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Abstract It was aimed in our study to research the impact of certain physical parameters on components of motoric features such as speed, strength and flexibility in boys aged 13 to 15 years old playing football through regular exercises of 6-week training program. A training program of 6 weeks that includes motoric feature components were applied on a total of 56 male athletes playing football in a licensed U13-U14-U15 teams of Beylikgücü Sports Football Club in Beylikdüzü county of Istanbul. The trainings continued as 4 days a week and a game in the weekend. The first day the footballers participated in the study, their preliminary test values were taken and following the six-week training program, their last measurements were taken and later these were compared. Descriptive statistics were used in the analysis of the data acquired in the study, and Wilcoxon analysis was used as non-parametric methods in hypothesis tests. The reason why non-parametric tests were preferred was because the variables were determined not to have distributed normally in Kolmogorov Smirnov test conducted to determine whether the dependent variables showed normal distribution. The acquired findings were evaluated in the confidence interval of 95% and at the significance level of 5%. A significant difference (p<0.01) was determined between the calf, back, biceps, femur, subscapularis, triceps, abdomen, suprailliac circumference and fat measurements and right hand grip and left hand grip strength, ten meters (sprint) running, flexibility and sit and lie down measurements of the test subjects before and after the 6-week training program. In spite of this, it was seen that there was no significance difference in vertical jumping, sit-up, push-up and thirty meters (sprint) measurements. As a result, almost a twofold increase was observed in the hand grip strengths of the age group 13 – 15 in comparison to the age groups of 10-12 and 11-13, and while our study shows parallelism with the adolescent age groups in literature, it draws the attention to the twofold increase in the age group of 15.

Keywords: adolescent, football, motoric components


1. Introduction

In football, a sports branch with vast audience and fans, the importance of the talents, physical fitness and biomotoric characteristics is an undeniable truth. In addition, the anthropometric features of the footballers have an important factor in determining their success and failures in the field. Because, football is in a sense “a sports branch, in which aerobic and anaerobic exercises are used together and subsequently, biomotoric factors such as strength, speed, endurance, flexibility, coordination, quickness and balance are intertwined, and at the same time technical and tactical unity is presented”. Especially performance is totally related with the strength, height, body weight, arm, leg and joint mobility and athlete’s level of flexibility [1]. The footballer wants to have a fast, strong, durable and perfect technique in return for his intense training program and the works he did selflessly and in a full-motivated way.

Therefore, the physical, physiological and biomotoric characteristics of the trainings the athlete performs during his trainings must be compatible with the type of sports he does. If these factors are brought together, it is unavoidable to have success as a result of a good organization of these factors [2]. It is seen that, among the biomotoric characteristics in football, endurance, strength and speed comes to the forefront. The main criterion for becoming a good footballer is to use the biomotoric features in the field, during the game, in the most efficient way depending on the position. Naturally, in terms of movement capabilities, the physical and physiological features are important as well. In addition to these, the suitability of the physical condition to the sports branch and having a high physiological capacity are among the important criteria in terms of performance [3]. In that sense, the impacts of technical and coordination trainings to be performed for 6 weeks by the footballers in the age group of 13-15 in Istanbul Beylikgücü Football club on the physical and biomotoric parameters was analyzed.
2. Material and Method

2.1. Sample
The sample of the study is comprised of all the 56 male athletes playing football in licensed U13-U14-U15 team of Beylikdüzü Sports Football Club in Beylikdüzü county of Istanbul.

