength, 559.35±16.30 / 605.27±13.30 (W) anaerobic power, 8.37±0.27 / 9.17±0.23 w/kg Rlt anaerobic power, 4.35±0.03 / 4.12±0.04 seconds 30 m sprint time, 49.97±1.43 / 51.14±1.40 cm vertical jump (Table 1). According to these results, there is a significant decreasing at the body weigth and percent body fat ($P<0.05$, Table 1). At the other hand there is a significant increasing on the Rlt handgrip strength, leg strength and its rlt value, Rlt back strength, anaerobic power and its rlt value, 30 m sprint time, vertical jump ($P<0.05$, Table 1). In addition there is no significant difference on the hand grip strength and back strength values ($P > 0.05$, Table 1).

Data comparison for subjects pre and post test results (mean ± SE) Table 1

Parameters	**Pre-test**	**Post-test**	***P*- value**
Body weight (kg)	66,91 ± 0,61[a]	65,07 ± 0,60[b]	0,007
Percent body fat (%)	19,74 ± 0,67[a]	17,35 ± 0,69[b]	0,001
Handgrip strength (kg)	47,79 ± 1,40	47,94 ± 1,41	0,071
Relative handgrip strength (kg)	0,71 ± 0,01[b]	0,72 ± 0,01[a]	0,002
Leg strength (kg)	106,78 ± 1,84[b]	120,10 ± 1,80[a]	0,001
Relative leg strength (kg)	1,59 ± 0,01[b]	1,81 ± 0,03[a]	0,001
Back strength (kg)	105,02 ± 1,65	106,24 ± 1,51	0,064
Relative back strength (kg)	1,56 ± 0,01[b]	1,60 ± 0,03[a]	0,002
Anaerobic power (W)	559,35 ± 16,30[b]	605,27 ± 13,30[a]	0,001
Relative anaerobic power (W/kg)	8,37 ± 0,27[b]	9,17 ± 0,23[a]	0,001
30 m.sprint (sec)	4,35 ± 0,03[a]	4,12 ± 0,04[b]	0,001
Vertical jump (cm)	49,97 ± 1,43[b]	51,14 ± 1,40[a]	0,003

[a, b] There was a significant difference between pre-test and post-test values. ($P < 0.05$)

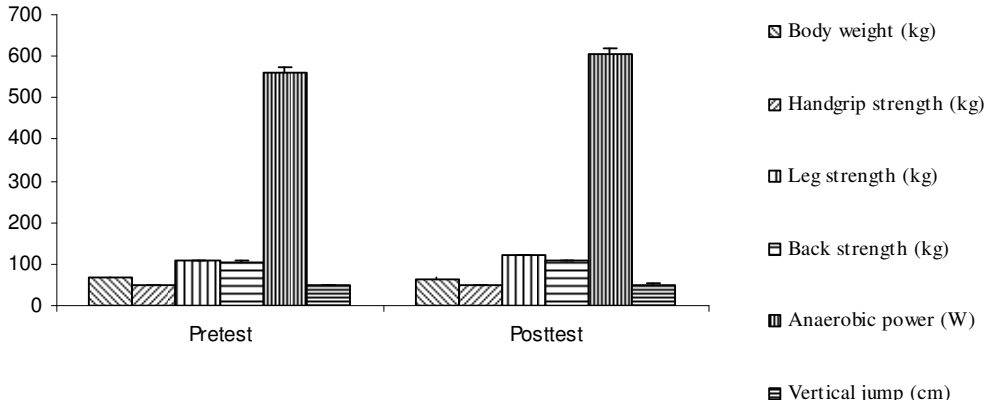

Figure 1. *Differences between pre-test and post-test of body weight, handgrip strength, leg strength, back strength, anaerobic power, vertical jump capacity of male soccer players during the training period by type of soccer played: 7-on-7 male soccer players. Values are mean and SE*

