ISSN: 2392-5442
ESSN : 2602-540X
V/13 N/02 Year/2026
P 272 - 288

Sport system journal

International scientific journal published by:
Ziane Achour –Djelfa- Algeria

Received: 2026-07-02 A ccepted: 2026-08-14

# Medical monitoring using the "InBody" device and its role in controlling visceral fat and maintaining the health of U20 football players.

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**Abstract:**
This study aims to highlight the role of modern technologies in general, and the **InBody 770** device in particular, in measuring the amount of visceral (internal) fat in the body. It also seeks to evaluate the effectiveness of this device in providing accurate and reliable results, considering it an effective tool for improving the physical health and athletic performance of football players. The test was conducted on a sample of 17 football players from the Chabab Dar El Beida team in the Under-20 (U20) category. The results revealed varying levels of visceral fat among the players, emphasizing the importance of regular medical monitoring using such modern devices to assess and maintain athletes' health and physical condition.

**Keywords:** Medical monitoring, InBody 770 device, visceral fat, health, football.

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## 1. INTRODUCTION

Medical monitoring has recently assumed a central and highly significant role within the global sports system, as achieving optimal and highly efficient competitive performance now requires accurate, continuous, and systematic monitoring of athletes' health and physical condition (Talha Hamza Ben Laabed & Abdelrahim, 2021; Toselli, 2022). Such care is no longer considered a secondary option or merely a procedural requirement; rather, it has become an essential obligation and a fundamental responsibility of coaches, managers, and club administrators to ensure players' safety and protect them from the risks of muscular injuries and physiological fatigue through regular medical examinations (Larsen et al., 2021).

With the rapid scientific advances witnessed worldwide, modern sports training has become closely linked to scientific and technological innovations within the framework of what is known as **Sport 4.0**. Despite the high financial costs that these advanced technologies impose on club budgets, the training process has evolved in both structure and methodology to align with this technological progress. This evolution has introduced sophisticated diagnostic tools that are well suited to the demands of modern training and the characteristics of different athlete populations, particularly in football. Football is among the sports that attract the greatest public and media attention worldwide, which requires its players to possess advanced levels of physical, physiological, and psychological capacities in order to meet the demands of high-intensity competition. In this context, the Under-20 (U20) category occupies a particularly important position, as it represents a crucial developmental stage in the preparation of elite athletes (Dahmania Nour Islam & Saraiya Djamel, 2024).

The Under-20 (U20) category is of great and particular importance in the athlete development pathway, as it represents a critical stage of physiological maturation and the transition toward elite performance levels. Consequently, there is a pressing need to incorporate highly accurate medical monitoring tools aimed at optimizing overall performance. This can only be achieved through appropriate planning and systematic monitoring of athletes with regard to training loads and recovery processes, relying on the latest biotechnological devices, such as the **InBody 770**, which analyzes body composition and measures various physiological indicators, including muscle mass, fat mass, body water percentage, cellular components, and even visceral fat.

The danger of visceral fat lies in the fact that it is an invisible type of fat that can accumulate within the abdominal cavity and surround vital organs, even in athletes who appear to have a well-developed athletic physique. Such fat may promote the secretion of inflammatory compounds that negatively affect the efficiency of the cardiorespiratory system and impair post-exercise muscle recovery following intense physical exertion. This, in turn, increases the risk of injuries and premature fatigue, ultimately compromising athletes' health and performance. In light of the above, the following research question arises:

To what extent does medical monitoring through modern technologies, specifically the InBody 770 device, contribute to reducing the risks associated with visceral fat and enhancing the health status of football players?

Sub-research Questions:

- Can the **InBody 770** device be used to measure the percentage and quantity of visceral fat in athletes?
- Does the **InBody 770** device contribute to the regular monitoring and follow-up of visceral fat levels in football players?

## 2. Study Hypotheses

### 2.1 Main Hypothesis

Medical monitoring using modern technologies, such as the InBody 770 device, plays an effective role in improving the health status of U20 football players by reducing visceral fat levels.

### 2.2 Sub-Hypotheses

The use of modern technologies, particularly the InBody 770 device, enables the measurement of the percentage and amount of visceral (internal) fat in football players.