2.2. Collection of the Data
Anthropometric Measurements of the athletes were taken. These measurements were started in the first week of November 2015 and terminated in the second week of December 2015. The heights of the footballers were measured in bare feet, wearing only shorts by stepping on a scale and standing with their backs against it and from the highest point. Body Weights were measured in bare feet with shorts via BASTER brand scale of 0.1 kg sensitivity in kilograms. Circumference Measurements of the calf, biceps and femur regions were taken 2 times from the right sides of the athletes and recorded as an average value. A bendable, steel tape measure with 7 mm width and a sensitivity degree of 0.1 cm was used for the circumference measurements. The tape measure was encircled around the regions to be measured with “0” end of the tape measure on the left hand and the remaining end on the right hand, and the number on top of the “0” point was recorded in cm. It was ensured that “0” end of the tape measure and the measured number did not come on top of each other but rather next to each other when making measurement. The tape measure was applied on body parts vertically and measure was made without squeezing much [4]. In Subcutaneous Fat Measurements, Holtain brand skinfold caliper that applies 10 g/sq mm pressure on every angle was used in order to determine the fat percentage of the body. The measurements were taken from the right side of the Suprailiac, Subscapula, Biceps, Triceps and Abdominal regions while the athlete was standing erect. In the measurement of skin thickness, subcutaneous fat layer between the thumb and index finger was slightly pulled up to separate it from the muscle tissue. Caliper was placed 1 cm away from the fingers and the thickness of the held skin fold was recorded in mm within 2-3 seconds based on the indicator on the caliper [5] Push-up Test was conducted via TRY-9004 100 Memory Mode brand chronometer by counting 30 seconds. The athletes were ensured to be in a face down position lying on the mat with only their toes touching the ground, hands opened up shoulder-wide and arms and body to be tense with the command “Ready!”! From “Start!” command to “Stop” command, the number of repetitions they could perform in 30 seconds without any breaks was recorded. Sit-up Test was measured through TRY-9004 100 Memory Mode brand chronometer by counting 30 seconds. The athletes got into the position with their back on the mat, and hands open shoulder-wide with arms and body to be tense with the “Ready!” command. The number of repetitions they performed with their feet on the ground and their leg held from “Start!” command until “Stop!” command within 30 seconds without any breaks were recorded at the end of measurement. Ten (10), Thirty (30) meters Sprint Tests were conducted through Tecnequie brand photocell and programmed computer system that acquired the value by exiting (via the program) from 50 cm front sides of the initial photocells and passing through other mid-transition points with photocell in the athlete high output technique in value seconds milliseconds. Following athletes’ first run, whose values were recorded twice, their jock was checked, and the athletes were made to run again after their pulses came back to normal, and this process was applied to all the athletes. For Flexibility Measurement, the athletes were asked to sit down and reach towards the stretching table with their bare feet in a straight position, with their hands before their bodies to reach the farthest place with their fingers back on the ruler that is placed on top of the stretching table. The conducted measurement value was taken. In vertical jumping test, the distance where the athletes can stretch while standing before the wall marked in cm with their legs spread shoulder-wide with their bodies sideways to the wall. Later, each athlete is given 3 trial rights for the same position, and the best of these were taken into consideration. The distance the subjects can reach while standing and the distance they can touch by jumping was found in meters and taken into consideration. [6] In hand gripping strength test, (Takei Scientific) brand hand dynamometer was used for measuring right and left hand gripping strength. While the subjects were standing, they were asked to tightly squeeze the dynamometer without bending the arm and touching the body. The best out of 2 try out for each arm was recorded and taken into consideration [7].

2.3. Analysis of the Data
The information and data acquired as a result of the measurements made within the framework of experiment method, were analyzed by using SPSS (Statistical Package for Social Sciences) for Windows 21.0. Descriptive statistics and hypothesis tests were used in the analysis of the data. In the descriptive statistics and hypothesis test used in the analysis of the data acquired from the study, Wilcoxon analysis was used as non-parametric methods. The reason for preferring non-parametric tests is because it was determined that variables were not distributed normally in Kolmogorow Smirnov test conducted in order to determine whether the dependent variables showed normal distribution depending on the groups. The acquired findings were analyzed at the confidence interval of 95% and a significance level of 5%.

