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# THE EFFECT OF FUNCTIONAL STRENGTH TRAINING ON CERTAIN SPECIFIC PHYSICAL ABILITIES AND THE ACCURACY OF PASSING AND SHOOTING IN YOUTH FOOTBALL PLAYERS

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**Abstract**

The aim of this study was to identify the effect of using functional strength training on specific physical abilities and the accuracy of passing and shooting in under-16 youth football players. The experimental method was employed, using a one-group experimental design with pre- and post-tests. The sample was intentionally selected from under-16 youth football players from several Iraqi clubs.

The research results indicated that functional strength training had a positive effect on the specific physical abilities of the players under 16 years old. Furthermore, functional strength training also positively influenced the accuracy of passing and shooting among youth football players under 16 years of age.

The researcher recommends that football coaches in general, and youth coaches in particular, incorporate the functional strength training program proposed in this study, due to its positive impact on specific physical abilities and skills, especially passing and shooting. Additionally, functional strength training should be aligned with the movement pathways and working muscles involved during the performance of football skills.

**Keywords**: Functional strength, physical abilities, passing and shooting, football

## Introduction and Research Problem:

The rapid acceleration in the development of football and the high levels of physical, technical, and tactical performance observed in global and continental tournaments highlight the critical role of muscular strength in players' overall physical performance. Muscular strength is a fundamental physical component that is closely linked to and influences all other fitness elements. Various training methods are used to develop it, such as resistance training, weightlifting, and functional strength training.

Functional strength is particularly important and significantly impacts players' performance. The greater the player's strength, the more powerful and faster their performance becomes, with a reduced risk of injury. Strength is defined as the player's muscular ability to resist or overcome external forces.

Functional training contributes to the comprehensive development of motor skills and movements by focusing on multi-joint movements as much as possible. A movement involving only a single joint cannot be classified as functional; in contrast, movements involving multiple joints and integrating muscle groups are considered functional. It is important to distinguish between functional training and specific training: functional training emphasizes performing movements and strengthening the core muscles that are fundamental to movement, whereas specific training targets particular muscle groups associated with specific performances, making it an essential component of functional training.

Functional strength training relies on balance, core stability, core strength, and central power. It emphasizes training the core muscle groups, working across multiple planes of motion, engaging multiple joints simultaneously, developing balance, enhancing motor coordination, and ensuring that movements are integrated and aligned with the specific demands and requirements of the practiced sport.

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Through his work in youth football training and observing training sessions and matches, the researcher noticed a weakness in players' strength levels, reflected in their general technical performance and particularly in the accuracy of passing and shooting. This weakness negatively impacts the precision of their skills. Moreover, it was observed that most youth coaches do not apply scientific methods when training players for muscular strength development, and they lack knowledge about functional strength and how to train it effectively.

This observation motivated the researcher to seek a solution by using functional strength training, given its significant role in increasing core muscle strength and its profound effect on motor performance. Therefore, the researcher decided to apply functional strength training and investigate its effects on certain specific physical abilities and the accuracy of passing and shooting among youth football players.

**Research Objectives:**

- To identify the impact of functional strength training on specific physical abilities among under-16 youth football players.
- To determine the impact of functional strength training on the accuracy of passing and shooting among under-16 youth football players.

**Research Hypotheses:**

1. There are statistically significant differences between pre- and post-tests in certain specific physical abilities in favor of the post-test.
2. There are statistically significant differences between pre- and post-tests in passing and shooting accuracy in favor of the post-test.

**Research Procedures:**

**Research Method:**

The researcher used the experimental method by employing the one-group experimental design with pre- and post-tests.

**Research Sample:**

The sample was intentionally selected from under-16 youth football players from different clubs. The researcher also utilized 20 players outside the research sample to conduct the pilot study.

**Table (1) Description of the Research Sample**

| Sample | Number | Sample Type | Club |
|---|---|---|---|
| Experimental group | 22 | Main | |
| Pilot study | 20 | Non-main | |
| Total | 44 | - | |

The researcher calculated the skewness coefficient for the research sample in the basic variables (age, height, weight, training age, some specific physical abilities, and the accuracy of passing and shooting) to ensure the normality of distribution for the experimental group. Tables (2), (3), and (4) illustrate this.

