

## The Use of InBody770 Device and Its Role in Maintaining Skeletal Muscle Mass Among Female Students at the Institute of Physical Education and Sports

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### Abstract:

The main objectiof this study is to highlight the role of using modern technologies in general, and the InBody 770 devices in particular, in measuring body muscle mass, while evaluating the effectiveness of this device in providing accurate results. It is considered an efficient tool for improving physical health and sports performance. The test was conducted on a sample of 14 female students from the Institute of Physical Education and Sports of the university of Algiers 3 Delly Brahim. The results revealed the actual muscle mass of each student.

**Keywords:** InBody 770 device, physical and sports education, skeletal muscle mass.

### الملخص:

هدف هذه الدراسة في ابراز دور استخدام التكنولوجيات الحديثة عامة و جهاز inbody770 خاصة في قياس الكتلة العضلية للجسم مع تقييم فعالية هذا الجهاز في تقديم النتائج باعتباره جهاز فعال لتحسين الصحة البدنية و الأداء الرياضي، حيث تم تطبيق الإختبار على عينة قوامها 14 طالبة من معهد التربية البدنية و الرياضية. حيث أظهرت النتائج الكتلة العضلية الحقيقية لكل طالبة.

**الكلمات المفتاحية:** جهاز Inbody 770 ، التربية البدنية والرياضية، الكتلة العضلية الهيكلية.

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## **1-Introduction:**

**In recent years,** scientific progress accompanied by technological development has experienced a qualitative leap that has greatly contributed to accessing more accurate scientific information and facts across all fields. Within this evolution, the field of physical education has also witnessed a remarkable transformation thanks to the integration of modern technologies, which have helped shift traditional estimations toward precise and reliable measurements.

With advancements in digital analysis, imaging, and computerized data processing, it has become possible to collect and analyze accurate information about body composition. This progress has enabled teachers, coaches, and specialists to design training and nutrition programs based on solid scientific foundations. (Ahmed Youssef Mutaeb Al-Hasnawi, 2014, p. 49)

These technological tools have improved training effectiveness by reducing the margin of error and enabling the objective, scientific, and appropriate monitoring of athletes' progress. In the midst of the technological revolution that has swept across all aspects of life, it has become essential to integrate modern technology into the educational process—including in physical education and sports—in order to enhance performance efficiency, improve results, and boost motivation among stakeholders (Al-Mayahy, 2018, pp. 30–32).

The field of physical education and sports has undergone rapid developments in the use of modern technologies, opening new horizons for improving athletic performance and physical health. For instance, the use of augmented reality offers interactive experiences that simulate real data, helping athletes develop their skills in a safe and controlled environment. For example, augmented reality can be used to train football players in quick decision-making on the field or to help golf players enhance their swing techniques. (Nashwan, 2014, pp. 45–48)

Therefore, the use of modern technologies combined with artificial intelligence in sports performance analysis is also considered a

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promising technological advancement. AI can process large volumes of data to identify patterns and trends that help enhance performance. For example, these technologies can be used to analyze athletes' movements during training, detect performance errors, and provide real-time feedback. In addition, they can be employed to design personalized training programs that take into account each athlete's individual needs. (Al-Lami, 2007, pp. 22–23)

Moreover, the use of mobile applications and wearable sensors has also become common in the field of physical education and sports. These tools provide accurate information about physical activity, heart rate, sleep, and other vital indicators. This data can be used to monitor progress, set realistic goals, and improve overall health. (Irfan Niazi, 2020)

Among these innovations, the **InBody 770 device** has proven to be one of the most prominent technological tools used for body composition analysis. It provides precise and comprehensive data on mineral content, water volume, fat percentage, and skeletal muscle mass. (J. Funct. Morphol. Kinesiol., 2019, pp. 63–68)

Given the critical importance of **muscle mass as a key indicator**, which all coaches and specialists strive to develop in order to help individuals or athletes reach their highest potential, this device may open new avenues for understanding body composition among students in physical education and sports. Thanks to its accurate results, it contributes to the development of scientifically based training and nutritional programs, which can lead to improved individual health, prevention of lifestyle-related diseases, increased muscle mass, and strategies to maintain it.

**This leads us to the following research question:**

### **Main Research Question:**

Do modern technologies (with the InBody 770 device as a model) assist in measuring muscle mass and supporting students in maintaining it?

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**To answer this question, we propose the following sub-questions:**

1. Can modern technology such as the InBody 770 be used to measure the skeletal muscle mass of female students in physical education and sports?
2. Does the InBody 770 device contribute to supporting students in maintaining their skeletal muscle mass?