3. Findings

Table 1. Some Personal Information of the Training Group that Participated in the Research

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>Avg.</th>
<th>Ss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>56</td>
<td>13,00</td>
<td>15,00</td>
<td>13,83</td>
<td>.781</td>
</tr>
<tr>
<td>Height</td>
<td>56</td>
<td>144,0</td>
<td>185,0</td>
<td>164,73</td>
<td>9,54</td>
</tr>
<tr>
<td>Weight</td>
<td>56</td>
<td>33,40</td>
<td>77,20</td>
<td>55,125</td>
<td>9,62</td>
</tr>
<tr>
<td>Athlete Age</td>
<td>56</td>
<td>2,00</td>
<td>3,0</td>
<td>2,6</td>
<td>.492</td>
</tr>
</tbody>
</table>

56 footballers aged from 13 to 15 participated in the study. Some of the personal characteristics of the subjects are given in Table 1. In that sense, the average age of the subjects that participated in the study was determined to be 13.83±0.781 years, heights 164,73±9,54 cm and weights 55,12±9,62 kg, and the athletes aged to be 2,60±0.49.
Table 2. Post-test Comparison in Regard to their Circumference and Fat Measurements

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Before</th>
<th>After</th>
<th>N</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg.</td>
<td>Ss</td>
<td>Avg.</td>
<td>Ss</td>
<td></td>
</tr>
<tr>
<td>Calf (Circumference)</td>
<td>34.18</td>
<td>3.83</td>
<td>34.62</td>
<td>3.86</td>
<td>56</td>
</tr>
<tr>
<td>Waist (circumference)</td>
<td>71.76</td>
<td>6.52</td>
<td>71.82</td>
<td>5.92</td>
<td>56</td>
</tr>
<tr>
<td>Biceps (circumference)</td>
<td>24.44</td>
<td>2.57</td>
<td>25.28</td>
<td>2.79</td>
<td>56</td>
</tr>
<tr>
<td>Femur (circumference)</td>
<td>47.41</td>
<td>5.19</td>
<td>47.89</td>
<td>5.28</td>
<td>56</td>
</tr>
<tr>
<td>Subscapular (Fat)</td>
<td>6.21</td>
<td>3.09</td>
<td>6.73</td>
<td>2.86</td>
<td>56</td>
</tr>
<tr>
<td>Triceps (Fat)</td>
<td>6.82</td>
<td>3.21</td>
<td>7.32</td>
<td>3.07</td>
<td>56</td>
</tr>
<tr>
<td>Biceps (Fat)</td>
<td>5.14</td>
<td>2.21</td>
<td>5.75</td>
<td>2.08</td>
<td>56</td>
</tr>
<tr>
<td>Abdomen (Fat)</td>
<td>7.91</td>
<td>3.37</td>
<td>8.25</td>
<td>2.98</td>
<td>56</td>
</tr>
<tr>
<td>Suprailiac (Fat)</td>
<td>7.00</td>
<td>2.87</td>
<td>7.80</td>
<td>2.41</td>
<td>56</td>
</tr>
</tbody>
</table>

The comparison of the test results in regard to the subjects’ circumference and their pretest and post-test results are given in Table 2. As a result of the matched group Wilcoxon test conducted so as to determine whether the calf, biceps, femur circumference measurement of the subjects, subscapular, triceps, biceps, abdomen, suprailiac fat measurement pre-test and post-test averages show any significant difference, the difference between the arithmetic averages were found to be statistically significant (p<0.01). However no significant difference between the pre-test and post-test averages of waist circumference measurement was found (p>0.01).

Table 3. Comparison of pre-test and post-tests in regard to the Subjects’ Performance Tests

