African Educational Research Journal
Special Issue 8(1), pp. 102-110, August 2020
DOI: 10.30918/AERJ.8S1.20.016
ISSN: 2354-2160
Full Length Research Paper

The effect of functional football trainings on body composition and some physiological characteristics of female football players

Mehmet Söyler[1]* and İdris Kayantaş[2]

[1]Yapraklı Vocational High School, Çankırı Karatekin University, Çankırı, Turkey.
[2]Physical Education and Sports Academy, Bingöl University, Turkey.

ABSTRACT

The aim of this study is to evaluate the body composition, physical and physiological parameters of the functional (cross fit, HIIT) exercises applied at the beginning of the preparatory season and at the end of the preparatory season, and to determine the physical and physiological parameters that occur in female footballers during the preparatory season. The average age of the study was 22.25 ± 3.8 years, average height; 166.36 ± 8.14 cm and a weight average 2018-2019 season in Turkey with 54.44 ± 3.24 kg Football Federation Women 1st league's elite players and 20 female volunteers participated in the play. Statistical analysis of the data obtained as a result of the measurements was made using the SPSS 25.00 for Windows package program. Arithmetic means, standard deviations, and differences between the averages of the data obtained after the measurements were found. In order to compare the data obtained after the measurements of the subjects participating in the study with each other and to determine the significance levels of the differences between the averages, they were analyzed at the level of 0.05 significance using “Paired Samples T Test”. As a result, in the light of the data obtained, it was determined that there were statistically significant differences in many parameters that were generally measured, except BMI values. It is believed that functional training, which is one of the determinants of performance, is due to the effect of female footballers on body composition and some physical parameters, and it is important to pay attention to functional training in regularly planned and created training contents.

Keywords: Elite female football players, physical, physiological, functional training.

*Corresponding author. E-mail: mehmetsoyler@karatekin.edu.tr.

INTRODUCTION

When football is evaluated in terms of physiological and psychological requirements it has a complex structure and there are many factors that affect the outcome of the game. Ideally, a player should be able to maintain a high level of intensity during the match. At the same time, it is imperative to maintain its ideal performance throughout the season and this depends on many factors. For this reason, besides technical and tactical training, it is important to develop features such as strength, aerobic and anaerobic power, speed, flexibility, coordination and skill with football-specific training.

Today, the game of football has traditionally been under the control of male players, and even aggressive behaviors have been shown to the participating women, with little encouragement. Despite this, football has become increasingly popular among women worldwide. For example: In England, women have been playing football since the early 1900s. Currently, 11,000 players are officially registered and have 200 teams. The most talented fight in 24 teams is; in the newly formed National League (Tamer et al., 1995). Women's football has a very short history in our country. In this short time, it is observed that our female football players, despite being within a certain stage, did not reach the expected performance level in the international arena.

In order to keep pace with the development of women's football in Turkey it is important first of a number of different research done. Within the scope of the researches, many issues such as the determination of the psychological, morphological and functional

characteristics of the athlete, the knowledge and experience of the trainers and the importance of the development in the technical field should be taken into consideration.

In this study, functional training (CrossFit) of female footballers during the preparatory season of the female football players in 2 different periods of the 2018-2019 season Women 1st league, Adana İdman Yurdu Sports Club women's football team, in the preparatory season and at the end of the preparatory season (total 10 weeks) and (HIIT) method and its loadings to determine the physical and physiological changes that occurred. It is thought that determining the physical and physiological characteristics of female football players participating in the study by applying functional training with this research is important in terms of being a sample for new researches and will contribute to the future of women's football. In addition, it is thought that the necessary importance should be given to high intensity, HIIT training activities in the training contents of the functional training programs that are planned and created regularly in female football players.

MATERIALS AND METHODS

Research group and working design

Turkey Football Federation's subject group in the study consisted of Women 1st League in the 2018-2019 season playing; 20 volunteers of Adana İdman Yurdu Sports Club elite football players. The measurements of the athletes were carried out at the beginning of the preparatory period and at the end of the preparatory period, and were carried out to determine the effect of functional football training on the body composition and some physiological features of female footballers. In the research, pretest-posttest method, which is an experimental method, was used (Baumgartner and Hensley, 2006). Prior to the studies, a health consent form was obtained from the participants that there was no health impediment in their participation in the study. During the research, physical and physiological test measurements were made to the subjects in 2 applications, before the 10-week preparation period and the end of the preparatory season. Before the study, all football players were informed about the content of the study and the tests to be performed.

