



THE EFFECT OF FUNCTIONAL TRAINING ON BASIC STRENGTH AND DYNAMIC BALANCE IN FOOTBALL PLAYERS

Muataz Riyadh Abdulhussein

University of Technology, Faculty of Mechanical Engineering

muataz.r.abdulhussein@uotechnology.edu.iq

Abstract

This research aims to identify the effect of functional training on basic strength and dynamic balance in football players. Specifically, it examines the impact of functional training on basic strength and dynamic balance. The researcher employed an experimental design, deemed most suitable for the nature of the research. A random sample of 26 football players was selected, divided into two groups: 13 players for a pilot study (validation of tests for reliability and validity) and 13 players for the experimental group. The researcher developed a training program using functional exercises, which was implemented with the research sample for two months. The results demonstrated that the functional training program was clearly effective in improving the basic strength of the studied football players. The functional exercises also led to a noticeable improvement in dynamic balance levels, consistent with [the research findings]. Regarding the requirements for skill performance on the field, statistically significant differences were found between the pre- and post-tests in favor of the post-test in all basic strength and dynamic balance tests. One of the most important recommendations was the necessity of adopting training programs based on functional exercises within the physical preparation plans for football players, due to their effective impact on developing basic strength and dynamic balance, and including stability and balance exercises within the daily training units of players with the aim of improving neuromuscular control and reducing the risk of sports injuries.

Keywords: job training, Functional Training, Basic Strength, Dynamic Balance, Football Players, Neuromuscular Control

Introduction

The tremendous recent development in the field of sports worldwide, especially in football, was not purely coincidental, but rather the result of intensive research and study of weaknesses and ways to address them, as well as the use of modern training methods and principles that raise the physical and technical level of players to the highest possible degree.

One of the most important modern concepts to emerge recently is functional training, which Gray Cook (2013) refers to the emergence of a new concept of training in recent years called functional training, which is based on the convergence of two common concepts: sports rehabilitation and physical preparation. The philosophy of this method is to develop strength and muscle capacity, as the primary and coordinated physical attributes of functional training through training the muscle groups involved in maintaining balance and body centre during isolated movements or training the body parts involved in these movements separately, which was common before the use of the concept of functional training. (Gray, 2013: 22).

Ahmed Ezzat (2021) points out that functional training has become widely practised because everyone needs strength and balance when performing various routine activities in their daily lives in general, and athletes need it to meet the requirements of the sports activities they practise in particular. Functional strength training focuses on improving the functional strength produced by the muscles to perform various activities, and all movement patterns in functional strength training originate from the spine. (Ezzat, 2021: 14)



Christen Cunningham (2010) adds that over the past ten years, functional training has become a commonly used term in the field of sports and is used under several names.

Functional training is one of the most important modern methods in developing athletic performance, as it focuses on training muscles according to the motor functions that players perform during a match. Core muscles are the foundation for balance, stability and movement control, making them a crucial factor in developing muscle strength and shooting skills in football players.

The researcher believes that functional training is an effective tool for improving athletes' performance in many physical areas. Whether the goal is to improve muscle strength, endurance, balance, speed, or agility, these types of training can be used to improve athletes' overall performance.

Football is one of the sports that relies most on physical strength, high fitness, and physical balance for optimal performance. However, despite the importance of these factors, many football players find it difficult to improve their core strength and dynamic balance, which negatively affects their performance in matches and causes them to suffer injuries.

Research problem

Many traditional training programmers that focus on strengthening the superficial muscles of football players do not adequately address core strength and dynamic balance, which are essential components of improving overall athletic performance and preventing recurrent injuries. Although some research points to the importance of core strength and balance in football, there is a lack of precise practical applications of functional strength exercises that integrate core strength and dynamic balance improvement in football player training.