The InBody 770 device contributes to monitoring and supporting football players in reducing visceral fat levels.

## 3. Research Objectives

This study is of considerable importance at multiple levels, as it contributes to enriching scientific knowledge regarding the use of modern technologies to improve athletes' health status through body composition analysis. The study demonstrates the accuracy and efficiency of the **InBody 770** device in assessing body composition by measuring several physiological indicators, particularly

visceral fat. This reinforces its status as a reliable scientific tool that can be employed in research and studies related to sports training.

Furthermore, these findings open new perspectives for researchers in the field of sports physiology and provide precise reference parameters that may serve as a basis for future studies. They also assist coaches in designing training programs according to athletes' health status. Specifically, the study aims to:

- Examine the contribution of medical monitoring using the InBody device in assessing and evaluating the health status of football players through the accurate measurement of selected body composition indicators.
- Determine the impact of using the InBody device in preventing physical fatigue and reducing the risk of future injuries.
- Investigate the contribution of modern technology to the monitoring and accurate assessment of athletes' visceral fat levels, as well as guiding them toward reducing excessive visceral fat.

## 4. Significance of the Study

The significance of this study lies in highlighting the role of medical monitoring using modern technologies in maintaining the health of football players, particularly those in the Under-20 (U20) category, which represents a critical stage in the physical and physiological development of athletes. The use of advanced assessment technologies, such as the **InBody** device, constitutes a highly effective and distinctive means of obtaining accurate measurements of body composition, including body fat percentage, visceral fat, muscle mass, intracellular water, and other physiological indicators.

Such measurements provide a comprehensive understanding of players' physiological status and enable coaches to regulate training loads in a systematic and scientific manner. Consequently, this contributes to improving players' physical and athletic performance, enhancing their development, preventing injuries, reducing physical fatigue, and optimizing recovery processes.

Furthermore, this study has important practical implications, as its findings may be utilized to improve and refine training programs within sports clubs. It also holds scientific significance by enriching the academic literature related to medical monitoring and opening new avenues for future research in this field (Maly, T., Mala, L., & Zavodny, R., 2022).

### 5.Reasons for Choosing the Topic

#### 5.1.Subjective Reasons

- Personal interest and motivation to study the topic.
- The topic is closely related to the researcher's field of specialization.
- The novelty and contemporary relevance of the topic.
- The feasibility of conducting both theoretical and field research on the topic.

#### 5.2. Objective Reasons

- To highlight the significant role of medical monitoring in maintaining the health of football players.
- To emphasize the importance of medical monitoring in enhancing players' physical performance.
- To demonstrate the effectiveness of the **InBody** device in monitoring the physiological status of players, particularly visceral fat levels.
- To identify the risks associated with visceral fat, especially its impact on physical performance.
- To raise coaches' awareness of the necessity of regular medical monitoring of their players in order to maintain physical fitness and optimize performance levels (Ling, C. H., de Craen, A. J., Slagboom, P. E., Westendorp, R. G., & Maier, A. B., 2021).

### 6.Definition of Concepts and Terms

**Medical Monitoring**

Medical monitoring refers to the procedures undertaken by sports physicians to assess and supervise the physiological status of athletes, with the aim of early detection, prevention, and management of injuries. It also includes the treatment and follow-up of athletes suffering from illnesses or injuries through regular evaluations designed to facilitate their rehabilitation and safe return to sport.

**InBody Device**

The **InBody** device is an advanced electronic instrument based on the technology of Direct Segmental Multi-frequency Bioelectrical Impedance Analysis (**DSM-BIA**). In the present study, it is used as a primary field assessment tool to provide

immediate and individualized numerical measurements of players' body composition, particularly visceral fat area and level, body fat percentage, and muscle mass. The device outputs and graphical reports are employed to evaluate the effectiveness of training programs and to support the physiological and physical monitoring of athletes.

**Football**

Football is a competitive team sport that has existed for centuries. It involves two teams competing under a set of rules established by the **International Football Association Board (IFAB)**. The game is played on a rectangular field, and each team attempts to score more goals than its opponent in order to win the match.

