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The Effect of Certain Physical Qualities on Playing Lines (Defense, Midfield, Attack) among Under-16 Football Players

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Abstract

This study aimed to identify the nature of the differences in certain physical qualities (endurance, speed, and explosive power) according to playing lines (defense, midfield, attack) among under-16 football players. The sample consisted of 22 players from the Widad Chabab Messaoud Boudjriou team, divided into three groups according to their playing lines (10 defenders, 6 midfielders, and 6 attackers). To achieve the study's objectives, the two researchers adopted the descriptive method in its comparative form and applied a battery of physical tests comprising the Brikci test to measure endurance, the 30-meter sprint test to measure linear speed, and the standing broad jump test to measure the explosive power of the lower limbs. After statistical treatment using the independent-samples t-test, the results showed no statistically significant differences at the 0.05 level among the playing lines in any of the three physical qualities under study, although slight, non-significant differences were recorded in favor of midfielders in endurance and speed, and in favor of defenders and midfielders in explosive power compared with attackers. The study concludes that the under-16 stage is

characterized by convergent physical levels among players regardless of their positions, which calls for attention to general physical development before fine specialization. The study recommended periodic testing and the design of position-specific training programs, while continuing to develop the general physical base of all players at this sensitive age stage.

Keywords: physical qualities; playing lines (defense–midfield–attack); under-16 players.

Introduction

Modern football no longer relies on skill alone; it has become a physical contest of the highest quality. Anyone watching the game today recognizes the extraordinary effort that players expend. They now possess exceptional strength and speed, which allow them to perform defensive and attacking roles with equal efficiency throughout the match. This development is evident in the ferocity of one-on-one duels for the ball and in the ability to devise quick solutions for implementing tactical ideas, such as high pressing and rapid transitions in counterattacks, details that make the difference on today's pitches.

In the face of these transformations, physical training is no longer a single mold applied to everyone; it has become a fine-grained matter that varies across the lines of the pitch (defense, midfield, attack), and especially for the under-16 category. This stage is the most critical in any player's career, because it lays the foundation of his physical and mental development. With the rapid physical and psychological changes that adolescents undergo at this age, scientifically grounded training becomes an absolute necessity to protect them from excessive loads and early injuries and to ensure that their skills develop in line with their future positions on the pitch. In this context, physical preparation emerges as a cornerstone and a decisive element in building the player and the team, and as a main determinant of the capacity to compete and win titles in the future. Mohamed Mufid confirms that raising the level of football performance requires specific physical preparation that is closely tied to the mastery and application of technical skills. And since players' tactical duties vary according to the different playing lines and positions, the efficiency of performance remains contingent on how well physical and skill levels match the functional demands of each position.

On the basis of these considerations, the idea of the present study took shape: to identify and describe the physical and skill characteristics of players according to their playing lines and different positions. This led us to formulate the following central research problem:

Research Problem

- **What is the nature of the differences in the basic physical qualities according to playing lines (defense, midfield, attack) among under-16 football players?**

Sub-questions:

- Do the levels of endurance (stamina) differ according to playing lines among the study sample (U16)?
- Do the levels of speed differ according to playing lines among the study sample (U16)?
- Do the levels of physical strength differ according to playing lines among the study sample (U16)?

Research Hypotheses

A. The General Hypothesis

- The levels of physical qualities differ significantly according to playing lines (defense, midfield, attack) among under-16 football players.

B. The Partial Hypotheses

1. There are statistically significant differences in the level of endurance (stamina) among the three playing lines (defense, midfield, attack) in under-16 football players.
2. There are statistically significant differences in the level of speed among the three playing lines (defense, midfield, attack) in under-16 football players.
3. There are statistically significant differences in the level of strength among the three playing lines (defense, midfield, attack) in under-16 football players.

The Pilot Study

There is no doubt that ensuring the methodical and disciplined conduct of any field research necessarily requires a pilot study, which was the first foundation on which we relied before drawing up the broad outlines of the research. This step aimed to assess the suitability of the field environment for the applied procedures, to verify the scientific validity of the instruments and test batteries used, and to identify potential obstacles so as to avoid them later.

Before embarking on this pilot experiment, we held a series of structured personal interviews with a select group of experts and specialists in sports training and movement science. The discussions centered on fixing the experimental protocol, and the following methodological guidelines were agreed upon:

- **Scheduling the measurements:** distributing the skill and physical tests among homogeneous groups carried out over several days, to avoid cumulative fatigue.
- **Methodological sequence:** observing the scientific progression governing the administration of the tests, and moving procedurally from simple to compound effort (from easy to difficult).