The importance of this research stems from its attempt to study the effect of functional training (Functional Training)

Research objectives:

The research aims to identify the effect of functional training on the core strength and dynamic balance of soccer players by:

- ♣ Identifying the effect of functional training on the core strength of soccer players
- ♣ Identifying the effect of functional training on the dynamic balance of soccer players

Research hypotheses:

- ♣ There are statistically significant differences between the two measurements (near and far) for the experimental research sample in core strength training for soccer players in favor of the far measurement
- ♣ There are statistically significant differences between the two measurements (near and far)
- ♣ of the experimental research sample in dynamic balance training for soccer players in favor of the far measurement

Previous studies

1. Bazaar Al-Jokul, Manhal Nabil Bouya, and Nivan Yasser Abdullah (2025) conducted a study entitled "The Effectiveness of Functional Training on Some Immunological and Physical Variables in Soccer Players." The study aimed to identify the effectiveness of functional training on some immune and physical variables in junior football players. The researchers used an experimental approach with a single group design with pre- and post-tests to suit the nature of the research. The research sample consisted of junior football players at Al-Karkh Sports Club. The research tools included physical tests designed to measure explosive strength in the lower limbs, transitional speed, endurance, and agility. The researchers concluded that the functional training program was effective in boosting the immune system efficiency of youth soccer players.

2. Hamid Majid Hamid, Zuhair Rashid, and Abdulstar Khudair Abbas (2025) conducted a study entitled "The Effect of Functional Strength Training on the Development of Certain Physical and Technical Abilities in



Young Soccer Players.” The aim of the research was to prepare functional strength training and apply it during training units in a scientific, studied, and organized manner for young players in the easiest way possible to achieve the desired goal, which is to develop certain physical abilities and perform complex skills for young football players. The researchers used an experimental approach and applied the research to a sample of 26 young soccer players aged 16-18 at the Al-Shuhada Sports Club in Wasit Governorate. The researchers concluded that functional strength training led to the development of physical and motor abilities in the research sample, and that the development in physical and motor abilities led to the development of the level of performance of complex skills in the research sample.

Research Procedures

First: Research Methodology

The researcher used an experimental methodology appropriate to the nature of the research and employed an experimental design.

Second: Research Population and Sample

- Research Population

The research population consists of soccer players registered with the Iraqi Soccer Federation for the 2024-2025 season.

- Research sample

A random sample of 26 football players, divided into 13 players for the exploratory study (standardization of tests for validity and reliability) and 13 players for the experimental group, as shown in Table 1.

Table No. (1)
Shows the numerical distribution of the research sample.

Classification	Research sample	Survey sample		Pilot group	
		Repetition	Ratio	Repetition	Ratio
Soccer players	26	13	%50	13	%50

-Statistical description of the research sample:

Table (2)
Statistical significance in the basic factors of the research sample.
n = 26

Variables	Unit of measurement	Arithmetic mean	Standard deviation	Twist coefficient	Flattening factor
Age	Year	21.69	1.63	2.02	1.56
Height	Poison	177.52	2.16	0.63-	0.96
Weight	Kg	75.91	4.08	1.31	0.48-
Training age	Year	7.23	3.61	0.102-	0.69

Table (2) shows the homogeneity of the research sample data in the initial basic measurements, where the values of the skewness coefficient range from (1.02 to 2.02), which is close to zero, and the flattening coefficient ranged between (0.48- to 1.56), which means that the fluctuation of the normal curve is considered



acceptable and average, neither fluctuating upwards nor downwards, confirming the similarity of the research sample individuals in the initial measurements.

Third: Data collection methods and tools:

- Devices and tools used in the research:

After referring to many similar references and studies, the researcher arrived at the devices and tools that contribute to completing the research procedures and achieving its objectives, which are:

- Rest meter for measuring total body length.
- Electronic medical scale
- Stopwatch to measure time (in seconds)
- Soccer ball.
- Soccer goal.
- Cones
- 5 kg medicine balls
- Ruler
- Chalk
- Whistle
- Measuring tape
- Markers

Measurements and tests used in the research:

The researcher referred to previous studies and scientific references that addressed the variables of the study and consulted with experts in the field. The researcher then arrived at the following tests, as shown in Table 3.