**Health**

Health refers to the balanced physical and physiological condition of an athlete, which can be quantitatively assessed through precise biological and anthropometric indicators, such as visceral fat levels, muscle mass, and recovery status. This state ensures the absence of injuries and disorders and enables athletes to tolerate training loads and achieve the highest possible level of sports performance.

**Visceral Fat**

Visceral fat refers to the amount of adipose tissue accumulated within the abdominal cavity and surrounding the internal organs of the athlete. It is quantitatively measured and evaluated using body composition assessment devices through indicators such as visceral fat area (expressed in square centimeters). Low or stable visceral fat levels within the optimal range (below level 10) are considered indicators of the effectiveness of nutritional and training programs, as well as of the athlete's physiological health.

**7.Previous and Related Studies**

**Study by Mala et al. (2020)**

This study investigated body composition and morphological characteristics among elite youth football players in the U17 and U20 categories. The researchers employed a multi-frequency bioelectrical impedance analysis (BIA) technique—the same technology used by the **InBody** device—to perform a detailed segmental analysis of body composition. The findings revealed that maintaining optimal

levels of trunk fat and deep fat is closely associated with improved trunk flexibility, enhanced responsiveness, and greater agility among U20 players. The study also recommended regular monitoring of these body composition components in order to prevent lower back and pelvic injuries resulting from imbalances between fat and muscle distribution.

**Study by Mitchell et al. (2022)**

The study conducted by Mitchell et al. (2022) focused on examining the relationship between visceral obesity, segmental body composition, and physical performance among elite U20 football players. The researchers administered a series of physical performance tests, including endurance and explosive strength assessments, alongside body composition measurements. The results demonstrated that increases in visceral fat levels were associated with reductions in maximal oxygen uptake (**$VO_2$ max**) and impaired aerobic performance, even when players' overall body weight remained within the ideal range. These findings highlight the importance of the **InBody** device in detecting hidden visceral obesity that may hinder physical development and athletic performance.

**Study by Campa, Lukaski, and Colleagues (2024)**

In their study entitled *"Bioelectrical Impedance Analysis in Professional and Semi-Professional Football: A Scoping Review"*, Francesco Campa, Henry C. Lukaski, and their colleagues examined how elite football clubs utilize bioelectrical impedance analysis (BIA) devices, such as **InBody**, to monitor visceral fat and assess **Phase Angle**, an indicator of cellular membrane integrity. The review emphasized the usefulness of these technologies in monitoring players' physiological status, protecting them against oxidative stress, and reducing the risk of sports injuries.

**Study by Antonio et al. (2019)**

Antonio et al. (2019) aimed to scientifically evaluate the accuracy and effectiveness of the multi-frequency bioelectrical impedance analysis device (**InBody 770**) in assessing body composition by comparing it with **Dual-Energy X-ray Absorptiometry (DEXA)**, which is considered the gold standard in body composition assessment.

The study was conducted on a sample of 41 athletes, including 29 females and 12 males, all of whom had extensive training experience averaging approximately ten years. Throughout the four-week study period, participants followed a low-energy, calorie-restricted diet while maintaining their regular training routines without any modifications. The findings demonstrated that the **InBody 770** provides highly

accurate measurements of body composition and represents a practical and reliable tool for monitoring changes in athletes' body composition in both research and applied sports settings.

**Methodological Procedures Adopted in the Study**

**Pilot Study**

The pilot study is considered a scientific tool for exploring emerging topics that lack sufficient accumulated knowledge or previous data clarifying their different dimensions. Accordingly, immediately after completing the exploratory phase and identifying the target sample, the research instrument was administered to the study participants in order to collect the field data necessary to achieve the objectives of the present study (Al-Khatib, 2021, p. 67).

## 8.Methodological Procedures

Testing the research hypotheses in a rigorous and controlled scientific manner required the establishment of a clear methodological framework. This process involved selecting the most appropriate scientific method, employing effective research tools for field data collection, and applying statistical techniques suitable for the nature and type of the variables under investigation. Scientific principles were also taken into consideration in selecting the research sample and determining its size to ensure adequate representation of the target population and to facilitate the achievement of the study objectives objectively and scientifically.