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Before</th>
<th>After</th>
<th>N</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg.</td>
<td>Ss</td>
<td>Avg.</td>
<td>Ss</td>
<td></td>
</tr>
<tr>
<td>Vertical Jumping</td>
<td>37.62</td>
<td>10.53</td>
<td>37.96</td>
<td>9.62</td>
<td>56</td>
</tr>
<tr>
<td>Sit-up (Strength)</td>
<td>37.62</td>
<td>4.72</td>
<td>24.83</td>
<td>4.13</td>
<td>56</td>
</tr>
<tr>
<td>Push-up (Strength)</td>
<td>26.25</td>
<td>4.46</td>
<td>26.16</td>
<td>3.80</td>
<td>56</td>
</tr>
<tr>
<td>Right Hand Grip (Strength)</td>
<td>30.20</td>
<td>9.02</td>
<td>30.96</td>
<td>8.93</td>
<td>56</td>
</tr>
<tr>
<td>Left Hand Grip (Strength)</td>
<td>28.74</td>
<td>8.59</td>
<td>29.59</td>
<td>8.78</td>
<td>56</td>
</tr>
<tr>
<td>Ten Meters (Sprint)</td>
<td>2.42</td>
<td>0.371</td>
<td>2.45</td>
<td>0.385</td>
<td>56</td>
</tr>
<tr>
<td>Thirty Meters (Sprint)</td>
<td>4.84</td>
<td>0.356</td>
<td>4.84</td>
<td>0.345</td>
<td>56</td>
</tr>
<tr>
<td>Sit lie down (flexibility)</td>
<td>17.67</td>
<td>8.21</td>
<td>18.82</td>
<td>7.50</td>
<td>56</td>
</tr>
</tbody>
</table>

The results regarding the pre-test post-test comparison regarding the subjects’ performance tests can be viewed in Table 3. As a result of the matched group Wilcoxon test conducted so as to determine whether the pre-test and post-test averages of the vertical jumping, right hand grip (strength), left hand grip (strength), ten meters (sprint), sit lie down (flexibility) measurement of the subjects show any significant difference, the difference between the arithmetic averages were found to be statistically significant (p<0.01). In contrast, no significant difference was found between the pre-test and post-test averages of sit-up, push-up, thirty meters (sprint) measurements.

4. Discussion and Result

4.1. Discussion

Pekel et. al stated that physical and physiological test applied on the children are used in order to evaluate the impacts of the regular physical activity on growth, development and health and to analyze the trainability of the children in adolescence; and they also added that the long term tendencies of the children and their acute reactions towards exercises of various intensities in growth, maturing and physical fitness models of the children can be determined through these tests. Ziyagil et. al, in a study they conducted in order to research on the annual changes of the physiological characteristics of young national wrestling team wrestlers of 16-17 ages; they measured right hand gripping strength values as 34.92 kg in pre-test and 42.46 kg in post-test, left hand gripping strength values as 33.50 kg in pre-test and 43.33 kg in post-test. In a study conducted by Ziyagil et. al on children doing sports, the hand gripping strength of the age group of 10 was determined as 15.20±4.07 kg, age group of 11 as 15.88±1.75 kg. and age group of 12 as 17.00±3.02 kg. The parallel and positive increase of age and strength during adolescence, supports pre-test and post-test measurements of our 6-week long study. [8] In a similar study, Pekel et. al found the right and left hand gripping strength averages of children aged 11 to 13 to be 20.8±6.51 19.9±5.5 kg [9], in a study conducted by Tınazcı et. al on boys aged 11, the right hand gripping strength was found to be 17.90±2.74 kg., left hand gripping strength was found to be 16.61±2.57 kg [10]. In a study conducted by Karacabey et. al on footballers aged 10 - 12, right hand gripping strength was found to be 15.7±2.79 kg., and left hand gripping strength to be 15.29±2.93 kg [11]. Gökdemir et. al, in a study they conducted on a total of 46 young wrestlers in the age group of 12 - 15, they determined the right hand gripping strength as 25.69 kg., and left hand gripping strength as 25.18 kg [12]. As a result of the literature study conducted, it was seen that hand gripping strengths of age groups of
before and after the training; a significant difference was
after the training. Comparing the measurement findings
attention [15].

twofold increase in the age group of 13 -15 attracts the
15. While our study shows parallelism with literatures, the
determined the biceps regions of basketball players as
after the training. Comparing the measurement findings
before and after the training; a significant difference was
determined (p<0.05) [25].

Abdominal regions of basketball players were
determined as 23±12.4mmHg before the training and
18.6±12.4mmHg after the training. Comparing the
measurement findings before and after the training; a
significant difference was determined (p<0.05) [25].