Table (3)
Tests used in the research

Tests	Unit of measurement	
Basic strength tests	One-legged hop (right)	Meter
	One-legged hop (left)	Meter
	Sit-up from lying position (20 seconds)	Number
	Throw a 5 kg medicine ball with both hands as far as possible	Meter
	Bend and extend arms	Number
	Broad jump from a standing position	Poison
Dynamic balance tests	Walking on the edge test	Second
	Balancing on one foot test	Second
	Changing direction test	Second
	Ball balance test	Second
	Dribbling test	Second

Fourth: Exploratory study:



The exploratory study was conducted from October 13, 2025, to October 21, 2025, on a sample of 13 players outside the main sample to measure validity and reliability.

Sixth: Scientific coefficients for the tests used in the research:

- Validity:

To find the validity coefficient for the tests under study, the researcher used the end-point comparison validity by calculating the mean values of the differences between the upper quartiles and the lower quartiles of the results of the survey sample, which consisted of 13 players, as shown in Table 4.

Table (4)
Significance of differences between the highest and lowest quartiles to determine the validity of differentiation
in the physical tests under investigation
N=13



The tabulated value (T) at a significance level (0.05) = 3.182 *Significant

The previous table shows that there are significant differences between the upper and lower quartiles in the tests under study, where the t-value ranged between 3.28 and 9.43, which is higher than the tabulated t-value, indicating the validity of the tests under study.

- Stability:

The stability coefficient for the tests was found by using the method of application and reapplication on the same exploratory study sample (13) players, where the tests were reapplied again after (7) days from the first application to determine the correlation coefficient between the first and second applications, as shown in Table 5.

Tests	Unit of measurement	The first application		The second application		Value of "R"
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation	
Basic strength tests						
Partridge (right)	Meter	16.24	1.32	16.47	1.36	*0.889
Partridge (left)	Meter	15.91	1.98	15.85	1.89	*0.932
Sitting up (20seconds)	Number	11.47	0.98	11.43	1.03	*0.942
Throwing the ball (5kg)	Meter	6.39	1.72	6.48	1.56	*0.914
Bending and stretching the arms	Number	21.74	1.24	21.92	1.20	*0.948
The broad jump	Poison	157.91	1.60	158.02	1.58	*0.954



Dynamic balance tests						
Walking on the edge test	Second	1.02	1.87	9.94	1.74	*0.911
Balance test	Second	19.42	2.63	19.48	2.55	*0.943
Trend reversal test	Second	5.93	2.35	5.88	2.31	*0.934
Ball balance test	Second	29.08	2.74	29.19	2.78	*0.919
Dribbling test	Second	12.34	1.47	12.41	1.48	*0.943

Tabulated value (R) at a significance level (0.05) = 0.532

Table (5) shows that there is a statistically significant correlation between the first application and the reapplication in the tests under study, where the calculated value of (r) ranged between (0.889: 0.954), which is greater than the tabulated t-value at a significance level of 0.05, indicating the stability of the tests under investigation.

Seventh: Training program using functional exercises

Overall goal of the program:

To improve overall physical performance by enhancing core strength, dynamic balance, motor coordination, and flexibility, enabling players to perform various athletic movements more efficiently and accurately, and reducing the risk of injury. The program also contributes to improving the ability to move quickly, change directions flexibly, and maintain body stability during demanding field situations, which enhances players' performance in matches and boosts their endurance and ability to compete with high efficiency.

Principles to consider when designing functional strength training:

- Exercises should be appropriate for the level and abilities of the research sample.
- Consideration should be given to the progression, adaptation, and individual differences of the research sample.
- Consideration should be given to performance timing in terms of acceleration, stabilization, and deceleration.

Time distribution of the functional strength training program:

- Total program duration: 8 weeks.
- Number of weekly units: 3 training units (24 units in total).
- Training unit duration: 45 to 60 minutes.

