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A comparative study of some physiological variables among players of the Sports Talent Center in football aged (14-15) years before and after the implementation of the training units' program for a period of one month

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Abstract

This study sought to identify specific physiological variables in football players aged 14–15 years at the Sports Talent Center and to compare the values of these variables before and after one month of training sessions conducted at the center. The study's significance resides in providing accurate scientific indicators of the players' physiological state and the degree of change during the training period thus promoting to the scientific evaluation and observing of training programs for emerging age groups.

The researcher used a observational comparative approach, as it was appropriate for the nature and objectives of the study. Measurements of specific physiological variables were taken for the players at the Sports Talent Center using a physiological scale. Measurements were taken before the start of the follow-up period and repeated after one month of regular training sessions at the center. The study involved a range of physiological variables related to body composition and the players' functional status.

The findings demonstrated a discrepancy in the values of some physiological variables between the pre- and post-measurements, revealing the changes that emerged in the players during the study period. The findings also confirmed the importance of implementing

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physiological measurements in observing layers' state and evaluating training programs, as these measurements supply objective information that helps coaches in proper planning and direction of the training process.

The researcher advocated the necessity of applying periodic monitoring of the physiological variables of young players in sports talent centers, and incorporating the results of modern measurements in assessing training loads and developing programs designed for this age group in addition to conducting similar studies on other variables and age groups.

Keywords: Physiological scale, physiological variables, skeletal muscle mass, calories burned, body fat

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introduction

Football is a sport that demands high levels of physical and physiological efficiency to attain optimal performance particularly in the early age stages which denote the foundation in building the player in the future, and can also be used in recruiting and choosing players.

Football has always been and is still considered the world's number one sport in terms of enjoyment, organization, and excitement. Furthermore training methods continue to expand through the introduction and development of new playing styles and the innovation of modern tactical approaches. This has resulted in a game characterized by power, speed, skillful play and tactical maneuvers that add to the beauty of matches and create a high level of excitement and enjoyment. All of these elements are directly associated to the quality of the player, comprising their natural talent and physiological characteristics. This is where the variations between players become apparent. Previously a player's physiological potential was revealing by their performance level, such as their capacity to play for extended periods or their ability execute new skills – what we call the improvement of their technical and physical abilities. Today, however it is possible to monitor the physiological changes that exist in players using modern equipment that provides more precise data than the experience of the coach themselves. While the coach's expertise in examination is still valued, and we don't want to reduce the role of training specialists, the data provided by this equipment offers a more comprehensive understanding of the game. The specialist is a quantitative data that more accurately and profoundly illustrates the shape of development and change in the body's physiological functions.

Sports talent facilities are important institutions that aim to identify and nurture athletic talent founded in sound scientific principles. Assessing physiological variables is important scientific method for establishing the level of functional adjustment of different body systems in athletes. These variables assist to identifying physical and functional capabilities and directing training programs to align with the growth and developmental characteristics of the target age group.

Hence came the idea of researching the use of a physiological medical scale which would measure these variables to monitor the development and progress of players especially for the targeted age groups, as they are in the growth stage with the aim to give a clear indicator to the specialized coach to monitor his players more deeply and also to know the level of his training program if it is advantageous to his players. In addition the medical scale can be an advance warning device that alerts the coach to injuries before they arise if the player is weak or if the player’s level is slow in development, so that he can make modifications to the training program to serve his work. From this viewpoint we note that many studies have concentrated on measuring

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some physiological variables as one of the basic measures to identify the body's reaction to the training load, such as the study of Mahmoud Abdel Fattah and Omar Bin Saeed (2018, pp. 22-40) on the differences in some physiological variables and body composition between players of the Premier League and the First Division, and the study of Ahmed Youssef Hussein (2021, pp. 112-129) on the influence of body mass index and its components on the explosive power of the lower limbs in junior volleyball players. The study by Mohammed Hassan Al-Obaidi et al. (2019; pp. 45-58) used the InBody 770 device to measure the percentage of fat, muscle mass, and water distribution in the body. The study by Laila Bint Saleh Al-Hashem (2022; pp. 210-225) monitored the hydration status (water balance) and body composition during the general preparation period. The study by Ibrahim Sayed Tawfiq (2020; pp. 301-330) investigated the effect of a recommended training program on some biochemical and physiological variables and body composition of volleyball players.