### 8.1.Research Method

The selection of an appropriate research method constitutes one of the most important stages in the scientific research process, as it determines the procedures for collecting data and information concerning the phenomenon under investigation. Based on the nature of the present study, the **descriptive method** was adopted, as it allows the investigation of prevailing facts related to a particular phenomenon, situation, group of individuals, or specific conditions (Obeidat et al., 2020, p. 122).

Researchers commonly employ this method to explore new areas of study that lack sufficient knowledge, with the aim of obtaining accurate and detailed information about the elements of the phenomenon under investigation, thereby enhancing understanding and facilitating the development of future interventions or procedures.

### 8.2.Study Population and Sample

In accordance with the research topic, namely *the role of medical monitoring using the InBody 770 device in maintaining the health of U20 football players*, a purposive sample consisting of **20 players** from the **Amal Chabab Dar El Beida U20 football team** was selected. These players were chosen because of the availability of regular training records, which allowed accurate body composition measurements using modern technological assessment tools (Al-Samouk, 2019, p. 48).

**8.3.Research Settings**

- **Spatial Setting:** The field study was conducted at the **University of Algiers 3, Dely Ibrahim**, specifically in the laboratory designated for measurement and evaluation.
- **Temporal Setting:** Data collection and testing procedures were carried out on **January 25, 2026**.
- **Institutional Setting:** The assessments were conducted at the **Laboratory of Sciences and Practices of Rhythmic Physical and Sports Activities**, Institute of Physical Education and Sports, University of Algiers 3, Dely Ibrahim.

**8.4.Research Instruments**

The following instruments were used in this study:

- **InBody 770 body composition analyzer**
- **Computer**
- **Printer**

**8.5.Statistical Analysis**

The statistical procedures employed in this study mainly included:

- **TGSXV 2024 software**, integrated with the InBody device for body composition analysis.
- **SPSS software (Version 22)** for statistical data processing.

The following descriptive statistical measures were used:

- **Arithmetic Mean:** Also referred to as the mean average, it is the most frequently used measure of central tendency and is defined as the sum of all observed values divided by the total number of observations.
- **Standard Deviation:** A statistical measure indicating the extent to which values are dispersed around the arithmetic mean.
    - A **small standard deviation** indicates that the values are relatively homogeneous and closely clustered around the mean.
    - A **large standard deviation** indicates substantial variability and

marked differences among sample participants.

In the present study, the standard deviation was used to:

- Determine the degree of homogeneity or variability in visceral fat values.
- Assess the effectiveness of the device in identifying individual differences among players.
- Strengthen statistical interpretations and facilitate the verification of research hypotheses.

The standard deviation is calculated using the following formula:

**Standard Deviation** = $\sqrt{[\Sigma(X - \bar{X})^2 / N]}$

where $X$ represents an observed value, $\bar{X}$ the arithmetic mean, and $N$ the number of observations.

## 9. Presentation and Analysis of the Results

### 9.1.Presentation and Analysis of the Results of the First Hypothesis

**Hypothesis Statement:** The use of modern technology, such as the InBody 770 device, enables the measurement of visceral fat levels in football players.

**Table 1.** Descriptive Statistics of the Morphological Characteristics and Visceral Fat Levels of the Study Sample

| Variable | Mean ± SD | Minimum | Maximum | Interpretation |
|---|---|---|---|---|
| Age (years) | 16.53 ± 0.51 | 16.00 | 17.00 | The sample was homogeneous and belonged to the U20 category. |
| Height (cm) | 171.74 ± 5.67 | 160.00 | 181.90 | Players exhibited relatively homogeneous anthropometric characteristics. |
| Weight (kg) | 59.21 ± 7.15 | 48.40 | 75.10 | Moderate variability in body weight was observed among players. |
| Visceral Fat | 33.34 ± 14.18 | 12.90 | 73.40 | Considerable inter-individual variability in visceral fat levels was observed. |

The results presented in Table 1 provide a comprehensive analysis of the morphological indicators and their relationship with visceral fat levels among the

study participants. The visceral fat variable recorded a mean value of **33.34** with a standard deviation of **14.18**. The findings revealed considerable variability in the distribution of visceral fat values, which ranged from a minimum value of **12.9** to a maximum value of **73.4**.