Training unit components:

Part 1: Warm-up: 10 to 15 minutes.

Objective: To prepare the body for training or physical activity, increase blood flow to the muscles, and improve joint flexibility, thereby helping to reduce the risk of injury.

Components:

- General mobility exercises: such as light jogging or brisk walking to stimulate blood circulation.
- Dynamic stretching exercises: such as bends or arm rotations to increase muscle and joint flexibility.
- Agility exercises: such as short sprints with sudden stops or quick changes of direction.

Exercise examples:

- Light jogging for 3-5 minutes.



- Dynamic stretching exercises such as knee lifts or trunk rotations.
- Circular arm and leg movements.

Part II: Main Workout: 30 to 40 minutes, depending on the intensity of the workout.

Goal: Focus on improving the required physical aspects such as strength, endurance, balance, flexibility, or specific athletic skills.

Components:

Principles to consider when designing functional strength training:

- Exercises should be appropriate for the level and abilities of the research sample.
- The progress, adaptation, and individual differences of the research sample should be taken into account.
- The timing of performance in terms of acceleration, stability, and deceleration should be taken into account.

Time allocation for the functional strength training program:

- Total duration of the program: 8 weeks.
- Number of weekly units: 3 training units (24 units in total).
- Duration of the training unit: 45 to 60 minutes.

Components of the training unit:

Part 1: Warm-up: 10 to 15 minutes.

Objective: To prepare the body for training or physical activity, increase blood flow to the muscles, and improve joint flexibility, thereby helping to reduce the risk of injury.

Components:

- General movement exercises: such as light jogging or brisk walking to stimulate blood circulation.
- Dynamic stretching exercises: such as bends or arm rotations to increase muscle and joint flexibility.
- Agility exercises: such as short sprints with sudden stops or quick changes in direction.

Examples of exercises:

- Light jogging for 3-5 minutes.
- Dynamic stretching exercises such as knee lifts or trunk rotations.
- Circular movements of the arms and legs.

Part II: Main workout: 30 to 40 minutes, depending on the intensity of the workout.

Goal: Focus on improving the desired physical aspects such as strength, endurance, and

- Program implementation:

The researcher implemented the proposed program on the experimental research group, consisting of 13 players, from November 1, 2025, to December 30, 2025, at a rate of three units per week for two months.

- Post-measurement:

Post-measurements of the variables under study were conducted on the research sample from January 2, 2026, to January 3, 2026, eight weeks after the implementation of the training program, and lasted for two days.

Statistical methods used in the research

The researcher used the following statistical method to process the data through the statistical program (SPSS 23) to find the following:

- ♣ Arithmetic mean.
- ♣ Standard deviation.
- ♣ Median.
- ♣ Coefficient of skewness.
- ♣ Coefficient of kurtosis.



- ♣ T-test
- ♣ Pearson's correlation coefficient
- ♣ Frequency and percentage.

Presentation and discussion of results:

First: Presentation and discussion of the results of the first hypothesis: There are statistically significant differences between the two measurements (close and distant) for the experimental research sample in basic strength training for soccer players in favor of the distant measurement.

Table (6)

Significance of differences between pre-test and post-test measurements for the experimental group (basic strength)

N = 13

Tests	Unit of measurement	Pre-test		Post-test		Value T	Level of significance
		Arithmetic mean	Deviation	Arithmetic mean	Deviation		
Partridge (right)	Meter	17.92	1.48	20.21	1.54	*4.56	0.00
Partridge (left)	Meter	15.08	2.61	18.09	2.12	*3.98	0.00
Sitting up (20seconds)	Number	11.84	2.17	14.91	1.99	*5.83	0.00
Throwing the ball (5kg)	Meter	5.38	1.06	6.74	1.02	*3.64	0.00
Bending and stretching the arms	Number	22.50	3.03	27.20	2.74	*6.91	0.00
The broad jump	Poison	159.54	2.14	173.42	2.04	*12.47	0.00

Value (t) at significance level (0.05) = 2.179

The results in Table 6 and Figure 1 show the following:

♣ There are statistically significant differences between the mean scores of the pre-test and post-test for the experimental group in favor of the post-test mean in the basic strength tests (one-leg hop (right, left), sit-ups (20 seconds), throwing a 5 kg medicine ball with both hands as far as possible, bending and extending the arms, and broad jump from a standing position) for soccer players, where the calculated “t” value ranged between (3.64: 12.47).