Nevertheless the aforementioned studies studied the physiological variables as a single unit and did not distinct each variable for a deeper understanding, which is somewhat of a weakness that needs more detail. This is where our research comes in to provide professionals with a more precise and clearer view of the effect of training load on players.

The 14-15 age group is important stage in the physical and physiological development of football players. However many training programs are implemented without depending on accurate scientific data that clarifies the level of physiological variables in these players. Furthermore the scarcity of studies focusing on this age group within sports talent centers necessitates understanding the fact of certain physiological variables among them. Therefore the research issue is defined as an attempt to identify and scientifically examine the level of certain physiological variables in football players aged 14-15 at sports talent centers.

Hence, the significant of studying some physiological variables among the players of the Sports Talent Center in football, aged (14-15) years and comparing them before and after a month of training units at the center is highlighted, as it provides scientific indicators that help coaches and researchers in developing the training process and raising the level of sports performance.

The study also aims to:

.1 determining the values of some physiological variables among the players of the Sports Talent Center in football aged (14-15) years before implementing the training units program.

.2 Identifying the values of some physiological variables among the players of the Sports Talent Center in football aged (14-15) years after applying the training units program for a month.

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.3 contrast between the results of the pre- and post-measurements of some physiological variables among the players of the Sports Talent Center in football aged (14-15) years.

.4 identifying impact of the training unit program implemented at the Sports Talent Center on the development of some physiological variables in players.

Method and Tools

Research Methodology: The researchers implemented the illustrative approach with a comparative study method, as the research sample was selected purposively. "The selection of the research participants is associated with the population from which it is taken as the sample is that part of the population on which the tests are carried out under scientific rules and methods so that it accurately represents the population" (Abbas; 2012). The research population was (20) players from the sports talent schools teams in Baghdad. The research sample was selected intentionally because of their resemblance in some physical features such as height, weight and age in order to start with one starting line during the experiment, and their number was (8) players which represents 40% of the original population. The experiment was conducted by conducting two tests, pre and post, in order to monitor the physiological developments that occurred during training.

Methods of Data Collection

The researchers depended on measurements taken using a physiological medical scale for some of the targeted variables in the research as the primary method for gathering information to guarantee accuracy in data extraction for the research sample.

Tools and Equipment Used in the Research:

.1Physiological scale for tracking certain physiological variables.

.2Measuring tape.

.3A modern mobile instrument for installing the specialized application for the physiological scale to directly extract data.

.4The application particular to the instrument used in the research.

Measurements:

.1A physiological scale was used to calculate operational indicators via its dedicated application. The scale's operation is explained in Appendix(1).

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.2A measuring tape was used to accurately determine the players' heights for data entry into the device's software within the mobile application before the empirical study began.

.3Skeletal muscle mass, caloric intake and body fat percentage were reported for each player.

.4Initial data for the players, including age, weight, and height, was recorded throughout the preliminary phase of the research to enable comparisons between players during the measurement of physiological variables, as shown in the table below.

Table1. shows the ages, weights and heights of the players.

ت	Age	Weight	Tallness
1	14	47	160
2	14	49	161
3	15	54	162
4	14	49	159
5	14	51	157
6	15	55	166
7	15	54	164
8	15	56	168

Pilot Study:

The pilot study was carried out on (4) players from the original community at the Sports Talent Center for Football. They were consequently excluded due to their differences from the sample in terms of training age, weight and height to guarantee a single starting point for the research sample. This took place on Sunday February 1, 2026, at the Sports Talent Schools fields in Baghdad at 5:00 PM. During the pilot study the device used in the research was tested and the players' data was entered to determine any barriers before starting the main experiment. This pilot study (is a preliminary experimental study executed by the researcher on a small sample before applying the main experiment) (Jumah, 2014).