Suprailliac regions of basketball players were
determined as 19±11.4mmHg before the training and
13±9.5 mmHg after the training. Comparing the
measurement findings before and after the training; a
significant difference was determined (p<0.05) [25].

As a result of their study, they determined the right
hand grip of basketball players as 46.1±5.3 kg. before the
training and 45.6±6.2 kg. after the training, which posed a
significant difference (p<0.05). They determined the left
hand grip as 43.8±6.7 kg. before the training and 42.7±6.9.

As a result of their study, they determined the flexibility
measurements of basketball players as 23.8±7.6 cm.
before the training and 25.7±7.6 cm. after the training.
There was a significant difference between flexibility
measurements findings before and after the training
(p<0.05) [25].

As a result of their study, they determined the sit-up
tests of basketball players as 26.2±4.2 total/30sec. before
the training and 29.6±3.8 total/30sec. after the training.
There was a significant difference between sit-up test
findings before and after the training (p<0.05) [25].

As a result of their study, they determined the push-up
tests as 25.9±8.4 total/30sec. before the training and
28.2±6.7 total/30sec. after the training. There was a
significant difference between push-up measurement
findings before and after the training; however, it was not
statistically significant (p<0.05) [25].

As a result of their study, they determined the Ten (10)
m speed tests as 2±0.2 sec. before the training and
1.86±0.2 sec. after the training. They determined the 30 m
speed tests as 4.87±0.6 sec. before the training and
4.45±0.5 sec. after the training. There was a significant
difference between speed test measurement findings
before and after the training (p<0.05) [25].

In their study that was conducted in 2014; Bakırçı and
Kevin and Kılıç investigated the effect of combined trainings applied
during the preparation period upon the performance of
university’s basketball team. As a result of their study,
they determined the biceps regions of basketball players as
8.8±7.3 mmHg. before the training and 6.1±5.8 mmHg.
after the training. Comparing the measurement findings
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4.45±0.5 sec. after the training. There was a significant
difference between speed test measurement findings
before and after the training (p<0.05) [25].

In their study that was conducted with handball players
aged 15-17 in 2014; Ürer and Kılıç compared the test
values of handball players before and after the research
and determined that there was no significant difference in
their 20 m. and 40 m. speed performances [25].

Evaluating the effects of plyometric studies upon some
strength parameters of handball players; significant
developments were observed on certain performances of
handball players (like health, tossing ball, doing push-ups,
sit-ups and pull-ups) at the end of the training program
[25].

While the vertical jumping and anaerobic strength
values of the age group of 11 were found to be higher in
comparison to Katie et. al, Hoffman et. al and Polat and
Saygın, Ziyagil et. al’s age group of 9, no significant
differences were found among other age groups. While no
significant difference was found in vertical jumping,
aerobic and aerobic strength parameters among the age
groups of 11 and 10 and 9 and 9 at the level of p=0.05, a
significant difference was found among the age group of 11
and 9 at the level of p=0.05 and p=0.01[8-16].

The studies show that significant differences can occur
in vertical jumping, anaerobic and aerobic strength values of
the children doing sports in their early adolescent and
adolescent periods, and many study results also support
these findings. It is emphasized that, a period of at least 2
years is required for a regular training in order to improve
the vertical jumping and anaerobic strength values among
the age groups of 9 - 11. While Çoban, in a study he
conducted found pre-test results for vertical jumping as
32,57±4,51 cm. and post-test as 35,71±3,96 cm. [15],
Yörükoğlu and Koz determined the vertical jumping value
during the basketball training held in different frequencies
among the age group of 10 - 13 as 36,01 ± 5,86 cm for
sports club and as 34,26 ± 6,18 for sports school [16].
(Yörükoğlu, Koz, 2007). In our study, the pre-test
37,62±10,53 cm and post-test 37,96±9,62 cm averages
were found at the level of p=0.05 [25].