These results are consistent with those of Abdi & Sadeghi (2013), which found that training programs aimed at strengthening core muscles improve muscle strength and dynamic balance in soccer players. The study showed a statistically significant improvement in core strength variables after implementing a specialized training program, which is consistent with the current results that indicated significant differences in favor of the post-measurement in the hop, sit-up, medicine ball throw, arm flexion and extension, and standing long jump tests.



In this regard, the results of the study by Mohamed Refai Mustafa (2024) that functional strength training had a positive effect on the specific physical abilities under study in under-16 soccer players, as well as on passing and shooting accuracy in under-16 soccer players.

The results of the current study are also consistent with the study by Huang et al. (2022), which showed that training based on strengthening the trunk muscles contributes to the development of functional strength and improves athletic performance, which has a positive impact on the specific physical abilities of soccer players. This is reflected in the results of the current study, which confirmed the effectiveness of the functional training program in improving basic muscle strength.

Second: Presentation and discussion of the results of the second hypothesis:

There are statistically significant differences between the two measurements (close and distant) of the experimental research sample in dynamic balance training for soccer players in favor of the distant measurement.

Table (7)

Significance of differences between the pre-test and post-test measurements of the experimental group in (dynamic balance)

N = 13

Tests	Unit of measurement	Pre-test		Post-test		Value T	Level of significance
		Arithmetic mean	Deviation	Arithmetic mean	Deviation		
Walking on the edge test	Second	10.53	1.86	11.23	1.39	3.61	0.00
Balance test	Second	18.47	3.02	22.92	2.86	5.48	0.00
Trend reversal test	Second	5.96	0.85	4.63	0.62	7.63	0.00
Ball balance test	Second	29.74	4.23	34.29	5.36	4.71	0.00
Dribbling test	Second	12.81	1.63	10.24	1.26	6.92	0.00

Value (t) at significance level (0.05) = 2.179

The results in Table 7 and Figure 2 show the following:

- There are statistically significant differences between the mean scores of the pre-test and post-test for the experimental group in favor of the post-test mean in dynamic balance (walking on the edge test, one-foot balance test, change of direction test, ball balance test, dribbling test) for soccer players, where the calculated “t” value ranged between (3.61: 7.63).

The results of the study by Abdi & Sadeghi (2013) agreed with the current results, which concluded that muscle stability training is effective in improving dynamic balance in soccer players and plays a role in increasing physical control efficiency during direction changes and rapid movements.

The results of the study by Huang et al. (2022) agreed with the current results, which found a significant improvement in functional balance after implementing a training program targeting the trunk muscles and balance, supporting the importance of incorporating functional exercises into soccer player training programs.

The researcher believes that the results obtained in this study confirm the effectiveness of the training program based on functional exercises in developing the physical fitness elements associated with the skill performance of soccer players, particularly improving core strength and dynamic balance. The researcher attributes this improvement to the nature of functional exercises, which rely on multi-level movements and motor levels



similar to the requirements of actual play, contributing to the activation of core muscles and strengthening the neuromuscular connections responsible for controlling the body during complex skills and rapid changes of direction.