Main Experiment

The main experiment began on Tuesday, February 3, 2026, at 5:00 PM. The team educated four times per week at the Al-Mawhiba Sports Complex in Baghdad. Each training session continued between 90 and 120 minutes, with the fifth session comprising of a match. Physiological variables were measured throughout the first week for monitoring purposes. These variables involved skeletal muscle mass calorie expenditure, and body fat percentage during physical

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activity within each training session for each player in the sample. The data was preserved via a committed program installed on a mobile application (pre-test). The data was then entered into specific forms for analysis by the researchers after the target period (30 days). A second measurement and follow-up (post-test) was conducted to identify differences and identify the extent to which the research objective was achieved. Table 2 shows the initial pre-test measurements for the research sample. (Abd et al., 2025) state that this work enables coaches to monitor individual player reactions during different training periods, thus helping to improve performance efficiency. Physical and reducing the risk of fatigue resulting from overexertion".

Table2. showed the pre-physiological measurements.

Sequence	Lean muscle Mass (kg)	Skeletal muscle (%)	Calories consumed	Fat%	Fat (kg)
1	26.4	32.4	1402.4	6.5	3.9
2	23.5	30.1	1329.4	5.0	2.8
3	28.6	29.8	1660.5	10.8	7.3
4	27.1	31.5	1512.1	6.4	4.0
5	32.3	33.6	1786.7	11.4	8.5
6	26.6	30.9	1570.2	10.3	6.7
7	25.1	28.7	1603.2	11.3	7.0
8	28.1	27.5	1642.1	13.2	9.2

Statistical Analysis of Data

The researchers used the Statistical Package for the Social Sciences (SPSS) software to process the data extracted from the medical scale by implementing the following statistical tests:

.1The t-test for matched samples to compare variations between physiological variables.

.2The arithmetic mean to calculate the average of the physiological values documented during the training sessions.

.3The standard deviation to measure the variance between the values logged for the players.

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Results

Table3. showed the post-test physiological variables.

Sequence	Lean muscle Mass (kg)	Skeletal muscle (%)	Calories consumed	Fat%	Fat (kg)
1	27.3	33.1	1430	6.0	3.7
2	24.4	31.0	1355	4.7	2.7
3	29.7	30.7	1692	10.2	7.1
4	28.2	32.2	1545	5.9	3.8
5	33.6	34.4	1822	10.7	8.2
6	27.8	31.8	1605	9.6	6.4
7	26.3	29.5	1635	10.6	6.7
8	29.4	28.3	1678	12.4	8.8

Table4. showed the means standard deviations and calculated t-values between the variables identify the statistical differences using the t-tset.

Variable	Test	Arithmetic mean	Standard deviation	Value (t)	Significance	Type of differences
Lean muscle Mass (kg)	**post**	**26.63**	**2.58**	**11.45**	**0.000**	**Significant**
	Pre	**27.83**	**2.76**			
Skeletal muscle (%)	**post**	**30.65**	**1.94**	**7.54**	**0.000**	**Significant**
	Pre	**31.35**	**1.91**			
Calories consumed	**post**	**1563.3**	**143.2**	**10.22**	**0.000**	**Significant**
	Pre	**1595.2**	**147.2**			
Fat%	**post**	**9.36**	**2.77**	**6.84**	**0.000**	**Significant**
	Pre	**8.76**	**2.17**			
Fat (kg)	**post**	**6.13**	**2.21**	**5.42**	**0.001**	**Significant**
	Pre	**5.92**	**2.16**			

The significance level was set at degree of freedom (7) and an error level of 0.05 the tabulated t-value was 2.36 .

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Discussion

Before progressing with the discussion, the researchers intend to clarify the importance of using the device as one of the modern tools for measuring non-traditional physiological variables, i.e.. it does not depend on the usual pattern such as medical analyses and others but rather the work of the medical physiological scale is based on safe multi-frequency bioelectrical resistance technology. It emerged through the results acquired by the researchers using the medical scale that it provides a detailed and precise view of the distribution of body masses, and this allow the researchers to monitor the level of change that transpired in the research sample and each player individually. Khalifa (2026) indicates that the use of devices (makes the exercises more challenging and encourages the sample to achieve the goals specified in each training unit).