The tests were conducted to female athletes in the same time period (08:30-12:00 / 14.00-16.00) and divided into days. The applied performance tests were carried out in the order of tests recommended by the American College of Sports Medicine (ACSM) (Ratamess, 2012).

Tests and training protocol

At the beginning of the preparatory period of female football players, **1st week** performance tests; age, height, weight, body mass index, percentage of body fat, flexibility, pro agility, vertical jump, sprint speed YO-YO IR1, Max VO_2 measurements were taken respectively. **2nd week** maximal power tests; cross fit (back squat, shoulder press, bench press, power clean) values were measured. On the tenth week after the implementation of the functional (flexibility – agility – speed - strength - endurance, CrossFit) training program included in the 8-week preparation training, the 1st day performance tests and the 2nd and 3rd day maximal strength tests were applied in the same way. (Table 1)

Table 1. Tests and training program.

Week -1	Week- 2	Week 2-9	Week-10
Performance tests	Maximal strength tests	Functional training program	1st Day: Performance tests 2nd and 3rd day: Maximal strength tests

Measurements

Health and performance measurement controls of the participants were realized; in the fully equipped training (camping facility) field and fitness center of a professional team in Adana. To the participants, respectively; height, body weight, body composition measurements, physical exercise tests and maximal strength tests were applied.

Body composition measurements

Participants whose height was measured were included in body composition measurement, Body weight (kg) of the participants, Body mass index-BMI (kg/m^2), Body fat Ratio (BFR), bio-electric impedance (BIA) analysis method (Inbody 270 Body Composition Analyzer, model Plus 270). BIA is an analysis method based on lean tissue mass and electrical permeability difference of oil (Lukaski, 2003). Body composition measurements of the subjects were made between 8.30-12:00 in the morning, without liquid and food intake following the evening hunger, and their needs were met. The metal and ornaments on the subjects were removed and the individual to be measured was asked to grasp the hand electrodes by standing in the vertical position by pressing

the aluminum soles of the analysis tool with the bare feet, in a light suit. Data were recorded with the help of a computer connected to the Body Composition Analyzer.

Physiological measurements

Sit and reach test

To measure the flexibility of the muscles; Sit-Reach test bench with length 35 cm, width 45 cm, height 32 cm was used and the test was repeated 3 times and the best result was accepted as the flexibility value (Tamer, 2000).

Pro-agility test

The pro-agility test area, also known as the 20 yard running test, was determined by placing the funnels to the left and right of the start line 5 yards (4.57 m). A photocell door is placed on the starting line. Repeat transition times can be taken in this way. Before the application started, the subject took its place in the starting line and when it was ready; it touched the funnel on the right and then the funnel on the left and ended the test by passing through the starting line (Bayraktar, 2013) (Figure 1). For the pro agility test of the athletes, the Fusion Sport Smart Speed (Australia) with a sensitivity of 0.01 seconds was measured with an integrated system consisting of photocell doors with Digital Atmospheric system.

Vertical jump test (strength)

The athletes jumped upwards on their knees after climbing on the jump meter mat for the vertical jump test. Participants were released to speed up the knees to jump, to collapse and to use time. They attempted to fall into the rectangular plastic area (Mat) on the ground connected to the jump meter after landing on the ground after the jump. The measurements were repeated twice and the best grade was taken into account. Results are recorded as "cm" (Reilly et al., 2000a). Digital splash mat system with Fusion Atmos Smart Speed (Australia) Digital Atmospheric system with 0.01 seconds precision was used in the measurements.

Reaction speed test (30 m speed)

For the reaction speed test of athletes, 30 m speed characteristics 0.01 sec. Sensitive Fusion Sport Smart Speed (Australia) Measured with integrated system consisting of photocell doors with Digital Atmospheric system. It started when the footballers felt themselves ready from the starting line one meter behind the starting photocell. Two measurements were taken at 3-min rest intervals and the best grade was evaluated (Gökhan et al., 2015).