- **Load and rest:** regulating the nature of the muscular work accompanying each package of tests, while ensuring that the players (under-16, U16) are given sufficient rest intervals between tests to achieve functional recovery.
- **Timing:** scheduling the testing hours in the evening, after the adolescents' school day ends, specifically between 5:00 and 7:00 p.m., to ensure the stability of the players' psychological and physiological state.

The methodological and organizational aims of this limited field experiment were defined in the following main points:

- **Spatial planning:** inspecting and laying out the spaces and pitches allocated for the physical tests, and estimating the areas required to carry them out safely.
- **Training the assisting staff:** forming an assisting team of field practitioners and training them specifically in the measurement protocols and in recording results accurately.
- **Technical inspection of the equipment:** verifying in practice the soundness and suitability of the technical means and devices used in measurement (such as stopwatches and morphological measuring devices).
- **Calibrating the movement sequence:** verifying the effectiveness of the dynamic sequence and the tactical order adopted in administering the test battery to the members of the sample, and ascertaining how seriously the testees took the tests and how genuinely they responded to them.

Table (1): Reliability, validity, and objectivity coefficients of the tests used in the research

Test / coefficient	Degrees of freedom	Significance level	Tabulated r	Reliability coefficient	Validity coefficient	Objectivity coefficient
30 m sprint	9	0.05	0.602	0.894	0.94	0.72
Standing broad jump	9	0.05	0.602	0.91	0.95	1
VO2max (Brikci test)	9	0.05	0.602	0.70	0.83	1

The Main Study

After verifying the suitability of the selected physical tests by establishing their quality indicators (reliability and validity), the final tests were administered to the research sample. The tests were applied to groups, in accordance with the experts' recommendations regarding the methodology and sequence of their application. The experiment took place at the Boughaba Abdesselam stadium in Messaoud Boudjriou, Constantine.

In this study we used the descriptive method in its comparative form (a comparative study), in order to reveal the differences in physical qualities among the defense, midfield, and attack lines. The descriptive method is the method that describes what exists and interprets it; it is concerned with determining the conditions and relationships that exist in reality, and also with identifying common or prevailing practices and recognizing the beliefs and attitudes of individuals and groups.

The Study Sample

The selection of the sample aims to draw a representative subset whose functional characteristics suit the nature of the field research, so as to ensure a precise scientific treatment of the problem posed.

The researchers relied on "purposive (deliberate) sampling" to select the research sample, given the requirements of the field assessment of playing lines. In its final form the sample comprised **22 players** from the Widad Chabab Messaoud Boudjriou under-16 team (U16), distributed by tactical specialization according to the positions and levels of play on the pitch, as shown in detail in Table (2).

Table (2): Distribution of the sample by playing line

Playing line	Number of players
Defense	10
Midfield	06
Attack	06
Total	22

Justifications for controlling and excluding sample members: To ensure the homogeneity of the extracted data and the absence of bias in the results, the following methodological exclusion criteria were applied:

- Exclusion of goalkeepers, numbering **(2 goalkeepers)**, because their specialized physical and technical requirements differ from those of the outfield players.
- Exclusion of **(4 players)** who were unable to complete the prescribed test battery owing to irregular attendance.
- Exclusion of **(2 players)** who suffered physical injuries that prevented them from completing the field measurements.

Data Collection Instruments

The Tests

Tests are among the most widely used methods in the field of physical education and sport, being the basis of objective assessment and the most effective way of arriving at accurate results in scientific research.

Proposed tests:

A. Physical tests

- **Standing broad jump test:** Purpose of the test: to measure the explosive power of the lower limbs (thigh and leg muscles).
- **30 m linear sprint test:** Purpose of the test: to measure linear (sprint) speed.
- **Brikci test (endurance):** Purpose of the test: to measure the level of aerobic capacity (VO2max), expressed as maximal aerobic speed (MAS).

Units of measurement: Brikci test, distance covered in five minutes (m); 30 m sprint, time (s), where lower values indicate faster running; standing broad jump, distance (m).

