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# Analysis of some morphological variables during the month of Ramadan for the Algerian national judo team, senior category

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## Abstract:

The study aimed to investigate the variation on some morphological variables (weight, body mass index, fat mass, lean mass, muscle mass) for the Algerian national judo team's major wrestlers during 2025 Ramadan fasting period where a training camp was held in the city of Staoueli (Algiers)in order to participate to the African Judo Championship, which was held in April 2025 ivory coast. For this purpose, we use the descriptive approach using the IN body 770 , The research population consisted of all the female wrestlers of the Algerian national judo team, numbering (20). The research sample consisted of 13 female judo wrestlers of the Algerian national team, selected purposively. The results showed statistically significant differences in weight and body mass index, while we recorded no significant differences in the remaining morphological variables (fat mass, lean mass, muscle mass).

**Key words:** Judo, Morphological Measurements, Body Mass Index, Lean Body Mass, Fat mass, Bone mass.

## 1. Introduction:

Ramadan is one of the holiest months in Islam and one of the five pillars of the faith. It mandates abstaining from food and drink from dawn until sunset, which can impact performance during training. This, in turn, may affect certain functional and morphological indicators of athletes preparing for various sporting events.

During the current decade, the holy month of Ramadan coincides with the middle of the sports season according to the Judo Federation calendar. Several international and regional competitions take place during or immediately follow this period, requiring athletes to continue their preparations as usual. This necessitates adjustments to training regimens during Ramadan, subject to certain conditions. Even if coaches find it difficult to maintain the same training pace for athletes, who are also affected during the holy month, the training, nutrition, and sleep programs must be carefully considered. The first obstacle that poses a serious threat to athletes is sleep deprivation, which can cause complications and injuries that hinder their development. Dr. Ghlaimy explains, "Sleep during Ramadan can lead to injuries if not adhered to. Elite athletes, who are required to exert high levels of effort, remain susceptible to injuries if they do not respect their usual sleep duration, especially during the first part of the night, which is designated for recovery—something undesirable for athletes." He also bases this on the support of several sports organizations concerned with this issue, which fund research in this area.

The planning of elite athletes' training during Ramadan is a recurring topic of discussion each year, particularly within federations that tend to maintain the same competition schedule as in other months. Coaches reject this approach, arguing that it is impossible to maintain the same intensity while fasting, fearing negative impacts on athletes' health and performance. However, some experts believe that elite athletes can continue their preparations normally during Ramadan, provided they adhere to their training, nutrition, and sleep programs.

Morphological indicators are a fundamental factor in all sports tests and are essential for talent identification (Han, 1988). Mimouni and Antipov (1986) emphasize the potential use of morphological indicators as diagnostic and predictive criteria for

athletic selection, as well as for monitoring and evaluating the effectiveness of high-level training.

Although the impact of intermittent fasting during Ramadan on body measurements and body composition has been questioned, none of the previous studies have attempted to explain the reported changes in these parameters. Furthermore, the systematic reviews that examined the topic were limited to comparing measurements of those indicators outside and during the Ramadan period.

Our current study focuses on the effect of a 15-day training camp during Ramadan, in preparation for the African Senior Championships immediately following its end, on certain morphological variables (body mass index, lean body mass, muscle mass, bone mass, and body fat percentage). Measurements were taken at the beginning of the camp, which coincided with the second week of Ramadan, a second measurement midway through the camp, and a final measurement at the end of Ramadan.

The literature on athletic body composition during Ramadan is largely limited to meta-analyses. It is important to remember that while calorie restriction and fasting have been independently proven to have a positive effect on body composition and weight (Correia et al., 2021), research on body composition during Ramadan has shown that body fat percentage may decrease, increase, or remain the same depending on the actual diet consumed during this period (Haouari et al., 2008). Therefore, some of these findings warrant further investigation in future studies. Interestingly, two studies were conducted on total body water, which remained unchanged during Ramadan. Another meta-analysis also found that food intake, including total calories, carbohydrates, protein, and water, did not change significantly compared to the athlete's usual diet (focusing on young athletes under 19 years of age) (Trabelsi et al., 2020). Consequently, there were no changes in body fat or lean body mass. Regarding body composition, the evidence suggests that athletes can maintain their body mass during Ramadan and, in some cases, even use this period to reduce body fat percentage, provided they receive appropriate nutritional and training support and advice.

Some studies, such as the one by Wandaji and Haddadi (2025), have shown that training during Ramadan has significant negative effects on overall weight or body mass index (BMI). However, a decrease in body fat mass was observed in football players under 19 years old.

In reviewing the results of previous studies, we note that measurements were taken before, during, and after Ramadan, while our study used all three measurements during the holy month. Therefore, methodologically, a direct comparison between the results of those studies and our study is not possible due to the difference in the timing of the measurements (before, during, and after Ramadan).