**Table (2) Skewness coefficient for the research sample in the basic variables (age, height, weight, training age)**

| No. | Variables | Unit of Measurement | Mean ($\bar{X}$) | Standard Deviation ($\pm\sigma$) | Median | Skewness |
|---|---|---|---|---|---|---|
| 1 | Age | Year | 15.57 | 15.60 | 15.60 | -0.44 |
| 2 | Height | cm | 165.14 | 5.17 | 165 | -0.07 |
| 3 | Weight | kg | 58.82 | 3.72 | 58.50 | -0.31 |
| 4 | Training Age | Year | 4.23 | 0.69 | 4 | -0.32 |

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Table (2) shows that the skewness coefficient values for the variables of age, height, weight, and training age ranged from (-0.32) to (-0.31). These values are within (±3), which indicates the homogeneity of the experimental group in these variables.

**Table (3) Skewness coefficient for the research sample in some specific physical abilities**

| No. | Variables | Test | Unit of Measurement | Mean ($\bar{X}$) | Standard Deviation (±σ) | Median | Skewness |
|---|---|---|---|---|---|---|---|
| 1 | Speed-strength | Broad jump | cm | 200.36 | 2.28 | 201 | -0.92 |
| 2 | Leg muscles strength | Leg strength | kg | 127.59 | 1.22 | 128 | -0.15 |
| 3 | Abdominal muscles strength | Abdominal strength (30 sec) | count | 21.86 | 0.71 | 22 | 0.20 |
| 4 | Speed | 50 m sprint | sec | 6.11 | 0.06 | 6.09 | 0.27 |
| 5 | Agility | 25 m zigzag run | sec | 3.84 | 0.04 | 3.83 | 0.56 |
| 6 | Motor balance | Balance test | sec | 68.77 | 5.60 | 68.50 | 0.18 |
| 7 | Speed endurance | 30 m × 5 times | sec | 28.75 | 0.68 | 28.73 | 0.23 |

Table (3) shows that the skewness coefficient values for the specific physical abilities under investigation ranged from (-0.15) to (0.56), and these values are within (±3), indicating the homogeneity of the group.

**Table (4) Skewness coefficient for the research sample in the level of passing and shooting accuracy**

| No. | Variables | Test | Unit of Measurement | Mean ($\bar{X}$) | Standard Deviation (±σ) | Median | Skewness |
|---|---|---|---|---|---|---|---|
| 1 | Passing accuracy | Passing accuracy | Score | 4.27 | 1.35 | 4 | 0.09 |
| 2 | Shooting accuracy by foot | Kicking the ball into a divided goal | Score | 10.36 | 3.43 | 10 | 0.32 |
| 3 | Shooting accuracy by head | Heading the ball into specific circles | Score | 6.05 | 0.95 | 6 | -0.10 |

Table (4) shows that the skewness coefficient values for passing and shooting accuracy ranged from (-0.10) to (0.32), and these values are within (±3), which indicates the homogeneity of the experimental group in these aspects.

**Scientific Coefficients for the Tests Used:Test Reliability:**

The researcher determined the reliability coefficient for the tests used by the method of applying and reapplying the test (Test-Retest). Tables (5) and (6) illustrate this.

**Table (5) Arithmetic Mean, Standard Deviation, and Correlation Coefficient between the First and Second Application in Specific Physical Abilities Tests**

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| No. | Test | Unit of Measurement | First Application (X̄) | First Application (σ) | Second Application (X̄) | Second Application (σ) | Correlation Coefficient |
|---|---|---|---|---|---|---|---|
| 1 | Broad Jump | cm | 200.30 | 2.75 | 200.60 | 2.88 | 0.92 |
| 2 | Leg Strength | kg | 127.30 | 1.34 | 127.90 | 0.88 | 0.88 |
| 3 | Abdominal Strength 30 sec | count | 21.80 | 0.79 | 22.50 | 0.85 | 0.83 |
| 4 | 50 m Sprint | sec | 6.12 | 0.06 | 6.10 | 0.06 | 0.94 |
| 5 | 25 m Zigzag Run | sec | 3.83 | 0.03 | 3.82 | 0.03 | 0.97 |
| 6 | Balance Test | sec | 67.40 | 3.57 | 67.90 | 3.73 | 0.98 |
| 7 | 30 m × 5 Times | sec | 28.84 | 0.74 | 28.73 | 0.73 | 0.98 |

Table (5) shows the existence of a statistically significant correlation at the 0.05 level between the first and second applications in the specific physical abilities tests, all of which have a high correlation coefficient, indicating the stability of the tests used in the research.

