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# THE EFFECT OF OLYMPIC LIFTS ON THE EXPLOSIVE POWER OF ELITE LEVEL FOOTBALL PLAYERS

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**Abstract:**
**Purpose:** The aim of this study was to investigate the effects of strength and power training on explosive power in elite football players. **Methods:** In this direction, 20 elite players who played football in a football club A team took part in the research. 10 of the participants were experimental group and 10 of them were the control group. In addition to the technical-tactical training, the players in the experimental group received strength and power training with Olympic lifts, and the technical-tactical training was applied to the players in the control group. Anthropometric measurements (age, height, body weight, BMI, percentage of body fat) and motoric field tests (vertical jump test, standing long jump test, 30 m speed test, agility) for the athletes in the experimental and control groups before and after the 6-week study program test). The data were analysed in IBM SPSS 25.0 program. In the analysis of the data obtained from the applied tests, non-parametric tests were applied, Wilcoxon signed rankings test was used for intra-group comparisons and Mann-Whitney U test was used for comparisons between groups. In statistical analysis, the level of significance was determined as $p < 0.05$. **Results:** As a result of the analysis, it was concluded that strength and power training applied to the experimental group had a positive effect on body weight, BMI and body fat percentage values from anthropometric measurements, vertical jump test, 30-meter speed test, and zig-zag agility test values from motoric field tests. There was a statistically significant difference between body weight, BMI, vertical jump test, 30-meter speed test and zig-zag agility test between experimental and control groups. **Conclusions:** According to the findings, it was concluded that the training program was effective in explosive power.

**Keywords:** Olympic lifts, football, explosive power

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## 1. Introduction

Sports are physical activities where games, competitions, and struggles aim to improve physical fitness [1]. The concept of football is a type of sport that is translated as football from the word foot and ball in English. It is a sport played between a ball between two opponents based on the ball entering the opponent's goal with the head or feet kick [2]. Football sport, aerobic and anaerobic performances are used consecutively, speed, power, curvature, elasticity, balance, muscular, cardiorespiratory power, coordination and so on. It is a highly planned game in which factors influence the performance [3].

## 2. Literature Review

The neuromuscular arrangement is defined as an explosive force by regulating the contractile and elastic components and creating a response of the muscle with the stress velocity for the effects [4].

The high explosive force in the sports field is effective on the jump performance [5]. Therefore, it is said that it would be beneficial to include weight training in training planning in order to improve the explosive power phenomenon [6]. Major explosive strength training; strength training (maximal strength training and strength continuity training), plyometric training, circular training, and complex training.

Strength; is the resistance of a muscle to resist resistance through relaxation and tension [7]. Strength training must be integrated with the qualifications of the athlete. The point to be considered in training; the athlete is loaded with appropriate intensity and appropriate resting principle [8]. Maximal force; continuity in force and constitutes the infrastructure of rapid force. Maximal force is the highest force an athlete exerts during a slow-motion or under isometric contraction conditions. The loading intensity, which is generally valid in maximal strength training, varies between 80 and 100 percent or 70 to 100 percent, and the number of repetitions varies between 1 and 10 [3]. Plyometric training includes resistance studies that enable the muscle to produce strong movements by passing to a concentric contraction that will occur in a very short time immediately after an eccentric contraction. It starts with the rapid extension of the muscle (eccentric phase), followed by the rapid shortening (concentric phase) of the same muscle. It occurs when the energy stored in parallel and series elastic components of muscle is released [4].

Complex exercises include concentric strength exercises and speed exercises in parallel with force exercises. It is a quick combination of strength exercises and speed exercises (squat jumps in the continuation of squats, plyometric push-ups in the continuation of the bench press, etc.) on the same day and within the scope of the same training. Weightlifting competitions consist of two movements: pulling and shaking. In the breakout movement, the athlete raises the barbell at one time and holds the elbows above his head without breaking the referee. In the shaking motion, he weighs the weight briefly on his shoulders and then lifts it up.

Weight, especially speed, power, coordination, and mobility, as well as technique, brings success. Even though Olympic weightlifting can be classified as an edge sport, many high-performance athletes such as short distance runners and shot putters use the exercise movements here in their training programs because of their fast strengths. Based on this information, the aim of the study is to investigate the effect of force and power training on explosive power in elite football players with Olympic lifts. Investigation of the effects of this training method on the explosive power of football players is important in terms of contributing to the literature.