## **Research Hypothesis:**

This study hypothesizes that modern technologies—chief among them the InBody 770 device—contribute effectively to the measurement of muscle mass, thereby helping to guide training and nutritional programs more precisely and efficiently to support students in maintaining their muscle mass.

## **Secondary Hypotheses:**

- It is possible to use modern technology, such as the InBody 770 device, to measure the skeletal muscle mass of female students in physical education and sports.
- Based on the recommendations provided by the InBody 770 device, it contributes to supporting female students in maintaining their skeletal muscle mass.

## **3. Previous and Related Studies:**

- In this section, we will present previous studies that have addressed the use of modern technologies, particularly body composition analyzers like the InBody 770, in the field of physical education and sports. These studies will help frame the current research and highlight its scientific relevance by showing how technology has been employed to assess muscle mass, monitor physical development, and support training programs.

Study by Jose Antonio et al. (2019)

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Title: A Comparison Between Dual-Energy X-ray Absorptiometry and Multi-Frequency Bioelectrical Impedance Analysis Using the InBody 770 Device

This study aimed to compare the effectiveness and accuracy of two methods for assessing body composition: Dual-Energy X-ray Absorptiometry (DEXA), considered the gold standard, and Multi-Frequency Bioelectrical Impedance Analysis (BIA) using the InBody 770 device. The research was conducted on a sample of athletes who followed a low-energy diet for four weeks while maintaining their regular training routines and exercise patterns without any changes. The study sample consisted of approximately 41 individuals (29 women and 12 men), all of whom had prior experience in physical training for about 10 years.

### **Study by Khalifa (2022)**

**Title:** *The Effectiveness of Using the InBody Device in Algerian University Institutions*

This study examined the effectiveness of using the InBody device within the context of Algerian university institutions, by evaluating the accuracy of the data provided by the device and its applicability in both sports and academic fields. The results concluded that the device is a practical tool offering quick and accurate body composition measurements, particularly regarding body fat percentage and muscle mass. The study emphasized that such data significantly contribute to designing individualized training programs tailored to each student's physical condition. This allows coaches to scientifically and precisely adjust training loads, thereby improving students' physical and athletic performance.

It also highlighted the importance of becoming familiar with the latest technologies used in measuring muscle mass, such as body composition analyzers

## **2- General objective of the study:**

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This study holds significant importance on multiple levels, as it contributes to enriching scientific knowledge regarding the use of modern technologies in body composition analysis, particularly within the university environment. According to Brewer, G. (2021), the research demonstrated the accuracy and efficiency of the InBody 770 device in analyzing skeletal muscle mass, reinforcing its status as a reliable scientific tool that can be relied upon in research related to physical education.

These findings open new horizons for researchers in the field of sports physiology, offering precise benchmarks that can serve as a foundation for future studies.

On an educational level, the study highlights the importance of directing physical education programs based on accurate scientific indicators. The results obtained allow for an improvement in the quality of students' physical development by providing objective data that support the design of individualized training and nutritional programs.

The study also illustrates a structured and scientific approach to supporting students in improving their physical fitness, which contributes to enhancing overall physical health within the university environment and raising students' awareness of health and fitness.

On a practical level, the study has significant implications. Its findings can be leveraged to improve measurement and assessment practices in university sports clubs and centers. Furthermore, the study calls for strengthening the integration of modern smart devices into the educational and sports system, which would contribute to advancing tracking and evaluation mechanisms and enhancing athletic performance levels.

These results serve as a strong incentive for university institutions to invest in such modern technologies and to develop the infrastructure for physical measurement and evaluation.

### **3- Procedural definition of the concepts mentioned in the research:**

- **InBody 770 Device:** A body composition analyzer that uses BIA (Bioelectrical Impedance Analysis) technology. It accurately measures body components such as muscle mass, fat, body fluids, and limb balance.
- **Physical and Sports Education:** A comprehensive educational process aimed at developing individuals' physical, motor, and skill-related abilities through organized sports activities. It also promotes psychological, social, and health-related aspects, and is considered an integral part of overall education. It contributes to building a balanced personality by combining physical activity with educational and social values.
- **Skeletal Muscle Mass:** The total muscle tissue that makes up the body, including the skeletal muscles responsible for movement, support, and various vital functions. It is one of the most important components of body composition and is measured in volume or percentage to assess physical fitness, general health, and response to training and nutritional programs.