Presentation and Analysis of the Results of the Comparison among the Playing Lines, U16 Category

Table (3): Results of the comparison between the defense and midfield lines, Brikci test, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
Brikci test (m)	U16 – Defense	10	1277.5	131.38	-1.99	2.14	14	0.05	Not significant
	U16 – Midfield	06	1410	124.25					

The results shown in Table (3), concerning the significance of the differences between defenders and midfielders in the Brikci test among U16 football players, indicate that the arithmetic mean of the defenders was 1277.5 with a standard deviation of 131.38, while the arithmetic mean of the midfielders was 1410, which is higher than that of the defenders. This means that the midfielders' aerobic capacities were greater than those of the defenders. The standard deviation for the midfielders was 124.25, which is slightly lower than that of the defenders, which means that the midfielders' levels are marginally closer to one another than the defenders'.

That is, the level of aerobic capacity (MAS) does not differ markedly between defenders and midfielders (U16), despite slight differences in favor of the midfielders.

Table (4): Results of the comparison between the defense and attack lines, Brikci test, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
Brikci test (m)	U16 – Defense	10	1277.5	131.39	0.05	2.14	14	0.05	Not significant
	U16 – Attack	06	1273.3	205.20					

The results shown in Table (4), concerning the significance of the differences between defenders and attackers in the Brikci test among U16 football players, indicate that the arithmetic mean of the defenders was 1277.5 with a standard deviation of 131.39, while the

arithmetic mean of the attackers was 1273.3, which is very close to the former. This means that the aerobic capacities of the two lines were very similar. Calculating "t", which expresses the significance of the differences between the means, we found that the calculated "t" equals 0.05, which is less than the critical "t" of 2.14 at n−2 (14) degrees of freedom and a significance level of 0.05. This is evidence that the differences between the two groups are not statistically significant.

That is, the level of aerobic capacity (MAS) does not differ between the defense and attack lines.

Table (5): Results of the comparison between the midfield and attack lines, Brikci test, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
Brikci test (m)	U16 – Midfield	06	1410	124.26	1.40	2.23	10	0.05	Not significant
	U16 – Attack	06	1273.33	205.20					

The results shown in Table (5), concerning the significance of the differences between midfielders and attackers in the Brikci test among U16 football players, indicate that the arithmetic mean of the midfielders was 1410 with a standard deviation of 124.26, while the arithmetic mean of the attackers was 1273.33, which is lower than that of the midfielders. This means that the midfielders' aerobic capacities were greater than those of the attackers. The standard deviation for the same sample was 205.20, which is greater than that of the midfielders, which means that there are clear differences in the levels of the attacking line's players.

That is, the level of aerobic capacity (MAS) does not differ markedly between the midfield and attack lines (U16), despite differences in favor of the midfielders.

Table (6): Results of the comparison between the defense and midfield lines, 30 m sprint without the ball, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
30 m sprint without the ball (s)	U16 – Defense	10	4.82	0.32	1.31	2.14	14	0.05	Not significant
	U16 – Midfield	06	4.61	0.29					

The results shown in Table (6), concerning the significance of the differences between defenders and midfielders in the 30 m sprint without the ball among U16 football players, indicate that the arithmetic mean of the defenders was 4.82 with a standard deviation of 0.32, while the arithmetic mean of the midfielders was 4.61, which is lower than that of the defenders. This means that the midfielders are relatively faster than the defenders. The standard

deviation for the same sample was 0.29, which is lower than that of the defenders, which means that the levels of the defenders and midfielders are close.

That is, the level of speed without the ball does not differ markedly between defenders and midfielders (U16).

Table (7): Results of the comparison between the defense and attack lines, 30 m sprint without the ball, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
30 m sprint without the ball (s)	U16 – Defense	10	4.82	0.32	0.17	2.14	14	0.05	Not significant
	U16 – Attack	06	4.80	0.23					

The results shown in Table (7), concerning the significance of the differences between defenders and attackers in the 30 m sprint without the ball among U16 football players, indicate that the arithmetic mean of the defenders was 4.82 with a standard deviation of 0.32, while the arithmetic mean of the attackers was 4.80 with a standard deviation of 0.23. This indicates that the level of 30 m sprint speed without the ball is close for the defense and attack lines, and that there are no differences in level between the two lines.

Table (8): Results of the comparison between the midfield and attack lines, 30 m sprint without the ball, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
30 m sprint without the ball (s)	U16 – Midfield	06	4.61	0.29	-1.25	2.23	10	0.05	Not significant
	U16 – Attack	06	4.80	0.23					

The results shown in Table (8), concerning the significance of the differences between midfielders and attackers in the 30 m sprint without the ball among U16 football players, indicate that the arithmetic mean of the midfielders was 4.61 with a standard deviation of 0.29, while the arithmetic mean of the attackers was 4.80, which is higher (that is, slower) than that of the midfielders. This means that the midfielders are relatively faster than the attackers. The attackers' standard deviation was 0.23, which is close to that of the midfielders.