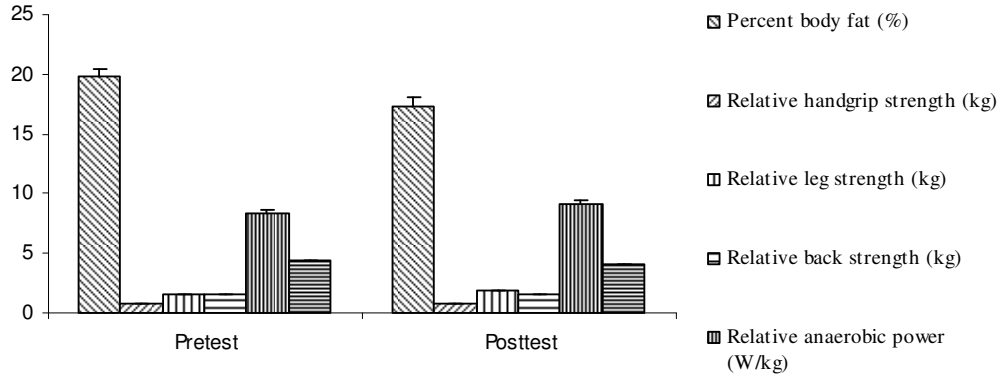

Figure 2. *Differences between pre-test and post-test of percent body fat, relative values of handgrip strength, leg strength, back strength, anaerobic power and 30 m sprint times of soccer players during the training period, by type of soccer played: 7-on-7 male soccer players. Values are mean and SE*

4. Discussion

In this study, the effects of the game form methods with the soccer players body weight, fat percentage, grip strength, power relative strength, leg strength, relative leg strength, back strength, back relative strength, anaerobic power, anaerobic power relative, 30m sprint and vertical jump parameters are studied. The existence of very few literature related to the effect of the game form (7v7 game) training methods on the force parameters have impelled us to do this study. One of the key issues for athletes is the body fat to carry without affecting their performances and the fat which exists at more percentages in the body is harmful in terms of performance. A significant decrease is obtained with the body weights and fat percentages values of the subjects being affected from the game form training in this study. Kalapotharakos et al., [21] has pointed out that the body weight averages (between 61-73kg) of the professional soccer players playing in Brazil and Greece are about the same to each other. Similarly, it is also very important for us that Bloomfield et al., [6] and Mohr et al., [26] have indicated that the Italian players; Bloomfield et al., [6] has reported that the German players; and Krustrup et al. [24] has shown that the Danish players are of the similar average body weight (61-73kg) in terms of proving the similarities in our study. Baltaci et al [1] has determined a significant decrease with the values between the body weights of the control and experimental groups in a study they have carried out on 29 male college students who are taken in 3-month training. That Sotiropoulos et al [31] has reported that the sedentary life of the professional soccer players during a 4-week transition period causes a significant increase with the body weight and fat percentage indirectly supports the findings we have obtained in this study. Johnson [20] has determined a 6% decrease in the body fat percentage with the two days per week aerobic training group and 11% with the three days per week training group.