Conclusions and Recommendations

First: Conclusions:

In light of the researcher's findings through the presentation and discussion of the research results, the following conclusions were reached:

- ♣ The functional training program showed clear effectiveness in improving the core strength of the soccer players under study.
- ♣ Functional exercises brought about a noticeable improvement in dynamic balance levels, in line with the requirements of skill performance on the field.
- ♣ Statistically significant differences were found between pre- and post-measurements in favor of post-measurements in all core strength and dynamic balance tests.
- ♣ The training program contributed to enhancing the players' motor control, especially in multi-directional movements and dynamic situations similar to competitive reality.
- ♣ The results indicated an improvement in neuromuscular efficiency resulting from the integration of stability, strength, and balance training into a single training plan.
- ♣ Functional training enhanced the players' ability to perform more efficiently during juggling, jumping, dribbling, changing direction, and trunk exercises.
- ♣ The results showed that functional training is an effective approach to physically preparing soccer players compared to traditional training methods that rely on isolated muscle exercises.

Second: Recommendations:

Based on the results and within the limits of the conclusions that could be reached, the researcher recommends the following:

- ♣ The need to adopt training programs based on functional training within the physical preparation plans for soccer players, due to their effective impact on developing core strength and dynamic balance.
- ♣ Inclusion of stability and balance exercises in players' daily training units to improve neuromuscular control and reduce the risk of sports injuries.
- ♣ Focus on multi-directional exercises.

References

First: References in Arabic

1. Ahmed Ezzat (2021): The effect of functional strength training using unstable surfaces on some physical and skill variables of young wrestlers, Master's thesis, Faculty of Physical Education, Benha University
2. Amal Mohamed Morsy (2015): The Effectiveness of Integrative Functional Training on Some Specific Physical Variables and the Level of Skill Performance in Balances and Turns in Rhythmic Exercises, Journal of Physical Education Research for Boys, Volume 3, Issue 5, Zagazig University.
3. Bazaar Ali Jukal, Manhal Nabil Bouya, Nivan Yasser Abdullah (2025): "The Effectiveness of Functional Training on Some Immunological and Physical Variables in Soccer Players," Published Research, Journal of Physical Education Studies and Research, University of Dohuk.
4. Hamid Majid Hamid, Zuhair Rashid, Abdulstar Khudair Abbas (2025): "The Effect of Functional Strength Training on the Development of Some Physical and Complex Skills of Young Football Players," published research, Misan Journal of Physical Education Sciences, 29(2), 1-10.



5. Omar Mohamed Diab (2022): "The effect of a muscle fitness training program on some basic skills of soccer players," published research, Scientific Journal of Physical Education and Sports Sciences, Vol. 97, No. 3, Faculty of Physical Education for Boys, Helwan University.

6. Mohamed Refai Mustafa (2024): "The effect of functional strength training on some specific physical abilities and passing and shooting accuracy in young football players," published research, Scientific Journal of Physical Education and Sports Sciences, Issue 105, Part 3, Faculty of Physical Education for Boys, Helwan University.

Second: Foreign references

1. Abdi J., Sadeghi H. (2013). The effect of eight-week core stability training program on the dynamic balance in young elite footballers. *Scoliosis*, 8(Suppl 1):P20.

2. American College of Sports Medicine. (2013). *ACSM's Guidelines for Exercise Testing and Prescription* (9th ed.). Lippincott Williams & Wilkins.

3. Behm D., et al. (2023). The importance of core strength for change of direction speed. *PMC*.

4. Bressel, E., & Smith, D. T. (2018). "Functional Training: A New Trend in Strength Training." *Journal of Strength and Conditioning Research*, 22(5), 1762-1768.

5. Christine Cunningham. (2010): The importance of functional strength training, personal fitness professional magazine, American council on exercise publication, April

6. Fabio Camona. (2015): Functional training for sports, Human kinetics champing li., England.

7. Gray Cook, (2013): *Athletic Body in Balance: Core Performance*.

8. Huang, H., et al. (2022). Effect of core training on skill-related physical fitness performance in athletes. *Frontiers in Physiology*.

9. McGill, S. M. (2015). *Core Training: Evidence Translating to Better Performance and Injury Prevention*. Human Kinetics.