## 3. Material and Methods

### 3.1. Subjects

In this study, the effect of strength and power training on explosive power in elite football players with Olympic lifts was investigated. Accordingly, anthropometric measurements (age, height, body weight, BMI, body fat percentage) and motoric field tests (vertical jump test, standing long jump test, 30 m speed test, agility test) were used to measure the explosive power and the final test.

### 3.2. Methodology

In the research, pre-test and post-test control group design was used. In the study, 20 elite players playing football a football club A team took part in the research Participants were selected by random sampling method. Two groups, experimental group and control group, were formed. There were 10 football players in both groups. Random sampling method was used to form the experimental and control groups. The training program was applied for 6 weeks. In the study that will last for 6 weeks, the players in the experimental group received 5 days a week, 1.5 hours of technical-tactical weighted football training, and in addition to this work program, 1 hour of strength and power training was applied 3 days a week.

The control group continued its 1-hour technical-tactical football training 5 days a week. Anthropometric measurements (age, height, body weight, BMI, percentage of body fat) and motoric field tests (vertical jump test, standing long jump test, 30 m speed test, agility test).

The training conducted within the scope of the research was conducted at a private football club training site. The measurements and tests applied to the participants were performed in fitness hall from the same sports club. The data were analyzed in IBM SPSS 25.0 program. Shapiro-Wilk test was used as a descriptive normality test. Descriptive statistics of all variables were calculated. In the analysis of the data obtained from the applied tests, non-parametric tests were applied, Wilcoxon signed rankings test was used for intra-group comparisons and Mann-Whitney U test was used for comparisons between groups. The level of significance was determined as $p < 0.05$ in statistical analysis.

## 4. Results

The data obtained from the measurements and tests performed were analyzed. In the study, when anthropometric measurements of the subjects were compared, a decrease in body weight values of -1,19%, BMI values of -1,16% and body fat percentage values of all subjects (N = 20) were found to be decreased by -1.50%. It was found to be statistically significant ($p < 0.05$, $p < 0.01$). When the anthropometric measurements of the subjects were compared, a decrease of -1.86% in body weight, -1.85% in body weight and -2.81% in body fat percentage values of the experimental group (N = 10) were determined and the change was statistically significant. It was found to be significant ($p < 0.05$, $p < 0.01$). When the anthropometric measurements of the subjects were compared, a decrease of -0.57% in body weight values, -0.54% in body weight values and -0.21% in body fat percentage values of the control group (N = 10) was determined and the change was not statistically significant ($p > 0.05$).

**Table 1:** Descriptive Statistical Analysis of Motoric Field Test Measurements of All Subjects

| Variables | Tests | Experimental Group (N=10) | Control Group (N=10) | All Group (N=20) |
|---|---|---|---|---|
| **Vertical Jump Test (cm)** | Pre Test | 36,61±2,37 | 35,77±2,32 | 36,19±2,32 |
| | Final Test | 37,57±2,39 | 35,46±1,99 | 36,51±2,40 |
| **Anaerobic Power (kg*m/sn)** | Pre Test | 87,85±10,23 | 92,79±6,73 | 90,32±8,80 |
| | Final Test | 87,35±10,03 | 91,90±6,28 | 89,62±8,47 |
| **Long Jump Test (m)** | Pre Test | 2,61±0,19 | 2,60±0,18 | 2,60±0,18 |
| | Final Test | 2,65±0,17 | 2,59±0,18 | 2,62±0,17 |
| **30 m Speed Test (sc.)** | Pre Test | 4,25±0,21 | 4,06±0,11 | 4,16±0,19 |
| | Final Test | 4,02±0,23 | 4,02±0,08 | 4,02±0,17 |
| **Zig Zag Test (sc.)** | Pre Test | 12,91±0,72 | 13,51±1,11 | 13,21±0,96 |
| | Final Test | 12,08±0,63 | 13,21±1,03 | 12,64±1,01 |

When the descriptive statistical findings of the results of the motoric field tests applied to the athletes were examined, the vertical jump test of the subjects (N = 20) was 36.19 ± 2.32 cm for the pre-test average, 36.51 ± 2.40 cm for the post-test, and the experimental group N = 10) vertical jump test pre-test average 36.61 ± 2.37 cm, post-test average 37.57 ± 2.39 cm, the control group (N = 10) vertical jump test pre-test average of 35.77 ± 2, 32 cm and 35.46 ± 1.99 cm in the final test. While vertical jump values were increased in all subjects and the experimental group, there was a decrease in the control group (Table 1).