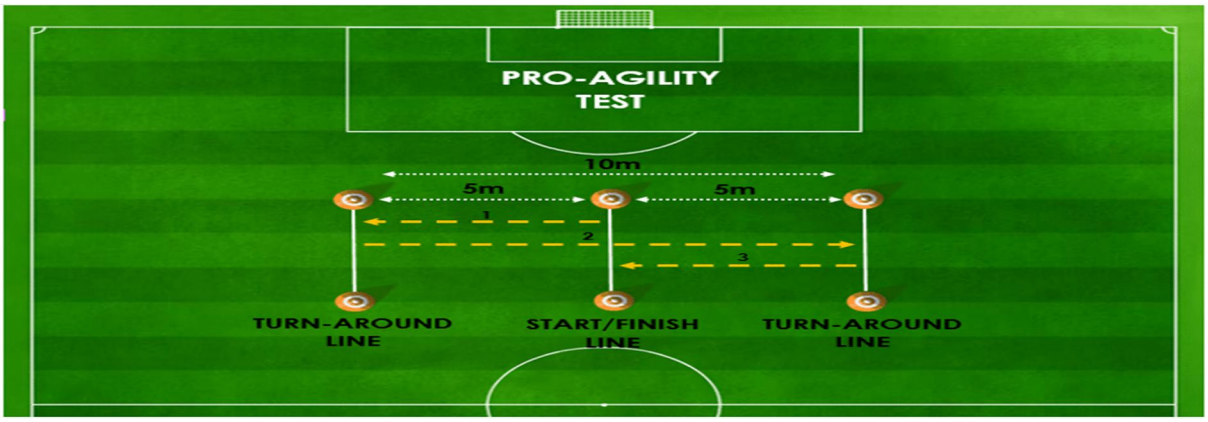

Figure 1. Pro-agility test (Bayraktar, 2013).

Yo-Yo IR 1 test (aerobic durability)

Starting from the starting line, the athletes made their runs according to the speed given by 20 m round trip. A signal is given every 20 m and at the starting point. Participants were given active rest for 10 seconds at every 40 meters they completed and active rest completed the 10 m walking distance. When the participants could not reach the finish line 2 times in a row, the test was completed and the distance traveled was written as a test result. As a result of the distances covered, the estimated oxygen consumption of the athletes is calculated with the formula given below.

In this study, VO_2 max measurement was done by one

method (Bangsbo and Krustrup, 2009). The method is in the field; among the values obtained as a result of Yo-Yo IR1 test application, VO_2 Max in the form of proportioning;

* YO-YO IR1- VO_2 Max proportioning

VO_2 Max from Yo-Yo IR1 results obtained by athletes. They proposed the formula below to calculate their values. Yo-Yo IR1 test: VO_2 Max (ml/min/kg) = IR1 distance (m) × 0.0084 + 36.4

* Yo-Yo IR1 measurement

As YO-YO IR1 test signal transmitter; 1 laptop computer in which the program related to this test is installed and a test setup prepared in the field were used (Bangsbo and Krustrup, 2009).

CrossFit measurements

Maximal strength test procedures

The tests were carried out for 2 days after the anatomical adaptation was exceeded in the 2nd week of the preparatory season. Tests and trainings were carried out with researchers, expert fitness trainers and team coaches. Maximal Force Tests (5RM - 3RM); Made in Diesel (USA) brand fitness equipment. In order to determine the maximum amount of weight that athletes can lift, the maximum weight that was lifted after 5 maximum and 3 maximum trials, respectively, was recorded in kilograms. Vehicles with 5 maximum (5RM) repetitions, respectively; Back Squat (kg), Shoulder Press (kg), Bench Press (kg) and 3 maximum repetitions (3RM) Power Clean (clean and jerk) (kg). These values are recorded in the data processing form (Haff and Triplett, 2016).

Back squat measurement

Back squat movement, effectively the front leg (quadriceps) and back leg muscles (hamstrings); in the secondary plan, it works the waist, back, abdominal muscles and calves. The athletes turned their feet wide with their shoulders wide and their toes about 30 degrees outward, squatting in the squat position, entered under the bar and allowed the bar to sit on the muscles located above the shoulder blades.

Then they lifted the bar and took a deep breath, as if they were sitting on a chair, causing the hip to collapse towards the ground. While descending in the appropriate position, the knees were outward, absolutely not allowed to turn inside and the hip was collapsed to be at least parallel to the knees. As it rises again, it is provided to lift the buttocks upwards. 5 maximum repetition (5RM) weight applications were performed for each athlete and processed to the highest weight data processing form (Haff and Triplett, 2016).

Shoulder press measurement

The shoulder press movement effectively works the middle shoulder muscle, which is facing the outer and anterior part of the body. Dumbbell forms the main carrier muscle group in the shoulder press movement. In this movement, the athletes took the weights (dumbbells) in their hands, brought them to shoulder height from both sides while standing, their hands turned their wrists with their palms facing forward. As they exhaled by taking the starting position (positive), they lifted the weights upward, after a second pause, they slowly lowered to the starting position while breathing. 5 maximum repetition (5RM) weight applications were performed for each athlete and processed to the highest weight data processing form (Haff and Triplett, 2016).