Despite showing similarities to the aforementioned studies, the decrease with

the body fat percentage strengthens the argument that fat metabolism can effectively be used as energy with the long-term aerobic exercises in our study. Claw force is important in evaluation the normal motor functions and measuring the general health. In this context, it also can be an indicator of the overall force [14]. Claw force Parameter of 7v7 has not significantly affected from the game form training in the study. While Vianna et al [36] has determined the paw force value of male soccer players to be 47.1 kg, Kartal and Günay [22] support our study when they have not indicated a significant difference in the same parameters with the pre-and post preparatory periods of the soccer players. Not monitoring a significant increase in paw force may result from the use of the sub-extremities more effectively in soccer. Although there is not a significant increase in paw forces, the reason for the significant increase with the relative grip force may result from a decrease in the percentage of body fat. Maximal leg strength is an important factor for jumping in soccer, hitting the ball in the head, taking quick action and changing direction [3, 10, 28]. Furthermore, while stabilizing a task in preventing of an injury, it undertakes an effective role in the application of an accurate and quick technique. The values of the leg strength and relative leg strength of the subjects have increased significantly in 8-week game form training. This increase can be described with the view of Rampinini et al. [30] "the specific training peculiar to soccer develops the physical features such as force beside the technical features". Similarly, Biçer, [5] has determined the pretest value of the amateur soccer players to be 112.39 ±14.5 kg and the posttest value to be 124.25±14.2 kg and found a significant increase between the two measuring. This significant increase we have achieved with the leg forces in our study can be explained by the development intramuscular coordination and maximal force which causes muscle hypertrophy following the movements such as sprinting, jumping, dribbling, smashing and bilateral struggling which are applied during the 7v7 game form training peculiar to soccer for 8-week long. The back force values of the subjects were not affected significantly from the game for trainings. Biçer [5] has determined the back force pretest average of the amateur players to be 90.14±15.9 kg and while the average posttest average value to be as 99.42±15.3 kg. Although this finding differs from our findings we have obtained, it may result from the method and period of training the players have done. Moreover, the use of lower extremities more effectively in soccer may not increase the strength in the back. Soccer is a sport where the aerobic and anaerobic energy systems are commonly used. However, when considering the game activities within the anaerobic energy system, the anaerobic energy system is more effective. Acting from this, anaerobic power and capacity is inevitable for the high performance of the soccer players [33]. The anaerobic power and relative anaerobic power value of the soccer players have significantly proved an increase together with the 7v7 game form trainings. While Brewer and Davis [7] have determined the anaerobic power to be average 638 W for the professional players and 637 W for the semi-professional players in their study, Davis et al [11] has reported this values to be 684 W in a similar study. This significant increase in anaerobic power values may result from increases in muscle strength. One of the most important properties determining the winning of the matches in soccer is of the sprint performance [10] and this increase in performance is associated with the level and rate of development of maximal force [17,34,38]. Chamari et al. [9] has reported

the 30m sprint time of the amateur soccer players to be 4.38±0.18 sec. Similarly, Kotzamanidis et al. [23] has determined the 30m sprint time of the soccer players to be 4.19±0.14 sec; and Cometti et al. [10] has determined the 30m sprint time of French amateur soccer players to be 4.24±0.14 sec. The sprint time that we have achieved in our study with the mentioned studies is important in terms of showing similarities.

The significant increase in sprint performance can be said to originate from neuromuscular system's producing more power with the maximal leg force as indicated by Hoff et al. [17]. It is pointed out that the vertical jump feature may be associated with the development of the maximal leg strength [38]. Vertical jump distance has proved to increase significantly being affected from the 7v7 game form trainings in the study we have carried out. Cometti et al. [10] has determined the vertical jump average to be 39.71±5.17 cm with the French amateur soccer players; and Chamari et al. [9] has determined the vertical jump average to be 51.3±6.7 cm with the young amateur players. While Victor et al. [35] has observed a significant increase in the vertical jumping distance of the soccer players at the end of 12-week training, Patlar et al [29]'s determining a significant increase of the soccer players doing game form training for 6-week period shows a similarity to our study. The movements such as sprint training, jumping, changing direction and dribbling that the soccer players often apply during the game form trainings may develop vertical jumping distance providing the intra-muscular coordination and maximal power increasing. Consequently, it can be concluded that 7v7 game form training method which is applied for 8 weeks and 3 days a week is of a significant effect on the parameters of the players' body weight, fat percentage, relative grip strength, relative strength back, leg strength, relative leg strength, anaerobic power, sprint and vertical jump, but not demonstrated the same significant effect with the back parameters. Acting from this, it might be possible to develop the basic attributes as well as the technical and tactical features especially allowing for 7v7 game form trainings in soccer.

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