The pre-test average of the anaerobic power value of the experimental group (N = 10) was 87.85 ± 10.23 kg * m / sec., The post-test average of 87.35 ± 10.03 kg * m / sec, long jump test pre-test average 2.61 ± 0.19 m, final test average 2.65 ± 0.17 m, 30 meters speed test pre-test average of 4.25 ± 0.21 sec, post-test average 4.02 ± 0.23 sec, zig zag agility test pre-test average of 12.91 ± 0.72 sec, post-test average of 12.08 ± 0.63 sec, the control group (N = 10), the anaerobic power value of 92.79 ± 6.73 kg * m / sec, 91.90 ±

6.28 kg * m / sec of the post-test mean, 2.60 ± 0.18 m of the pre-test mean of the long jump test of the control group (N = 10), 2.59 ± of the post-test mean 0.18 m, 30 meters speed test 4.06 ± 0.11 sec of the pre-test, 4.02 ± 0.08 sec of the final test, zig zag agility test 13.51 ± 1.11 sec of the pre-test average test average was 13.21 ± 1.03 sec. A decrease in anaerobic power values was detected in all three groups. All subjects and experimental group showed an increase in long jump values, while a decrease was observed in the control group.

In all three groups, 30-meter speed test values were also decreased. In addition, a decrease in zig-zag agility test values of the three groups was determined (Table 1).

**Table 2:** Comparison of Intra-Group Anthropometric Measurements of All Subjects

| Groups | Tests | Body Weight | | BMI | | Body Fat Percentage | |
|---|---|---|---|---|---|---|---|
| | | ⚜ ± S.S. / % | Sig. (2-tailed) | ⚜± S.S. / % | Sig. (2-tailed) | ⚜± S.S. / % | Sig. (2-tailed) |
| **Experimental Group (N=10)** | **Pre Test** | 65,59±7,05 | **0,005**** | 21,12±1,71 | **0,005**** | 7,83±1,42 | **0,012*** |
| | **Final Test** | 64,37±6,64 | | 20,73±1,65 | | 7,61±1,34 | |
| | **Dif. (%)** | % -1,86 | | % -1,85 | | % -2,81 | |
| **Control Group (N=10)** | **Pre Test** | 70,18±5,41 | 0,052 | 22,16±0,79 | 0,053 | 9,46±0,63 | 0,779 |
| | **Final Test** | 69,78±4,98 | | 22,04±0,83 | | 9,44±0,54 | |
| | **Dif. (%)** | % -0,57 | | % -0,54 | | % -0,21 | |
| **All Groups (N=20)** | **Pre Test** | 67,88±6,55 | **0,000**** | 21,64±1,40 | **0,000**** | 8,65±1,36 | **0,032*** |
| | **Final Test** | 67,07±6,35 | | 21,39±1,44 | | 8,52±1,37 | |
| | **Dif. (%)** | % -1,19 | | % -1,16 | | % -1,50 | |

*p<0.05 (significance level) **p<0.01 (significance level)

In the study, when anthropometric measurements of the subjects were compared, a decrease in body weight values of -1,19%, BMI values of -1,16% and body fat percentage values of all subjects (N = 20) were found to be decreased by -1.50%. It was found to be statistically significant (p <0.05, p <0.01) (Table 2).

When the anthropometric measurements of the subjects were compared, a decrease of -1.86% in body weight, -1.85% in body weight and -2.81% in body fat percentage values of the experimental group (N = 10) were determined and the change was statistically significant. It was found to be significant (p <0.05, p <0.01), the control group (N = 10) -0.57% of body weight values, -0.54% decrease in BMI values and -0.21% decrease in body fat values and the change was not statistically significant (p> 0.05) (Table 2).