Bench press measurement

Bench press movement, in addition to effectively working the chest, triceps, forearm, forearm muscle groups, also indirectly employs all of the back muscle groups that have to support the body to lift the neck muscles and weight, as well as the leg and hip muscle groups that serve as a bridge support. In this movement, athletes have been positioned in a straight bench tool in accordance with the movement. While holding the bar, correct grip technique was checked by ensuring that they take positions at the shoulder width ratio. The athlete was asked to lower the weight bar up to 4 cm below the collarbone after taking a deep breath and then lift it in the same direction. 5 maximum repetition (5RM) weight applications were performed for each athlete and processed to the highest weight data processing form (Haff and Triplett, 2016).

Power clean

In this movement, the athletes are standing in the standing position on the lifting platform behind the weight-loaded bar; feet open at hip-shoulder width, provided posture. They bent at the hips and knees, grabbed the bar at shoulder distance, and started to move with the hip down, chest outside, the back straight and the central region contracted. They straightened the knees and hips and pulled the weight bar upwards in the upright position throughout the body. When the weight bar crossed the waist area (belt area), the hips and knees quickly fell into a quarter squat position and caught the weight bar in a clean position and continued with the elbows high. Complete accuracy is achieved with the weight bar. 3 maximum repetition (3RM) weight applications were

performed for each athlete and processed to the highest weight data processing form (Haff and Triplett, 2016).

Functional training

The word functional, which means functional, is now widely used in the sports and fitness industry. Especially the concept of "Functional Training" has an important place today. As the name suggests, these workouts have many effects and benefits. Basically, it is a training system that aims to enable our body to gain functionality. The purpose of functional training is to have a certain physical and functional fitness. General concepts as examples of the features that provide this conformity; Concepts such as force, flexibility, mobilization, coordination, cardio-respiratory fitness examples are given as examples. We can say "Functional Training" to trainings that work physically with many parameters and many muscle groups. For example, CrossFit is based on high-intensity functional exercises (Sperlich et al., 2011).

Functional training protocol

In this study, since the end of the pre-tests at the beginning of the season, fitness and resistance training based on functional training was performed 3 days a week (Monday-Wednesday-Friday) for 8 weeks (Table 2). Different adaptations based on the same training are aimed by focusing on CrossFit training programs, which are designed for women athletes in functional training content and applied in many different sports branches. Workouts lasted 3 days a week and 1 hour. (Table 3)

Training load and intensity are increased every week depending on the type of exercise and activity performed. The weight that the athletes can lift weekly is increased by 2 to 2.5 kg throughout the whole team, and the weights that the athletes followed cannot be lifted by 2 to 2.5 kg and continued with the same weight until reaching the maximum weight. Football specific training sessions continued through the team's technical team and the training program prepared by the coaches for the athletes. At the end of 8 weeks, the preparatory season has passed to the final test phase. The final test phase worked on a calendar-based process as described in the test protocol.

Statistical analysis

SPSS 25.00 package program was used in the analysis of the data. The pre and post-test differences were examined with the Paired Simple t-test and the level of significance was determined as $p \leq 0.05$.

Table 2. Sample functional training program.

	Monday	Wednesday	Friday
1st week (%70)	Back Squat 3×5 Shoulder Press 3×5	Power Clean 5×3 Pull-ups 3×max reps	Back Squat 3×5 Bench Press 3×5
2nd week (%75)	Back Squat 3×5 Shoulder Press 3×5	Dead-lift 3×5 Pull-ups 3×max reps	Back Squat 3×5 Bench Press 3×5

Table 3. Sample functional training program.

	Monday	Wednesday	Friday
1st week	Mix Time: Double Under -Box Jump Dumbbell Snatch –Dead-lift Power Clean Hand Stand Push-up - Rep Pistols	Amrap: Amrap 20 min.5 Pullup 10 Pushup- 15 Air Squat 5 Back squat	Tabata: Kettlebellswings Kettle bell push press Kettle bell SDHP Goblet Squat- Burpees
2nd week	Mix Time: Hang Clean to Push Press- Tire Flips Bodyweight Squats- Clapping Push Ups Prowler Push-Leg Raises- Jump Squats	Rowing Annie: 500 m row-50 sit-ups 400 m row-40 sit-ups 300 m row-30 sit-ups 200 m row-20 sit-ups 100 m row-10 sit-ups	“Running Cindy” 20 min: 400 m run- 5 pull-ups 10 pushups- 15 air-squats

FINDINGS

Looking at the age and height length values of the female football players participating in the study, the average age is 22.25 ± 3.8 years and the average height is 166.36 ± 8.14 cm.