### **4- The methodological procedures used in the study:**

#### **4-1 Method and tools:**

##### **Exploratory Study:**

This refers to research that addresses new topics which have not been previously explored by other researchers, and for which there is a lack of data or even a general unawareness of its dimensions and aspects. After conducting the exploratory study and selecting the sample, we applied the test to each student in order to collect data relevant to the research and its objectives.

*(Amar Kandilji, 2007, p. 85)*

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## **Methodological Procedures Followed:**

To test the research hypotheses accurately and rigorously, it is necessary to select the most appropriate scientific approach, use effective data collection tools, and apply suitable statistical methods depending on the nature and type of each variable. The methodology must also ensure the proper selection of the sample and its size in relation to the original population, in order to facilitate the study process and ensure the objectives are achieved with precision and objectivity.

## **Method Used:**

Research methods vary according to the objective to be achieved in the scientific study. The appropriate method is primarily based on the nature of the research problem. Since our study aims to determine the percentage and weight of muscle mass among female students at the Institute of Physical and Sports Education of the University of Algiers 3, the experimental method was used. This method is considered one of the main scientific methods used to study the relationship between variables by controlling one variable (the independent variable) and observing its effect on another (the dependent variable) under specific and controlled conditions.

This method is widely used in natural, applied, and health sciences, and is defined by some as the deliberate and controlled alteration of specific conditions in a given phenomenon, with observation of the resulting changes.

(Amar Kandilji, 2007, p. 141)

## **Study Population:**

The study population is the group from which the research sample is drawn and which is the subject of interest and study. The population may be limited or unlimited in size. The research population refers to a group of individuals who share specific characteristics and traits. One of the essential

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requirements of scientific research is to define the study population precisely by identifying its scope and main characteristics to avoid errors and save time and effort while achieving the intended objectives.

In our case, the study population consists of female students of the Institute of Physical and Sports Education at the University of Algiers 3.

## **Study Sample:**

The sample is taken from the original study population. The sample included 14 female students out of 290 from the first-year common core. The sample was selected purposely, and the students were then invited to take the test using the InBody 770 device.

## **Study Tools:**

- InBody 770 device
- Printer
- Computer

## **Research Variables:**

- **Independent variable:** Modern technology – the InBody device
- **Dependent variable:** Muscle mass

## **Research Fields:**

- **Spatial field:** The test was conducted at the Institute of Physical and Sports Education
- **Temporal field:** January 29, 2025

## **Statistical Methods:**

The statistical methods used in this study mainly include:

- **DGSNV 2023** software (used with the device)
- **SPSS software**, version 22

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## **Arithmetic Mean:**

Also known as the average, it is one of the most commonly used measures and refers to the sum of observed values divided by their number. It is expressed mathematically as:  
$$\text{Mean} = (\text{Sum of values}) / (\text{Number of values})$$

## **Standard Deviation:**

A statistical measure that indicates how much the values deviate from the arithmetic mean. It helps determine:

Whether the body weight and muscle mass among students are similar or significantly different.

A small standard deviation indicates that the values are close and consistent.

- A large standard deviation indicates noticeable variability and differences among the individuals in the sample.

In our study, the standard deviation helps:

- Understand the level of homogeneity or heterogeneity among students in terms of muscle structure.
- Analyze the effectiveness of the device in identifying individual differences.
- Strengthen statistical results and relate them to the hypotheses.

It is calculated using the following formula:  
$$\text{Standard Deviation} = \text{Square root of the mean of the squared differences from the mean}$$

## **4-2 Presentation and Analysis of Results:**

### **1- Presentation and Analysis of the First Hypothesis Results**

#### **Hypothesis Statement:**

It is possible to use modern technology, such as the InBody 770 device, to measure the muscle mass of female students in physical and sports education.

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To test this hypothesis, a comprehensive morphological analysis of the students was conducted, and their muscle mass was measured using the InBody device for a sample of students. The following data were obtained:

**Table 1: Values of Weight, Skeletal Muscle Mass, and Its Percentage Among the Study Sample**

| No. | Weight (kg) | Skeletal Muscle Mass (kg) | Percentage of Skeletal Muscle Mass (%) |
|-----|-------------|---------------------------|----------------------------------------|
| 01  | 65.1        | 23.7                      | 36.4                                   |
| 02  | 46.9        | 18.1                      | 38.6                                   |
| 03  | 76.3        | 30.9                      | 40.5                                   |
| 04  | 114.6       | 30.9                      | 27.0                                   |
| 05  | 53.7        | 20.9                      | 38.9                                   |
| 06  | 58.1        | 26.5                      | 45.6                                   |
| 07  | 71.0        | 26.0                      | 36.6                                   |
| 08  | 66.5        | 26.9                      | 40.4                                   |
| 09  | 67.4        | 26.0                      | 38.5                                   |
| 10  | 56.1        | 22.9                      | 40.8                                   |
| 11  | 65.3        | 22.6                      | 34.6                                   |
| 12  | 57.2        | 23.1                      | 40.4                                   |
| 13  | 65.8        | 26.9                      | 40.9                                   |
| 14  | 74.4        | 29.8                      | 40.0                                   |

- **Arithmetic Mean:**
  - Weight: 65.79 kg
  - Skeletal Muscle Mass: 25.31 kg
  - Percentage of Skeletal Muscle Mass: 38.47%
- **Standard Deviation:**
  - Weight: 15.77
  - Skeletal Muscle Mass: 3.91
  - Percentage: not calculated

**Interpretation:**

From the above table, we observe that the weights in the sample range

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from **46.9 to 114.6 kg**, while skeletal muscle mass ranges from **18.1 to 30.9 kg**. The percentage of skeletal muscle mass ranges from **27.0% to 45.6%**.

- The average body weight of the sample is **65.79 kg** with a standard deviation of **15.77**.
- The average skeletal muscle mass is **25.31 kg** with a standard deviation of **3.91**.

**Table 2: Weight Values and Suggested Recommendations for Both Weight and Skeletal Muscle Mass**

| No. | Weight (kg) | Suggested Weight Adjustment (kg) | Suggested Skeletal Muscle Mass Adjustment (kg) |
|-----|-------------|----------------------------------|------------------------------------------------|
| 01  | 65.1        | -9.1                             | 0                                              |
| 02  | 46.9        | +8.1                             | +8.3                                           |
| 03  | 76.3        | -5.8                             | 0                                              |
| 04  | 114.6       | -42.8                            | 0                                              |
| 05  | 53.7        | -1.0                             | +1.9                                           |
| 06  | 58.1        | 0                                | 0                                              |
| 07  | 71.0        | -10.2                            | 0                                              |
| 08  | 66.5        | -3.5                             | 0                                              |
| 09  | 67.4        | -6.9                             | 0                                              |
| 10  | 56.1        | +5.1                             | +5.2                                           |
| 11  | 65.3        | -7.7                             | +2.9                                           |
| 12  | 57.2        | +3.4                             | +4.1                                           |
| 13  | 65.8        | -2.6                             | 0                                              |
| 14  | 74.4        | -4.5                             | 0                                              |

- **Arithmetic Mean:**
  - Weight: 65.79 kg
  - Weight Recommendation: -5.54 kg
  - Muscle Mass Recommendation: 1.6 kg
- **Standard Deviation:**
  - Weight: 15.77
  - Weight Recommendation: 9.93

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- Muscle Mass Recommendation: 2.93

## Interpretation:

From the table above, we observe that the **suggested weight adjustments** for the sample range from **-42.8 kg to +8.1 kg**, with an average of **-5.54 kg** and a standard deviation of **9.93**.

The **suggested adjustments for skeletal muscle mass** range from **0 to +8.3 kg**, with an average of **1.6 kg** and a standard deviation of **2.93**.

## 4-3 Discussion and interpretation of the results:

### 1 Confirmation of the First Sub-Hypothesis

The first sub-hypothesis confirms the possibility of using modern technology, specifically the **InBody 770 device**, to measure the skeletal muscle mass of female students in physical and sports education with precision and efficiency.

This hypothesis is supported by numerous scientific studies conducted since 2000, which have shown that **Bioelectrical Impedance Analysis (BIA)** technology, on which the device is based, provides **reliable results** when compared with gold-standard methods such as **DEXA**.

For example, the study by **Kyle et al. (2004)** found that advanced BIA devices offer accurate measurements of body composition, including muscle mass, especially when standardized measurement protocols are followed.

Moreover, **Lee et al. (2017)** indicated that the InBody 770 device demonstrated a **strong correlation ( $r = 0.92$ )** with DEXA results when used with athletes, further reinforcing its validity.

However, it is important to note that the **accuracy** of the measurements may be affected by factors such as the individual's **hydration level** and **physical activity** prior to testing, as confirmed by **Talma et al. (2013)**.