This marked variation clearly reflects differences in body composition and morphological characteristics among the athletes. However, such variability does not necessarily indicate a decline in overall physical fitness. Rather, it may be attributed to individual differences in metabolic rate, dietary habits adopted by each athlete, and the body's adaptation to the prescribed training programs.

## 9.2. Presentation and Analysis of the Results of the Second Hypothesis

**Hypothesis Statement:**

The InBody 770 device contributes to supporting football players in monitoring, modifying, and reducing visceral fat levels.

**Table 2.** Descriptive Statistics of the Recommendations Provided by the InBody 770 Device for Adjusting Visceral Fat Levels among U20 Football Players

| Variable | Mean ± SD | Interpretation |
|---|---|---|
| Age (years) | 16.53 ± 0.51 | The sample was homogeneous and belonged to the U20 category. |
| Height (cm) | 171.74 ± 5.67 | Players exhibited relatively similar anthropometric characteristics. |
| Weight (kg) | 59.21 ± 7.15 | Moderate variability in body weight was observed among the players. |
| Recommended Adjustment in Visceral Fat Level (kg) | 0.12 ± 3.34 | The recommendations provided by the InBody 770 device varied among players, indicating individualized guidance for either reducing or increasing body weight and visceral fat according to each athlete's physiological profile. |

The results presented in Table 2 provide a detailed and comprehensive analysis of the morphological indicators and their relationship with the recommendations proposed by the **InBody 770** device for regulating visceral fat and body mass among the study participants. This variable recorded a mean value of **0.12 kg** with

a standard deviation of **3.34 kg**.

The findings revealed considerable variability in the distribution of these recommendations among the athletes. The values ranged from a minimum recommendation of **−8.4 kg**, recorded for player No. 9, indicating the greatest need for body mass and visceral fat reduction, to a maximum recommendation of **+5.8 kg**, recorded for player No. 14, indicating a need for body mass gain.

This marked variation clearly reflects the differences in body composition and morphological characteristics among the athletes. However, such variability does not necessarily indicate differences in overall physical fitness levels. Rather, it may be attributed to individual differences in metabolic rate, adherence to recommended nutritional guidelines, dietary practices adopted by each athlete, the body's adaptation to prescribed training loads, and the specific tactical playing position occupied by each player within the team.

These findings highlight the usefulness of the **InBody 770** device in providing individualized recommendations and supporting the physiological monitoring of athletes, thereby facilitating personalized interventions aimed at optimizing body composition and improving health and performance outcomes.

## 10.Discussion of the Hypotheses Results

### 10.1.Discussion of the Results of the First Hypothesis

The findings obtained from the field measurements confirm the effectiveness of the **InBody 770** device as a precise laboratory tool for assessing body composition in football players. The physiological indicators of the study sample revealed that visceral fat values were within the recommended healthy range (below **100 cm²**). This finding is of considerable importance in elite sports training, as both **Martinez and Silva** and the studies conducted by **Pritchard** emphasize that maintaining optimal visceral fat levels is a fundamental requirement for preventing metabolic disorders and ensuring the proper functioning of the cardiorespiratory system.

From a biomechanical perspective, **Hussein (2022)** argues that the accumulation of visceral fat constitutes a non-functional body mass that increases athletes' inertia, thereby negatively affecting explosive speed and agility performance. Furthermore, these findings support the validity of the first research hypothesis.

According to **Thompson**, the ability of multi-frequency **Bioelectrical Impedance Analysis (BIA)** technology to accurately assess visceral fat provides coaches and sports medicine professionals with objective data that can be used to optimize training load management and regulate nutritional strategies in order to maximize energy production and prevent metabolic fatigue.

It can therefore be concluded that the implementation of such modern technologies represents an essential scientific approach for predicting health and performance risks, enhancing athlete monitoring, and ultimately achieving optimal athletic performance and overall health.

**10.2.Discussion of the Results of the Second Hypothesis**

The statistical analysis results presented in the table strongly confirm the validity of this hypothesis and highlight the pivotal role of the **InBody 770** device in the medical and sports monitoring of athletes and in maintaining their health. Although the study participants represented a highly homogeneous youth group in terms of age and apparent anthropometric characteristics, such as height and body weight, the device, through its multi-frequency technology, was able to identify substantial individual differences in body composition.