When Table 4 is examined, a significant difference was found in the body weight (kg) and BFP (%) values of female footballers at $p < 0.05$ level.

When Table 5 is examined, the flexibility (cm), pro agility (sec), vertical jump (cm), 30 m sprint (sec), Yo-Yo IR1 Shuttle Run (Max. VO_2) values of female footballers; there was a significant difference at $p < 0.05$ level.

When Table 6 is analyzed, there was a significant difference found in the levels of Back Squat, Shoulder Press, Bench Press and Power Clean values of female footballers at $p < 0.05$ level.

Table 4. Descriptive statistics of female players related to weight, BMI, BFP values.

Variances		Average	S.D.	T	p
Weight (kg)	Pre test	60.55	3.21	8.782	0.000*
	Post test	54.33	3.21		
BMI (kg/m^2)	Pre test	22.72	1.26	-3.22	0.751
	Post test	22.78	1.216		
BFP (%)	Pre test	20.51	1.05	10.595	0.000*
	Post test	18.14	1.07		

*$p < 0.05$.

Table 5. Descriptive statistics on flexibility, vertical jumping, 30 m Speed and Yo-Yo IR1 values of female football players.

Variances		X	S.D.	T	p
Flexibility (cm)	Pre test	30.95	2.89	2.308	0.000*
	Post test	31.81	2.687		
Pro. Agility (sec)	Pre test	6.03	0.43	9.285	0.000*
	Post test	5.28	0.21		
Vertical Jump (cm)	Pre test	22.37	3.175	-7.154	0.000*
	Post test	27.07	3.349		
30 m sprint (s)	Pre test	5.99	0.329	12.015	0.000*
	Post test	5.19	0.105		
Yo-Yo IR1(Max VO_2)	Pre test	40.61	1.201	-11.431	0.000*
	Post test	43.95	1.418		

*$p < 0.05$.

Table 6. Descriptive statistics on female footballers' back squat, shoulder press, bench press, power clean values.

Variances		X	S.D.	T	p
Back Squat	Pre test	97.80	7.431	-8.933	0.000*
	Post test	111.40	5.641		
Shoulder Press	Pre test	50.00	8.885	-11.449	0.000*
	Post test	78.25	6.544		

Table 6. Continues.

Bench Press	Pre test Post test	60.00 80.25	5.619 5.954	-9.951	0.000*
Power Clean	Pre test Post test	68.00 79.75	9.233 4.722	-4.480	0.000*

*p < 0.05.

RESULTS AND DISCUSSION

In the study, the effect of functional training practices on the body composition and physical-physiological features of female football players was investigated.

Evaluation of body composition characteristics

According to the results of our study, the average body weight of female footballers was 60.55 kg in the pre-test, while it decreased to 54.33 kg in the post-test and dropped to 18.14% in the post-test ($p < 0.05$). As a result of the training done here, it was determined that the body weights and BFP of the subjects decreased significantly.

Considering the literature, respectively, in a study, body weight is similar to our results in this age group and the results of Topuz (2008) and Arı (2012). Somboonwong et al. (2015) averaged 54.77 ± 3.30 kg body weight of Thai female footballers; McCormack et al. (2014) average body weight between 54.50 and 62.1 kg. In their study, Palmer et al. (2014) found the average body weight of female athletes playing in the United States NCAA 1st place as 54.61 ± 2.16 kg. When the literature is examined, the results of our study are similar to the results found.

According to the results of our study, the BFP average of female footballers decreased from 20.51% in the pretest to 18.14% in the posttest ($p < 0.05$). As a result of the training done here, it was determined that the body fat percentage of the subjects decreased significantly. Colqohoun and Chad (1986) measured the body fat ratio using hydrostatic weighing techniques to his work on 10 Austrian states and international players at the close of the competition season. They found an average of 20.8 ± 4.7% body fat in carvers. Body fat percentage is considered normal between 15 and 20% in women athletes. The distribution of body fat percentage of female footballers in this study is at a level that can be considered normal (Edward et al., 1988). There is a parallel decrease in body fat percentage measurements of athletes Göksu and Yüksek (2003), the results of their research are similar to our study. According to these results, it can be said that athletes have a more suitable body structure for performance.

When the literature is examined, the results of our study are similar to those found. These changes can be interpreted as intense and rich exercise practices, training period and metabolism caused by functional training and the reactive result of the body.