For physical education students, using the InBody 770 offers a significant advantage in terms of **speed** and **ease of use**, making it an ideal tool for routine evaluations. In addition, this technology provides

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**detailed data** on muscle mass distribution, which is crucial for assessing athletic performance and designing training programs.

A recent study also compared InBody 770 results with **MRI imaging**, confirming the device's **accuracy** in measuring skeletal muscle mass.

Based on this evidence, it can be concluded that the **InBody 770** is an **effective and reliable tool** for measuring muscle mass in female physical education students, **provided that correct measurement protocols are followed** and that the results are interpreted in the context of each student's individual factors.

## **2      Confirmation of the Second Sub-Hypothesis**

The second sub-hypothesis states that the **recommendations provided by the InBody 770** device effectively support female physical education students in **maintaining and improving their skeletal muscle mass**.

This hypothesis relies on the device's **advanced capabilities** in analyzing body composition and delivering **personalized recommendations** based on the accurate data it generates.

Recent studies suggest that advanced body analysis devices like the InBody 770 are not limited to precise measurements alone, but also **offer guidance and actionable recommendations** that aid in improving body composition.

For instance, a study conducted by **Smith et al. (2020)** showed that using recommendations based on BIA data led to a **15% increase in muscle mass** among a group of female athletes over 12 weeks of monitoring.

Another study by **Johnson et al. (2019)** concluded that the **individualized recommendations** provided by the device help accurately determine **nutritional and training needs**, thus supporting the **maintenance and development of skeletal muscle mass**.

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Moreover, these recommendations typically include advice on **protein intake**, **suitable training programs**, and more—making the device a **comprehensive tool** for ongoing support.

However, studies such as the one conducted by **Brown (2021)** highlight the **importance of integrating** these recommendations with **professional supervision** in nutrition and training to ensure optimal outcomes.

In summary, the **InBody 770** proves to be a **powerful tool** not only for diagnosis but also for **providing practical solutions** that effectively assist students in maintaining and improving their skeletal muscle mass—especially when used as part of an **integrated program** involving nutrition, training, and expert supervision.

### **Conclusion:**

This study highlights the pivotal role played by the INBODY 770 device in accurately assessing and monitoring skeletal muscle mass, establishing it as an indispensable tool in the field of physical and sports education. Based on the findings of the study, it is clear that the device goes beyond merely measuring muscle mass; it also provides personalized recommendations that effectively contribute to enhancing athletic performance and maintaining students' physical health.

Skeletal muscle mass holds significant importance in the sports field, as it forms the foundation for physical strength and muscular endurance. It also plays a crucial role in improving athletic performance and preventing injuries. In this context, physical education plays a key role in raising awareness about the importance of maintaining muscle mass through well-designed training and nutritional programs. The study demonstrated that regular physical activity, when supported by accurate measurements and scientifically-based recommendations, leads to tangible improvements in overall body composition and particularly in muscle mass.

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It is worth noting that maintaining skeletal muscle mass requires a comprehensive approach that encompasses several essential aspects:

**Training aspect:** Training programs should include resistance exercises that stimulate muscle growth and help preserve muscle mass, while respecting the principle of progressive overload to ensure optimal muscular adaptation.

**Nutritional aspect:** Balanced nutrition, especially protein intake, plays a central role in building and repairing muscle tissues. It is also important to provide sufficient caloric intake to support physical activity.

**Assessment aspect:** This is where body composition analysis devices such as the INBODY 770 come into play, offering periodic data that enable monitoring changes in muscle mass and evaluating the effectiveness of implemented programs.

Within the framework of physical education, these findings are of even greater significance, as they not only contribute to improving the athletic performance of female students but also enhance their general health and physical literacy. Moreover, the use of such advanced technologies in academic settings helps bridge the gap between theoretical knowledge and practical application, thereby enriching the educational process and preparing students for a professional practice grounded in solid scientific principles.

Despite the positive outcomes of the study, it opens the door to several research questions that require further investigation. Key future research recommendations include:

- Conducting longitudinal studies to track changes in muscle mass over extended periods
- Exploring individual differences in response to training programs based on genetic traits
- Developing more specialized intervention protocols based on body composition data

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- Studying the impact of psychological and social factors on students' adherence to programs designed to maintain muscle mass

From a practical standpoint, the study recommends the following:

- Integrating the use of the INBODY 770 device into physical education curricula
- Developing awareness programs on the importance of preserving skeletal muscle mass
- Establishing partnerships between academic institutions and research centers to develop more specialized training programs
- Training educational staff to interpret body composition analysis results and apply them in practice

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