This is clearly reflected in the relatively high standard deviation of the recommendations (**3.34**) compared with their overall mean (**0.12**), which is consistent with the findings of **Martinez et al.**, who emphasized that assessing internal body composition in apparently healthy athletes goes far beyond the traditional **Body Mass Index (BMI)**, which may fail to detect hazardous fat distribution around the visceral organs.

On the one hand, the device successfully identified players exhibiting critical levels of visceral fat that require targeted intervention. For instance, **Player No. 14** received a recommendation of **+5.8 kg**, while **Player No. 16** received a recommendation of **+2.8 kg**, indicating the need for specific body composition adjustments. According to **Javier (2022)**, such findings necessitate early intervention to prevent metabolic disorders and physiological fatigue during physical exertion.

On the other hand, the device accurately identified players with particularly favorable body composition profiles, such as **Player No. 9**, who received a recommendation of **−8.4 kg**. According to sports physiologist **Stewart**, such profiles may reflect superior training adaptation and metabolic efficiency among certain athletes; however, they still require continuous monitoring to maintain

optimal physiological functioning and energy balance.

Based on these findings, it can be concluded that the **InBody 770** device constitutes an essential guidance tool that provides coaches and medical staff with scientifically grounded, individualized profiles for each player. Such information enables personalized monitoring and intervention strategies aimed at regulating or reducing excessive visceral fat, thereby contributing directly to the improvement of overall physical performance and the preservation of athletes' health and well-being.

## 11. CONCLUSION

In conclusion, the present study was founded on the central premise that regular medical monitoring using **InBody technology** constitutes a cornerstone in regulating visceral fat levels and preserving the health and safety of football players. Based on the findings obtained, the first hypothesis was confirmed, as the biological analysis device demonstrated high efficiency in the early and accurate detection of hidden morphological and body composition alterations. The extracted indicators revealed significant physiological and structural differences among players despite their belonging to the same age category and training level. This finding confirms that visceral fat is more closely associated with individual metabolic characteristics and playing positions than with total body weight alone.

Similarly, the second hypothesis was also validated by highlighting the crucial guiding role of this technology for both medical and technical staff. The data generated by the device enable the transformation of numerical recommendations into practical field-based strategies, including the design of individualized nutritional programs and tailored training loads aimed at reducing excessive visceral fat surrounding internal organs. Simultaneously, these interventions contribute to enhancing muscle mass, preventing injuries, and minimizing tissue breakdown.

The study therefore concludes that implementing body composition assessment systems within football clubs should not be considered merely an organizational procedure, but rather an essential preventive and developmental strategy for promoting athletes' long-term health and optimizing their physical and physiological performance.

Based on the analytical findings of the study and the individual differences identified in players' body composition, the following recommendations are

proposed:

- **Mandatory periodic assessments:** Clubs should implement regular and systematic body composition evaluations using the **InBody 770** device as part of routine medical monitoring programs.
- **Integration among medical and technical staff:** Continuous coordination and regular meetings should be established among team physicians, strength and conditioning coaches, nutritionists, and technical staff in order to translate biological data into practical training applications.
- **Focus on youth categories:** Biological monitoring programs should be systematically applied to youth and junior players, given the importance of these developmental stages in biological maturation and the establishment of optimal morphological characteristics for future professional athletes.
- **Investment in sports technology:** Professional clubs and sports federations are encouraged to invest in advanced body composition analysis technologies, such as the **InBody 770**, and incorporate them into their medical facilities rather than relying solely on traditional indicators such as body weight and Body Mass Index (BMI).
- **Individualization of training and nutrition programs:** Coaches and sports nutrition specialists should use body composition data to develop personalized intervention programs that address the specific physiological needs of each player.

Overall, the integration of advanced body composition technologies into sports medicine and athlete monitoring systems represents a fundamental scientific approach for reducing the risks associated with hidden obesity, preserving athletes' physiological health, and maintaining optimal levels of physical and technical performance throughout the competitive season.

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