Walisoff et. al 10 m sprint time 1.82±0.3 sec., 20 m
sprint time 3.0±0.3 sec. and 30 m sprint time 4.0± 0.2 sec
[17].

In a study conducted by Meylan and Malatestia on 14
boys with the age average of 13.3±0.6, they observed that
increase rate of 2.11% and 3.72% respectively occurred in
5 m sprint and 10 m sprint times following the
plyometrics training of 8-weeks. Similarly, in a study
conducted by Rimmer and Sleivert, 26 male athletes were
made plyometrics training of 8 weeks special for their
sprint ability. At the end of the training period, it was
observed that a significant improvement occurred in 10 m
sprint performance (1.96 sec. / 1.91 sec.) [18], and that
Diallo et. al found significant differences in 20, 30 and 40
m sprint values as a result of the trainings applied for 3
days on children aged 10 – 12 [19].

Saçaklı, found 30 m sprint averages of footballers aged
14 to be 4,65 sec [20]. While Loko et. al. state that children
aged 10-17 are faster than the children in the age and type
found in his study [21]. Kien et. al found that middle
school children aged 10 - 12 who participated that
recreation programs were faster than the same age group
that did not participate in the recreational sports activities
[22]. Ziyagil, in a study he conducted, found 20 m sprint
variables as 4.99 ± 0.73 sec., and 20 m sprint variables as
and fat measurements of the subjects and right hand grip subscapularis, triceps, abdomen, suprailiac circumference was found between the calf, waist, biceps, femur, after the trainings were compared.

The values before the start of the trainings and test measurements were taken after the six-week training the first day they participated in the study, and their post-weekends. Pre-test values of the footballers were taken on the 20 m run of the control group was determined to be 2.87 sec before the training and 2.91 sec after the training [23].

Çakıldan et. al in their study called “Profile of the Physical and Physiological Characteristics of Second League Football Team During the Preparation Period Prior to the Season”, found that studies to be conducted on and 10 and 30 m sprint, sprinting with and without ball can have a positive effect on the performance to be shown during the whole season and that the measurements to be made can improve the sprint characteristic at a certain level. This result supports our study [24].

The improvement of basic performance ability is special and methodical. In the process of developing a certain physical performance (strength), other physical performance characteristics (sprint, endurance) are also indirectly affected. This effect can be negative or positive. Therefore, in addition to the development period characteristics of the child, the physical performance characteristic desired to be improved must be well known as well [8].

According to the study results of Pekel et. al, in boys and girls at the age group of 10 - 13 doing sports, positive relationships that generally range from low to high levels between the diameter, circumference and length measurements among the anthropometric features and the speed, power and strength test performances [9].

The competition performance in sports necessitated the physical preparation in order to take the anthropometric measurements and physiological performance levels together with the technical and tactical works to the highest point. As known, the children are in a development and growth period. The physiological systems of these young children within this period are not at a level sufficient enough to meet the burdens necessitated by the intense trainings.

4.2. Result

In this study, conducted on a total of 56 male athletes playing in licensed U13 - U14 - U15 teams of Beylikdüzü Sports Football Club in Beylikdüzü county of Istanbul, a 6-week training program was applied on the footballers. The trainings continued 4 days a week and in the weekends. Pre-test values of the footballers were taken on the first day they participated in the study, and their post-test measurements were taken after the six-week training program. The values before the start of the trainings and after the trainings were compared.

As a result of this comparison, a significant difference was found between the calf, waist, biceps, femur, subscapularis, triceps, abdomen, suprailliac circumference and fat measurements of the subjects and right hand grip and left hand grip strength, ten meter (sprint) runs, flexibility and sit lie down measurement (p<0.01). In contrast, no significant difference was observed in vertical jumping, sit-up, push-up and thirty meter (sprint) measurements.

As a result, almost a twofold increase was observed in the hand grip strengths of the age group 13 – 15 in comparison to the age groups of 10-12 and 11-13, and while our study shows parallelism with the adolescent age groups in literature, it draws the attention to the twofold increase in the age group of 15.

References

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