Evaluation of physical – physiological characteristics

While the flexibility of the players was 30.95 cm in the pre-test, it was seen as 31.81 cm in the post-test ($p < 0.05$). As a result of the examination between footballers, there was a significant difference in the flexibility parameter at the level of $p < 0.05$. It has been observed that it contributes to a high degree. Looking at the studies in this field in the literature, Cicioğlu et al. (1998), in their study, stated the flexibility values of the subjects as 31.41 ± 4.2 cm in handball players. Duyul (2005) reported that the training program has a positive effect on the flexibility levels of athletes. Acccording to Atesoglu (1995), the value of flexibility in elite handball players is 30.9 ± 5.6 cm in T.M.O., 31.09 ± 2.7 cm in P.T.T. In Sümerbank, it was found to be 31.4 ± 3.6 cm. Davis et al. (2008) found 8.4% increase in flexibility values in their study of 11-week strength and endurance training in female college football players. In this sense, the results of our study comply with the literature.

Pro-agility of footballers (5-10-15 m) while the mean was 6.03 seconds in the pretest; it decreased positively to 5.28 seconds in post-test and showed a positive increase ($p < 0.05$). As a result of the examination between football players, a significant difference was found in the agility parameter at $p < 0.05$ level. It has been observed that the studies carried out during the training process significantly contributed to the agility values of the subjects. In their research, where Váczi et al. (2013) investigated the effect of six-week different strength training period on different agility test values, when the pre-test and post-test values were examined, it was observed that there was a statistically significant difference compared to before and after the training period (Vaczi et al., 2013). Piper (2009) found pro-agility agility test results statistically significant in his study. Molenaar (2009), in his study in female volleyball players determined that there is a statistically significant difference according to the results of pro-agility test before the season, between the season and after the season. In this sense, the results of our study comply with the literature.

Vertical jump values of football players were 22.37 in the pre-test and 27.07 cm in the last test ($p < 0.05$). As a result of the examination between the footballers, a significant difference was found in the vertical jump parameter at the level of $p < 0.05$. It was observed that the studies carried out during the training process significantly contributed to the vertical jump values of the subjects.

Considering the studies made in this sense in the literature, Martel et al. (2005) found that there was a statistically significant improvement in their work with female volleyball players, Kılınç (2007) with female basketball players and students of the School of Physical Education and Sports (Marte et al., 2005; Kılınç, 2007). Castagna and Castellini (2013) measure the vertical jump values of Italian national football players 30.2 ± 3.5 cm; Göksu and Yüksek (2003) found the vertical jump values of elite female football players as 30.4 ± 6.4 cm. In the study conducted by Shalfawi et al. (2013), it was determined that female footballers who performed strength training for 10 weeks differed in the vertical jump pretest-posttest values and the strength exercises had a positive effect on the vertical jump feature. In this context, it is seen that there are similar results between the results of our study and the literature.

While 30 m sprint values of the players were 5.99 seconds in the pre-test, it was observed that it was 5.19 seconds in the post-test ($p < 0.05$). As a result of the examination among the footballers, a significant difference was found in the sprint parameters at the level of $p < 0.05$. It was observed that the studies conducted during the training process significantly contributed to the sprint values of the subjects.

Considering the studies in this field in the literature; Manson et al. (2014) in their studies examining the physiological characteristics of female footballers; the sprint values of senior players are 5.04 ± 0.34 seconds, the sprint values of the players under 20 years of age are 4.89 ± 0.26 seconds. They determined as. Imamoğlu, Bostancı and Kabadayı (2004) sprint values of 5.15 ± 0.13 sec for female athletes. They found the sprint values (Imamoglu et al., 2004). In a similar study conducted by İnce et al. (2004), they found higher than the mean values between the pretest and posttest data. In this sense, it is seen that the results of our study are similar to the literature.

Yo-Yo IR1 max VO_2 values of the players are 40.61 ml/kg/min in the pretest. In the post-test, 43.94 ml.kg/min was detected ($p < 0.05$). As a result of the examination among the footballers, a significant difference was found in the aerobic endurance parameter at $p < 0.05$ level. It was observed that the studies conducted during the training process significantly contributed to the aerobic endurance values of the subjects. Considering the studies in this field in the literature, Davis and Brever (1993) reported that the average maxVO_2 values in female soccer players were between 47.1 and 57.6 ml.kg/min. In the research of Taskıran and Varol (1995) on female handball players, MaxVO_2 average was 44.3 ± 0.3 ml/kg/min before the season, after season 44.5 ± 0.3 ml/kg/min was determined. In other studies on the subject, MaxVO_2 values are 42.10 and 47.43 ml.kg/min respectively (Thierry-Aguilera, 2000). In this context, the results of our study provide close and similar changes with the literature.