**Table 3:** Comparison of Intragroup Motoric Field Test Measurements of All Subjects 1

| Groups | Tests | Vertical Jump Test | | Anaerobic Power | | Long Jump Test | |
|---|---|---|---|---|---|---|---|
| | | ⚜ ± S.S. / % | Sig. (2-tailed) | ⚜± S.S. / % | Sig. (2-tailed) | ⚜± S.S. / % | Sig. (2-tailed) |
| **Experimental Group (N=10)** | **Pre Test** | 36,61±2,37 | **0,017*** | 87,85±10,23 | 0,203 | 2,61±0,19 | 0,092 |
| | **Final Test** | 37,57±2,39 | | 87,35±10,03 | | 2,65±0,17 | |
| | **Dif. (%)** | % 2,62 | | % -0,57 | | % 1,53 | |
| **Control Group** | **Pre Test** | 35,77±2,32 | 0,333 | 92,79±6,73 | 0,114 | 2,60±0,18 | 0,505 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **(N=10)** | **Final Test** | 35,46±1,99 | | 91,90±6,28 | | 2,59±0,18 | |
| | **Dif. (%)** | % -0,87 | | % -0,96 | | % -0,38 | |
| **All Groups (N=20)** | **Pre Test** | 36,19±2,32 | | 90,32±8,80 | | 2,60±0,18 | |
| | **Final Test** | 36,51±2,40 | 0,218 | 89,62±8,47 | **0,044*** | 2,62±0,17 | 0,349 |
| | **Dif. (%)** | % 0,88 | | % -0,78 | | % 0,77 | |

*p<0.05 (significance level) **p<0.01 (significance level)

Comparing the in-group motoric field test measurements of the subjects, an increase of 2.62% in the vertical jump test values of the experimental group (N = 10), a decrease in anaerobic power values of -0.57% and a long-jump test of 1.53% increase was determined. The change in the vertical jump test was found to be statistically significant (p <0.05), and the change in anaerobic power and long jump test values was not statistically significant (p> 0.05). When we look at the control group (N = 10), a decrease in vertical jump test values, -0.87%, -0.96% in anaerobic power values and -0.38% in long jump test values were found and this change was not statistically significant. (p> 0.05) (Table 3).

**Table 4:** Comparison of Intragroup Motoric Field Test Measurements of All Subjects 2

| **Groups** | **Tests** | **30 m Speed** | | **Zig Zag Test** | |
|---|---|---|---|---|---|
| | | **⚜ ± S.S. / %** | **Sig. (2-tailed)** | **⚜± S.S. / %** | **Sig. (2-tailed)** |
| **Experimental Group (N=10)** | **Pre Test** | 4,25±0,21 | | 12,91±0,72 | |
| | **Final Test** | 4,02±0,23 | **0,005**** | 12,08±0,63 | **0,005**** |
| | **Dif. (%)** | % -5,41 | | % -6,43 | |
| **Control Group (N=10)** | **Pre Test** | 4,06±0,11 | | 13,51±1,11 | |
| | **Final Test** | 4,02±0,08 | **0,036*** | 13,21±1,03 | **0,011*** |
| | **Dif. (%)** | % -0,99 | | % -2,22 | |
| **All Groups (N=20)** | **Pre Test** | 4,16±0,19 | | 13,21±0,96 | |
| | **Final Test** | 4,02±0,17 | **0,000**** | 12,64±1,01 | **0,000**** |
| | **Dif. (%)** | % -3,37 | | % -4,51 | |

In the study, when the motor group test measurements of the subjects were compared, a decrease of 30.3m speed velocity and -3.57% zig zag agility test values of all subjects (N = 20) was determined. The difference between pre-test and post-test values was found to be statistically significant (p <0.01) (Table 4). When the measurements of the motoric field test of the subjects were compared, a decrease of -5.41% in the 30-meter speed test values and -6.43% in the zig-zag agility test values of the experimental group (N = 10) were determined. The difference between pre-test and post-test values was found to be statistically significant (p <0.01), the control group (N = 10) -0.99% in 30-meter speed test values and -2.22% in zig zag agility test values. A decrease was determined. The difference between pre-test and post-test values was found to be statistically significant (p <0.05) (Table 4).

**Table 5:** Intergroup Anthropometric Measurements of All Subjects Comparison of Change Differences

| Variables | Groups | N | U | Sig. |
|---|---|---|---|---|
| **Body Weight (kg)** | Experimental Group | 10 | 12,5 | **0,003**** |
| | Control Group | 10 | | |
| **BMI (kg/m²)** | Experimental Group | 10 | 12 | **0,003**** |
| | Control Group | 10 | | |
| **Body Fat Percentage (%)** | Experimental Group | 10 | 24 | 0,052 |
| | Control Group | 10 | | |

When the differences between pre-test and post-test differences of the anthropometric measurements performed within the scope of the study were examined, it was found that there was a statistically significant difference in body weight and BMI values between the experimental group and the control group ($p < 0.01$). In body fat percentage values, there was no statistically significant difference between the experimental and control groups ($p > 0.05$) (Table 5).