The significance of this device lies in its capacity to identify net skeletal muscle mass and the allocation of fluids, muscle tissue, and fat. This is important for football players in their growth years, as it enabled us to confirm that the increase in the players' weight was a "qualitative" (muscular) augmentation not a "quantitative" (fat) one. Moreover supplying researchers with data on the rate of calorie consumption facilitated to understanding the efficiency of internal energy burning in the sample making the device used an indispensable diagnostic tool in designing modern training programs and confirming that the training process proceeds according to sound physiological principles, away from guesswork.

By providing the results in Table No. (4), it became clear that there were statistically significant differences between the pre-test and post-test in favor of the post-test in all physiological variables. The computed value of (t) for net muscle mass was (11.45), for the percentage of calories consumed was (10.22), and for the percentage of fat was (6.84). These values are greater than the tabulated value, which confirms the effectiveness of the training units developed by the technical staff.

Here, the researchers would like to explain some key points regarding the positive development achieved in the research sample:

.1 The age of the target group in the research, as these ages are characterized by accelerated growth and response to training. This is supported by the figures shown through countries (4) of muscle development and the amount of calorie consumption through the significant change and the appearance of development results in a remarkable way. Nahla Obaid and Shahd Jassim (2024) indicate that “training affects the physical abilities and performance of skills among young football players in specialized schools who are between 14 and 16 years old directly and effectively,” (the

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increase in net muscle mass and skeletal muscle indicates the investment of natural growth energy and directing it towards muscle building through specialized sports training (Ahmed, 2010)).

.2 The impact of regular training units, which were suitable to the age group and thus the training program facilitated to bringing about physiological development. This explains the significant difference between the pre-test and post-test, which is involved in countries (3 and 4) in the amount of calories consumed by the research sample, which was extracted through the medical scale device.

.3 The relationship between the variables: increasing the level of skeletal muscle by a significant percentage necessarily led to an enhancement in the body mass index and general ability, which is reflected positively on the physical and skill performance of football players. (Abdul Saheb; 2025) indicates that "exercises greatly help in getting rid of excess weight by reducing the percentage of fat in the body," and this is what the results showed in Table No. (4), where the calculated value of (t) became.(6.84)

.4 Changes in body composition: We examine a decrease in body fat percentage accompanied by an increase in muscle mass suggesting "body reshaping." The training did not cause to random weight loss but rather improved body quality by increasing muscle tissue and decreasing fat tissue.

Summary of the Discussion:

These findings confirm that daily training sessions have attained their objectives in the physiological changes of the players.

(Abd et al., 2025) stated, "These studies will facilitate to a deeper understanding of the physical factors affecting performance as well as the design of specialized training models and programs based on scientific data." Furthermore, physiological measurements using a medical balance device have proven their ability to more accurately track these changes providing coaches and researchers with a precise means of assessing the physical condition of players.

Conclusions

.1The valuable biological response through the four weekly training sessions resulted in a significant physiological response leading to a substantial improvement in the players' physical improvement during the research period.

.2The efficiency of modern technology revealed by the use of a medical scale as an accurate tool for identifying and tracking subtle physiological changes makes it a necessary alternative to traditional measurements.

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.3Improved muscle development as the results demonstrated an increase in skeletal muscle mass indicating the effectiveness of the training load in promoting muscle tissue in young athletes (aged 14-15).

.4Improved metabolic efficiency as the sample measured a significant increase in basal metabolic rate a physiological indicator of increased bodily activity and the vitality of internal systems resulting from regular training

Recommendations

1. Continuous tracking of athletes' physiological balances by coaches at sports talent schools on a regular basis for two months to monitor muscle mass development and ensure the lack of physical strain.

2. preserving the training intensity. Since the athletes have shown a good response to four training sessions it is suggested to maintain this intensity and gradually increase the number of training sessions in the upcoming phases to achieve maximum technical and physiological benefits.

3. performing future studies that link these physiological variables to physical abilities in general.

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