Evaluation of strength characteristics

As a result of the examination between the footballers, a significant difference was found at the level of maximal force at the level of $p < 0.05$. It was observed that the studies conducted during the training process significantly contributed to the maximal strength values of the subjects.

Considering the studies conducted in this field in the literature, Cotterman et al. (2005) determined 34.2 ± 8.3 kg for bench press women and 86.6 ± 13.8 kg for squat women. In a similar study, Cinel et al. found that the bench press was 72 ± 0.7 kg and the shoulder press was 88 ± 0.7 kg after working with reloading method in elite female volleyball players (Cinel et al., 2006). In the study by Wong et al. (2010), the power clean values for the increase in strength are similar to our study. In this sense, the results of this study also provide similar changes with the literature.

As a result, it is considered that functional training, which is one of the determinants of performance, is effective on body composition and some physical parameters of female footballers and that necessary training should be given to functional training activities in regularly planned and created training contents. Besides, the study results are thought to be the basis for the training programs to be prepared for football players in this age group and lower age group.

REFERENCES

Arı Y. (**2012**). The effect of the twelve-week plyometric training program on some physical and physiological parameters of female football players aged 14-16. Gazi University, Master Thesis, Ankara.

Ateşoğlu, U. (**1995**). Evaluation of Physical and Physiological Profiles of Elite Female Handball Players. Gazi University Institute of Health Sciences, Department of Physical Education and Sports Master Thesis, Ankara.

Bangsbo, J., and **Krustrup**, P. (**2009**). Physical demands and training of top-class soccer players. (Eds. Reilly, T. and Korkusuz, F.). In: Science and Football VI, Rout ledge, 318-329.

Baumgartner, T., and **Hensley**, L. (**2006**). Conducting and reading research in health and human performance. Boston, MA: McGraw-Hill. (4th ed.).

Bayraktar I, (**2013**). Relationships between the agility, speed, reaction and vertical jumping abilities of elite boxers. Academic View Journal. ISSN: 1694-528X (35) 1-8.

Castagna, C., and **Castellini**, E. (**2013**). Vertical jump performance in Italian male and female national team soccer players. Journal of Strength and Conditioning Research, 27(4): 1156–1161.

Cicioğlu, İ., Günay, M., and Gökdemir, K. (**1998**). Comparison of physical and physiological profiles of elite female athletes in different branches. Gazi Physical Education and Sports Sciences Journal,