That is, the level of speed without the ball does not differ markedly between the midfield and attack lines (U16), although there are slight differences in favor of the midfielders.

Table (9): Results of the comparison between the defense and midfield lines, standing broad jump test, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
Standing broad jump test (m)	U16 – Defense	10	2.22	0.14	-0.31	2.14	14	0.05	Not significant
	U16 – Midfield	06	2.24	0.11					

The results shown in Table (9), concerning the significance of the differences between defenders and midfielders in the standing broad jump test among U16 football players, indicate that the arithmetic mean of the defenders was 2.22 with a standard deviation of 0.14, while the arithmetic mean of the midfielders was 2.24, which is very close to that of the defenders. This means that the level of explosive power of the leg muscles is close between the two lines. The midfielders' standard deviation was 0.11, which is very close to the former.

That is, the explosive power of the leg muscles does not differ markedly between the defense and midfield lines.

Table (10): Results of the comparison between the defense and attack lines, standing broad jump test, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
Standing broad jump test (m)	U16 – Defense	10	2.22	0.14	1.67	2.14	14	0.05	Not significant
	U16 – Attack	06	2.10	0.12					

The results shown in Table (10), concerning the significance of the differences between defenders and attackers in the standing broad jump test among U16 football players, indicate that the arithmetic mean of the defenders was 2.22 with a standard deviation of 0.14, while the arithmetic mean of the attackers was 2.10, which is lower than that of the defenders. This means that defenders are distinguished by greater explosive power of the leg muscles than attackers, while the attackers' standard deviation was 0.12, which is close to that of the defenders.

That is, the explosive power of the leg muscles does not differ markedly between the defense and attack lines, despite slight differences in favor of the defenders.

Table (11): Results of the comparison between the midfield and attack lines, standing broad jump test, U16

Test	Sample	n	Mean	Standard deviation	Calculated t	Critical t	df	α level	Statistical significance
Standing broad jump test (m)	U16 – Midfield	06	2.24	0.11	2.06	2.22	10	0.05	Not significant
	U16 – Attack	06	2.10	0.12					

The results shown in Table (11), concerning the significance of the differences between midfielders and attackers in the standing broad jump test among U16 football players, indicate that the arithmetic mean of the midfielders was 2.24 with a standard deviation of 0.11, while the arithmetic mean of the attackers was 2.10, which is lower than that of the midfielders. This means that midfielders are distinguished by greater explosive power of the leg muscles than attackers, while the attackers' standard deviation for the same sample was 0.12, which is close to that of the midfielders.

That is, the explosive power of the leg muscles does not differ markedly between the midfield and attack lines, despite differences in favor of the midfielders.

Discussion of the Study Hypotheses

1. Discussion of the Partial Hypotheses

The three partial hypotheses predicted statistically significant differences among the playing lines (defense, midfield, attack) in endurance, speed, and strength, respectively, among football players under 16 years of age.

a. Endurance (aerobic capacity) – first partial hypothesis:

From Tables 3, 4, and 5, concerning the aerobic capacity test (the 5-minute Brikci test), it became clear to us that the level of aerobic capacity does not differ markedly among football players under 16 across the different lines, despite slight differences in favor of the midfielders compared with the defense and attack lines.

This is relatively consistent with the study of Eid (2012), entitled "Physical and Skills Characteristics According to Playing Positions among Soccer Beginners in the West Bank," which confirms that there are no statistically significant differences at the 0.05 significance level in the physical characteristics of players in the different playing positions among football juniors in the West Bank.

It contradicts the study of Boukhalfa and Ben Abboud (2012–2013), entitled "The Physical Requirements of the Football Player According to Playing Positions (Defense, Midfield, Attack)," which confirms the existence of statistically significant differences among the playing lines (defense, midfield, attack) in the endurance component in favor of the midfielders.

It also contradicts the study of Younus (2011), entitled "A Comparative Study of the Elements of General and Specific Physical Fitness among Football Playing Lines," which confirms the existence of differences in some elements of general and specific physical fitness (agility, general endurance, explosive power of the legs, speed endurance, and strength endurance of the legs) among the playing lines.

b. Linear (sprint) speed – second partial hypothesis:

From Tables 6, 7, and 8, concerning the 30-meter sprint test without the ball, it became clear to us that the level of linear speed does not differ markedly (statistically) among all lines in football players under 16, despite slight differences between midfielders and attackers in favor of the midfielders.