**Table 6:** Comparison of Differences between Groups of Motoric Field Tests of All Subjects

| Variables | Groups | N | U | Sig. |
|---|---|---|---|---|
| **Vertical Jump Test (cm)** | Experimental Group | 10 | 86 | **0,005**** |
| | Control Group | 10 | | |
| **Anaerobic Power (kg*m/sn)** | Experimental Group | 10 | 60 | 0,481 |
| | Control Group | 10 | | |
| **Long Jump Test (m)** | Experimental Group | 10 | 73 | 0,089 |
| | Control Group | 10 | | |
| **30 m Speed Test (sc.)** | Experimental Group | 10 | 1 | **0,000**** |
| | Control Group | 10 | | |
| **Zig Zag Test (sc.)** | Experimental Group | 10 | 12 | **0,003**** |
| | Control Group | 10 | | |

When the differences between the pre-test and post-test changes of the motoric field test measurements performed within the scope of the research were examined, it was found that there was a statistically significant difference between the experimental group and the control group in the vertical jump test, 30 meter speed test and zig-zag agility test values ($p < 0.01$). In anaerobic power and long jump test values, there was no statistically significant difference between the experimental group and the control group ($p > 0.05$) (Table 6).

## 5. Discussion

Gunay et al. [9] in the study of the relationship between strength, flexibility, quickness and anaerobic strength of height, body weight and anthropometric variables in footballers, a statistically significant difference was found between pre-test and post-test body weight measurement values after 8 weeks of strength training and a decrease in body weight of athletes. ($P < 0.05$). Akcan [10] examined the effect of the two different

strength training program applied on the physical and physiological characteristics of male athletes in various branches, at the end of the eight-week strength training program found a decrease in body weight values of the athletes in the experimental group and the current decrease was statistically significant $p < 0.05$ level of significance. Pulur [11] in the study of the effect of the general strength training method and the combined strength training method on the development of the performance characteristics of basketball players, a decrease in body fat percentage values of athletes in group A and B occurred and stated that the decrease was statistically significant ($p < 0.05$).

Özdemir [12] the first test results of the groups in his study (experimental group; standing long jump: 2.19cm, vertical jump: 34.28 cm, 10 m speed: 1.77 sec, 30 m speed: 4.37 sec, agility t test: 11.07 sec), (control group; standing long jump: 2.14 cm, vertical jump: 34.71 cm, 10 m speed: 1.79 sec, 30 m speed: 4.49 sec, agility t test: 11,13 sec) and final test results (experimental group; long jump by standing: 2.31 cm, vertical jump: 42.92 cm, 10 m speed: 1.40 sec, 30 m speed: 4.11 sec. , agility t test: 10.39 sec), (control group; standing long jump: 2.12 cm, vertical jump: 33.71 cm, 10 m speed: 1.85 sec, 30 m speed: 4.61 sec, agility t test: 11.35 sec) between the average values examined; It was observed that there was a significant increase in the post-test values of the experimental group ($p < 0.05$). In the control group, no statistically significant difference was found ($p > 0.05$).

Özitin [13] 15-16 age group athletes applied to the eight-week plyometric and quick strength training 30 meters speed training values 3.99 seconds before training and 3.73 seconds after the training determined that the change was statistically significant. Gunay and Onay [14] in the study of the effect of general maximal strength training and increased resistance exercises on aerobic-anaerobic power and body composition, it was observed that there was no change in anaerobic power values of male athletes in the 20-year age group as a result of maximal strength training.

## 6. Conclusion

As a result of the research carried out; It was concluded that strength and strength training applied to the experimental group had a positive effect on body weight, BMI and body fat percentage values from anthropometric measurements. Within the scope of the research, it was seen that the training program carried out in the experimental group had a positive effect on the vertical jump test, 30-meter speed test and zig-zag agility test among the motoric field tests. There was a statistically significant difference between body weight, BMI, vertical jump test, 30-meter speed test and zig-zag agility test between the experimental and control groups ($p < 0.05$, $p < 0.01$). According to the findings, it was concluded that the training program was effective in explosive power.

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