3(4): 9-16.
Cinel, Y., Yenigün Ö., Çolak T., Özbek A., Yenigün N., and Çolak E., (**2006**). Comparison of pyramidal loading method and reloading methods in the selection of training program to be applied for the development of maximal force in volleyball players. Spormeter Journal of Physical Education and Sports Sciences, 4(1): 25-29.
Colqohoun, D., and **Chad**, K. E. (**1986**). Physiological characteristics for Australian female soccer players after competitive season. Australian Journal of Science and Medicine in Sport, 18: 9–12.
Cotterman, M. L., Darby, L. A., and Skelly, W. A. (**2005**). Comparison of muscle force production using the smith machine and free weights bench press and squat exercises. Journal of Strength and Conditioning Research, 19(1): 171.
Davis, J. A., and **Brewer**, J. (**1993**). Applied physiology of female soccer players. Sport Medicine. 16(13): 180-189.
Davis, W. J., Wood, D. T., Andrews, R. G., Elkind, L. M., and Davis, W. B. (**2008**). Concurrent training enhances athletes' strength, muscle endurance, and other measures. The Journal of Strength and Conditioning Research, 22(5): 1487-1502.
Duyul, M. (**2005**). Comparing the effects of handball, volleyball and football university teams on the success of some motoric and anthropometric features. On Dokuz Mayıs University, Master Thesis, Samsun.
Edward, L. F., Bowersr, W., and Foss, M. L. (**1988**). The Physiological Basis of Physical Education and Athletics. Saunders College Publishing. Philadelphia.
Gökhan, İ., Aktaş, Y., and Aysan, A. A. (**2015**). Examining the relationship between leg force and speed of amateur football players. International Journal of Science Culture and Sports, 4(2): 47-54.
Haff, G. G., and **Triplett**, N. T. (**2016**). Essentials of strength training and conditioning. Champaign, IL: Human Kinetics. (4th Ed.).
İnce, G., Zülkadiroğlu, Z., and Budak, D.B., (**2004**). Çukurova University School of Physical Education and Sports Special Talent Examination of Candidates and II. Comparison of Rights Results. Ankara University School of Physical Education and Sports Spormetre Journal, 2(1): 5-10.
Kılınç, F. (**2007**). Investigation of the effectiveness of the combined training program applied based on the versatile performance analysis of Yıldız women's basketball team. Exercise Journal, 2(1).
Lukaski, H. C. (**2003**). Regional bioelectrical impedance analysis: Applications in health and medicine. Acta Diabetologica, 40(1): 196-199.
Manson, S. A., Brughelli, M., and Harris, N. K. (**2014**). Physiological characteristics of international female soccer players. Journal of Strength and Conditioning Research, 8(2): 308-318.
Martel, F. G., Harmer, M. L., Logan, M. J., and Parker, B. C. (**2005**). Aquatic plyometric training increases vertical jump in female volleyball players. Medicine and Science in Sports and Exercise, 37(10): 1814-1819.
McCormack, W. P., Stout, J. R., Wells, A. J., Gonzalez, A. M., Mangine, G. T., Fragala, M. S., and Hoffman, J. R. (**2014**). Predictors of high-intensity running capacity in collegiate women during a soccer game. Journal of Strength and Conditioning Research, 28(4): 964–970.
Molenaar, J. A. (**2009**). A comparison of conditioning levels between off season and competition season for division II women's volleyball. Submitted to Northern Michigan University Inpartial fulfillment of the requirements for the degree of masters of Science. 12-13.
Palmer, T. B., Thompson, B. J., Hawkey, M. J., Conchola, E. C., Adams, B. M., Akehi, K., Thiele, R. M., and Smith, D. B. (**2014**).The influence of athletic status on the passive properties of the muscle-tendon unit and traditional performance measures in division i female soccer players and non-athlete controls. Journal of Strength and Conditioning Research, 28(7): 2026–2034.
Piper, B. (**2009**). The effect of PNF stretching on the agility of high school athletes. California University of Pennsylvania in partial fulfillment of the requirements for the degree of Master of Science.; 18-20.
Ratamess, N. (**2012**). Foundation of strength training and conditioning. (Third edition). United States: American College of Sports Medicine, 451-488.
Reilly, T., Bangsbo, J., and Franks, A. (**2000a**). Anthropometric and physiological predispositions for elite soccer. Journal of Sports Sciences, 18: 669–683.
Shalfawi, S. A. I., Haugen, T., Jakobsen, T. A., Enoksen, E., and Tønnessen, E. (**2013**). The effect of combined resisted agility and repeated sprint training vs. strength training on female elite soccer players. Journal of Strength and Conditioning Research, 27(11): 2966–2972.
Somboonwong, J. Chutimakul, L., and Sanguanrungsirikul, S. (**2015**). Core temperature changes and sprint performance of elite female soccer players after a 15-minute warm-up in a hot humid environment. Journal of Strength and Conditioning Research, 29(1): 262–269.
Sperlich, B., De Marées, M., Koehler, K., Linville, J., Holmberg, H. C., and Master, J. (**2011**). Effects of 5 weeks of high-intensity interval training vs. volume training in 14-year-old soccer players. The Journal of Strength and Conditioning Research, 25(5): 1271-1278.
Tamer, K. (**2000**). Measurement and Evaluation of physical-physiological performance in sports, 2. Printing.
Tamer, K., Günay, M., Tiryaki, G., and Cicioğlu, İ. (**1995**). Physiological Characteristics of Turkish Female Soccer Players, Third World Congress on Science and Football Book of Abstracts Cardiff.
Taşkıran, Y., and **Varol**, R. (**1995**). Comparison of pre-and post-season values of some respiratory and blood parameters in elite female handball players. Ege University, 1: 83-89.
Thierry-Aguilera, R., (**2000**). The Effect of Training of the Maximum Oxygen Consumption (VO2max) and the Physical Conditioning of College Female Soccer Players. PHD Thesis, UMI Number 9969015, USA
Topuz, F. (**2008**). The effect of special pliometric studies on the leg strength development of young volleyball players. Kırıkkale University, Master Thesis, Kırıkkale.
Váczi, M., Tollár, J., Meszler, B., Juhász, I., Karsai, I. (**2013**). Short-term high intensity plyometric training program improves strength, power and agility in male soccer players. Journal of Human Kinetics, 36(1): 17-26
Wong, P. L., Chaouachi, A., Chamari, K., Dellal, A., and Wisloff, U. (**2010**). Effect of preseason concurrent muscular strength and high-intensity interval training in professional soccer players. The Journal of Strength and Conditioning Research, 24(3): 653-660.

Citation: Söyler, M., and Kayantaş, İ. (2020). The effect of functional football trainings on body composition and some physiological characteristics of female football players. African Educational Research Journal, 8(1): S102-S110.