**Table (6) Arithmetic Mean, Standard Deviation, and Correlation Coefficient between the First and Second Application in Passing and Shooting Accuracy Tests**

| No. | Test | Unit of Measurement | First Application (X̄) | First Application (σ) | Second Application (X̄) | Second Application (σ) | Correlation Coefficient |
|---|---|---|---|---|---|---|---|
| 1 | Passing Accuracy | Degree | 4.60 | 1.58 | 5.00 | 1.33 | 0.95 |
| 2 | Kicking the Ball into a Divided Goal | Degree | 9.60 | 3.20 | 9.80 | 2.39 | 0.94 |
| 3 | Heading the Ball into Specified Circles | Degree | 5.90 | 0.99 | 6.30 | 0.67 | 0.88 |

Table (6) shows the existence of a statistically significant correlation at the 0.05 level between the first and second applications in the individual offensive skills tests, all of which have a high correlation coefficient, indicating the stability of the tests used in the research.

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**Test Validity:**

The researcher conducted a differentiation validity test to ensure the validity of the tests used in the research by applying the tests to two groups: the first group (10) players under 16 years old as a distinguished group, and the second group (10) players under 12 years old as a non-distinguished group, from the junior sector players of Baladeyet Ismailia Club. Tables (7) and (8) illustrate this.

**Table (7) Arithmetic Mean, Standard Deviation, and T-Value between the Distinguished Group and the Non-Distinguished Group in Special Physical Abilities**
*($n_1 = n_2 = 10$)*

| No. | Test | Unit of Measurement | Distinguished Group ($\bar{X}$) | Distinguished Group ($\sigma$) | Non-Distinguished Group ($\bar{X}$) | Non-Distinguished Group ($\sigma$) | Difference Between Means | T-Value |
|---|---|---|---|---|---|---|---|---|
| 1 | Standing Broad Jump | cm | 200.30 | 2.70 | 154.70 | 6.02 | 45.50 | 21.81 |
| 2 | Leg Strength | kg | 127.30 | 1.34 | 111.80 | 3.58 | 15.50 | 12.81 |
| 3 | Abdominal Strength (30 sec) | Count | 21.80 | 0.79 | 15.50 | 1.18 | 6.30 | 14.05 |
| 4 | 50-Meter Sprint | sec | 6.12 | 0.06 | 6.42 | 0.06 | -0.30 | -11.97 |
| 5 | 25-Meter Zigzag Run | sec | 3.83 | 0.03 | 4.13 | 0.03 | -0.30 | -19.33 |
| 6 | Pass and Balance | sec | 67.40 | 3.57 | 60.00 | 5.75 | 7.40 | 3.46 |
| 7 | 30 m Sprint Repeated 5 Times | sec | 28.84 | 0.74 | 30.013 | 0.65 | -1.29 | -4.15 |

The critical t-value at a significance level of 0.05 = 2.101

It is clear from Table (7) that there are statistically significant differences between the distinguished and non-distinguished groups in the special physical abilities tests under research, as the calculated t-values are greater than the critical t-value at the 0.05 significance level, indicating the validity of these tests.

**Table (8) Arithmetic Mean, Standard Deviation, and T-Value between the Distinguished Group and the Non-Distinguished Group in Passing and Shooting Accuracy**
*($n_1 = n_2 = 10$)*

| No. | Test | Unit of Measurement | Distinguished Group ($\bar{X}$) | Distinguished Group ($\sigma$) | Non-Distinguished Group ($\bar{X}$) | Non-Distinguished Group ($\sigma$) | Difference Between Means | T-Value |
|---|---|---|---|---|---|---|---|---|

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | Passing Accuracy | Degree | 4.27 | 1.35 | 6.36 | 1.05 | 2.09 | -7.97 |
| 2 | Kicking the Ball into a Divided Goal | Degree | 10.36 | 3.43 | 17.86 | 2.68 | 7.50 | -9.57 |
| 3 | Heading the Ball into Specified Circles | Degree | 6.05 | 0.95 | 7.77 | 1.11 | 1.73 | -7.23 |

The critical t-value at a significance level of 0.05 = 2.101

Table (8) shows that there are statistically significant differences between the distinguished and non-distinguished groups in the passing and shooting accuracy tests under research, as the calculated t-values are greater than the critical t-value at the 0.05 significance level, indicating the validity of these tests.

**Functional Strength Training Program:**

**1- Defining the Objective of the Proposed Functional Strength Training:**

The training aims to strengthen the core muscles and leg muscles and to examine their effect on certain specific physical abilities as well as the accuracy of passing and shooting among youth football players.