This is relatively consistent with the study of Younus (2011), which confirms the existence of a slight disparity in some elements of physical fitness (linear speed among the playing lines), and with the study of Eid (2012), which confirms that there are no statistically significant differences at the 0.05 significance level in the physical characteristics of players in the different playing positions among football juniors in the West Bank.

It contradicts the study of Boukhalfa and Ben Abboud (2012–2013), which confirms the existence of statistically significant differences among the playing lines (defense, midfield, attack) in the speed component in favor of the attackers.

c. Explosive power of the lower limbs (thigh and leg muscles) – third partial hypothesis:

From Tables 9, 10, and 11, concerning the standing broad jump test, we found that the level of explosive power of the lower limbs (thigh and leg muscles) does not differ markedly among football players under 16 across the different lines, despite slight differences in favor of the defenders and midfielders compared with the attackers. This is relatively consistent with the study of Younus (2011), which found that the levels of the defense and attack lines are close in the explosive power of the legs.

It is likewise relatively consistent with the study of Eid (2012), which confirms that there are no statistically significant differences at the 0.05 significance level in the physical characteristics of players in the different playing positions among football juniors in the West Bank.

It contradicts the study of Boukhalfa and Ben Abboud (2012–2013), in which it was found that there are statistically significant differences among the playing lines (defense, midfield, attack) in the strength component in favor of the attackers.

2. Discussion of the General Hypothesis

From the discussion of the partial hypotheses, it became clear to us that the level of aerobic capacity does not differ markedly among football players under 16 across the different lines, despite slight differences in favor of the midfielders compared with the defense and attack lines.

The level of linear speed does not differ markedly (statistically) among all lines in football players under 16, despite slight differences between midfielders and attackers in favor of the midfielders.

In addition, the level of explosive power of the lower limbs (thigh and leg muscles) does not differ markedly among football players under 16 across the different lines, despite slight differences in favor of the defenders and midfielders compared with the attackers.

Accordingly, the partial hypotheses and the general hypothesis were not confirmed: the levels of the physical qualities studied do not differ significantly according to playing line in this age category.

The level of physical qualities among football players under 16 (defense, midfield, attack) was close across the different lines, as follows:

- The level of aerobic capacity does not differ markedly among football players under 16 across the different lines, with slight differences recorded in favor of the midfielders compared with the defense and attack lines.
- The level of linear speed does not differ markedly among all lines in football players under 16, with slight differences recorded between midfielders and attackers in favor of the midfielders.
- The level of explosive power of the lower limbs (thigh and leg muscles) does not differ markedly among football players under 16 across the different lines, with slight differences recorded in favor of the defenders and midfielders compared with the attackers.

Conclusion

Sports training in the contemporary football system has witnessed successive leaps and developments, driven chiefly by the tireless pursuit of the latest scientific methods and means capable of raising players' physical capacities. This methodological orientation aims to prepare and qualify sports cadres at all technical, physical, and psychological levels, so as to ensure that they enter official competitions with high efficiency, reach the podium, and achieve the targeted goals.

The formulation of standardized training programs, built on solid scientific foundations that respect contemporary theories and physiology of sports training and keep pace with the dynamic demands of modern football, is the essential tool for bringing players to football maturity and high sporting levels, especially when dealing with the youth and junior categories, which represent the future reservoir of the clubs.

From this methodological perspective, the great importance emerges of designing training plans based on continuous and objective assessment, and of identifying precisely the points of strength and weakness through a set of standardized physical tests and measurements tailored to the type of activity and to the different playing positions.

In this context, the present research focused on a comparative study of certain physical qualities among football players of the under-16 category at the Widad Chabab Messaoud Boudjriou

club, according to the three playing lines (defense, midfield, attack). The field results and the statistical analyses of the experimental sample showed no statistically significant differences in the physical qualities studied that could be attributed to playing lines, with only slight, non-significant differences in favor of the midfielders in endurance and speed and in favor of the defenders and midfielders in explosive power, so that we were finally able to confirm that: The overall level of physical capacities and qualities among under-16 football players of the Widad Chabab Messaoud Boudjriou team was largely close and homogeneous across the different playing lines (defense, midfield, attack).

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