**2- Principles to Be Considered When Designing Functional Strength Training:**

- The suitability of the training to the level and abilities of the research sample.
- Consideration of progression, adaptation, and individual differences within the research sample.
- Attention to performance timing in terms of (acceleration – stabilization – deceleration).

**3- Functional Strength Training:**

The training included exercises aimed at improving stability and balance, strengthening the core muscles and limbs in general, and specifically the legs.

**4- Time Distribution of the Functional Strength Training Program:**

- Program duration: (8) weeks.
- Number of training sessions: (3) sessions per week.
- Total number of training sessions: (24) sessions.
- Duration of each daily training session: (95) minutes.
- Warm-up duration: (15) minutes; main part duration: (75) minutes; cool-down duration: (1) minute.
- Total program duration: (2,280) minutes.
- Duration of functional strength training within a training session: (20) minutes.
- Total duration of functional strength training across the entire program: (480) minutes.

**Statistical Treatments:**

Statistical treatments were conducted using the Statistical Package for the Social Sciences (SPSS) software.

**Presentation and Discussion of Results:**

**Presentation and Discussion of the Results of the First Hypothesis:**

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**Table (9)** *The Mean, Standard Deviation, Difference Between Means, and the Calculated "t" Value Between Pre- and Post-Tests for the Research Sample in Specific Physical Ability Tests*

| t | Test | Unit of Measurement | Pre-Test Mean (X) | Pre-Test SD (S) | Post-Test Mean (X) | Post-Test SD (S) | Difference Between Means | Correlation Coefficient |
|---|---|---|---|---|---|---|---|---|
| 1 | Standing Long Jump | cm | 200.36 | 2.28 | 211.41 | 1.18 | 11.05 | -18.83 |
| 2 | Leg Strength | kg | 127.59 | 1.22 | 138.32 | 2.30 | 10.73 | -22.36 |
| 3 | Abdominal Strength (30 sec) | count | 21.86 | 0.71 | 33.14 | 1.49 | 11.27 | -30.20 |
| 4 | 50-meter Run | sec | 6.11 | 0.06 | 6.02 | 0.02 | -0.08 | 6.42 |
| 5 | 25-meter Zigzag | sec | 3.84 | 0.04 | 3.77 | 0.01 | -0.07 | 8.68 |
| 6 | Balance Test | sec | 68.77 | 5.60 | 82.95 | 3.24 | 14.18 | -9.67 |
| 7 | 30 meters (5 times) | sec | 28.75 | 0.68 | 22.94 | 1.88 | 5.81 | 13.51 |

The calculated "t" values for the differences between pre- and post-tests for the research sample in specific physical ability tests ranged from (6.042) to (30.020). These values are greater than the tabled "t" value at a significance level of (0.0005), indicating that there are significant differences between the pre- and post-tests, with the post-test showing better means.

**B - Discussion of the First Hypothesis Results:**

Table (9) shows that there are statistically significant differences between the pre- and post-test means for the research sample in the specific physical ability tests, with the post-test showing a better result.

The researcher attributes the improvement in the specific physical abilities under investigation to the functional strength training used in the study, its careful structuring, and its suitability for the age group of the research sample. This program aimed at strengthening the core muscles, as well as the muscles of the legs and arms, and enhancing the coordination between them. The program incorporated various resistances, such as body weight resistance, free weights, medicine balls, rubber bands, and Swiss balls, all of which contributed to an increase in muscular strength. Muscular strength plays a vital role in the development of other physical fitness components as well as motor performance.

This finding is supported by both Refai Mustafa and Bret Contreras & Glen Cordoza, who agreed that muscular strength is one of the key components upon which most fitness elements like speed, agility, endurance, and balance are based, contributing significantly to their improvement. Functional strength training is intended to strengthen the muscles responsible for movement, thus increasing strength and speed. The stronger the muscle, the greater the force it can produce, which in turn improves the ability to run, jump, change directions, balance, and accelerate.

Both Ryan Alexander (2000), James Donnelly & others (2020), and Nate VanKouwenberg (2024) confirm that functional strength training enhances positive adaptations in muscle growth for football players, increasing muscle capacity and efficiency, leading to improved performance. For speed, it is directly influenced by strength level, as acquiring strength increases the muscle's ability to produce greater force, thus

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enabling faster movement over a sustained period with minimal fatigue. These results are in agreement with studies by Mohamed Sultan and Emad Al-Hakim.

The functional strength training positively affected various fitness elements like strength, speed, coordination, agility, balance, and endurance in football players. Therefore, the first hypothesis is confirmed: There are statistically significant differences between the pre-test and post-test in certain physical abilities under investigation, with the post-test showing better results.

**Second Hypothesis: Presentation and Discussion of Results:**

**Table (10)** *Mean, Standard Deviation, Difference Between Means, and Calculated t-Value Between Pre- and Post-Test Measurements in Passing and Shooting Accuracy Tests*

| t | Test | Unit of Measurement | Pre-Test Mean (X) | Pre-Test SD (S) | Post-Test Mean (X) | Post-Test SD (S) | Difference Between Means | t-Value |
|---|---|---|---|---|---|---|---|---|
| 1 | Passing Accuracy | degree | 4.27 | 1.35 | 6.36 | 1.05 | 2.09 | -7.97 |
| 2 | Kicking Ball to a Divided Goal | degree | 10.36 | 3.43 | 17.86 | 2.68 | 7.50 | -9.57 |
| 3 | Heading Ball to Targeted Circles | degree | 6.05 | 0.95 | 7.77 | 1.11 | 1.73 | -7.23 |

The table shows that the calculated t-values for the differences between pre- and post-test measurements for the passing and shooting accuracy tests are significant, as they exceed the tabulated t-value at a significance level of (0.05), indicating a statistically significant difference between the pre- and post-tests, with the post-test showing an improvement.

**Table (10)** shows that the calculated t-values for the significance of the differences between the pre- and post-test measurements in the passing and shooting accuracy tests range from (7.23) to (9.57), which are greater than the tabulated t-value at the 0.05 significance level. This indicates that there are significant differences between the two measurements, with the post-test showing better averages.

**B - Discussion of the Second Hypothesis Results:**

Table (10) shows that there are statistically significant differences between the pre- and post-test means in the specific tests for passing and shooting accuracy in favor of the post-test.

The researcher attributes this improvement to the functional strength training, which contributed to increasing muscle stability and body balance during performance, especially in passing and shooting. Additionally, the increase in muscular strength improved the efficiency of the neuromuscular system and the muscles' ability to transmit neural stimuli more effectively. This, in turn, reduced the effort required during performance, enhancing the player's sense of control and accuracy.

This finding is supported by Ibrahim Abu Al-'Ala, Abd El-Fattah, and Ahmed Nasr Juan Santana, who pointed out that strength training enhances the efficiency of the nervous system, improves neuromuscular control, and increases the ability of the muscles to recruit motor units during muscle contraction. It also improves the response timing to stimuli, leading to more effective and powerful muscle contractions. Achieving the best coordination between muscle contraction and relaxation contributes positively to better and more precise skill performance.

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The philosophy of functional strength training focuses on specificity, emphasizing the core muscles, stability, body positioning, and how these relate to the performance of basic football skills, such as speed, strength, and directional changes. Using varied resistance training techniques targeting these elements plays a crucial role in increasing speed and power in working muscles, thereby improving skill performance during matches.

This is in agreement with the findings of Refai Mustafa, Ibrahim Abu Al-'Ala, Addi Hassan, and Hassan Abu Abda, who emphasized that the skills football players perform during matches require muscular strength, especially for passing and shooting. When executing a kick, stronger muscles contribute to more powerful kicks, and the stable leg helps maintain body balance. Additionally, the trunk and arm muscles play a key role in maintaining balance, which increases control over performance power, speed, and precision.

These results align with the studies of Mohamed Sultan, Emad Al-Hakim, Rafiq Al-Kubaisi, Abdul Razzaq Al-Majidi, and Ashraf Ahmed, which found that functional strength training positively affected skill levels in football players, especially in passing and shooting.

Thus, the second hypothesis is confirmed: There are statistically significant differences between the pre- and post-test measurements in passing and shooting accuracy, with the post-test showing better results.

**Conclusion:**

- Functional strength training has had a positive effect on the specific physical abilities of the under-16 football players in the study.
- Functional strength training has also positively influenced the passing and shooting accuracy of the under-16 football players.

**Recommendations:**

- Football coaches, especially those working with youth teams, should adopt the functional strength training techniques suggested in this research due to their positive impact on specific physical abilities and skills, particularly passing and shooting.
- Attention should be given to regulating the loads in functional strength training, with a focus on educating coaches on how to manage them effectively.
- Functional strength training should be aligned with the movement patterns and active muscles involved during skill execution in football.

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