## 2. Study importance:

- This is a qualitative study in the field of monitoring elite judo athletes.
- It clarifies the effects of high-level athletic training during Ramadan on elite judo athletes.

Based on the results of the current study, we will attempt to answer the following question:

Are there statistically significant differences in some morphological variables during a preparatory training camp held during Ramadan for female members of the national judo team?

3. **Study Objectives**: To determine the effect of holding a preparatory training camp during Ramadan on certain morphological variables.

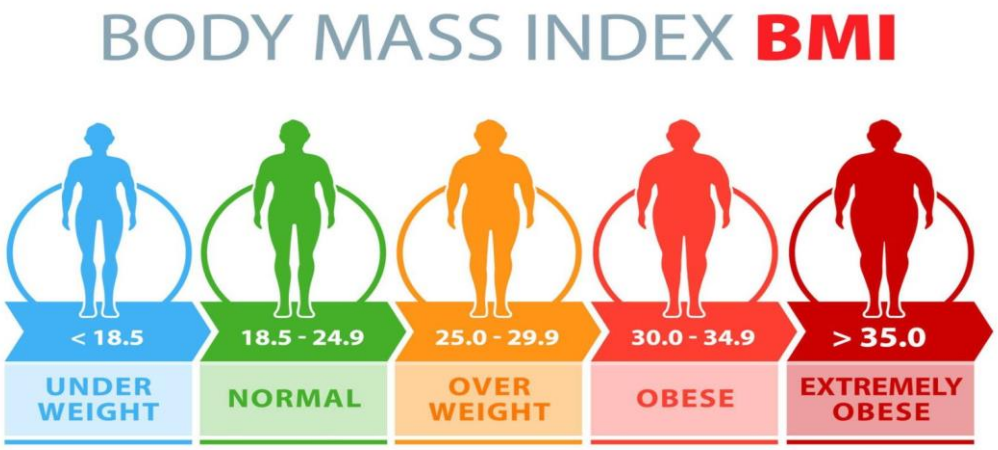
4. **Research Hypothesis**: The research hypothesis was formulated as follows: There is a significant effect of weight, body mass index (BMI), and fat mass, while there is no significant effect of the remaining morphological variables (muscle mass and lean mass) during a preparatory training camp held during Ramadan on the female members of the national judo team.

## 5. Defining Study Terms:

***Judo***: or "The Gentle Way": is a Japanese martial art and sport founded by Jigoro Kano in 1882. It relies on throwing, submission, and control techniques, utilizing the opponent's weight and strength against them.

***Morphological Measurements***: These are anthropometric measurements of body composition and its various proportions, such as body fat percentage, height, circumference, and body mass index (BMI).

***Body Mass Index (BMI)***: A globally recognized measure of obesity calculated by dividing body weight in kilograms by the square of height in meters.




***Lean Body Mass***: This is the total body weight minus fat mass, which is an essential component of the body that plays a vital role in metabolism and essential bodily functions.

***Muscle mass***: This is the total amount of muscle tissue in the body, including skeletal muscle, smooth muscle, and cardiac muscle.

***Fat mass***: Also called lipid mass, this is the total amount of fat cells (adipocytes) and fats (triglycerides) found in the human body, forming adipose tissue.

***Bone mass:*** Bone mass reflects the amount of minerals, especially calcium and phosphorus, that make up the bones, thus determining their strength and resistance.

**6. Methodological Procedures:**

**6.1. Research Methodology:**

During our research, we used the experimental method due to its suitability to the nature of the study, employing three follow-up measurements during the month of Ramadan.

**1.2. Research Areas**:

***Timeframe***: The 2024-2025 sports season.

***Spatial Area***: The training camp was conducted in Staoueli (Algiers). Training took place at the multi-sports hall, specifically in the judo hall, with accommodation provided at the El Mahdi Hotel in Staoueli.

## 2. Data Collection Tools:

Given the nature of the study, measurements of height and weight were taken, along with five tests for:

- Body Mass Index (BMI).
- Fat Mass.
- Lean Mass.
- Muscle Mass.

- Bone Mass. m.os

- Exploratory Phase:

This experiment was conducted on a sample of (13) female wrestlers from the Algerian National Judo Team. Dr. Omar Chlihi, an assistant coach, facilitated this study and allowed us to conduct the research tests on the sample. This included assessing the suitability and validity of the equipment and tools used for measurement, determining the time required for the tests, and verifying the validity and appropriateness of the research test forms.

Study Population and Sample:

The research population consisted of all (20) female wrestlers from the Algerian National Judo Team. The research sample comprised 13 female judo wrestlers from the Algerian National Team, selected purposively. These wrestlers represent the elite of the sport and participated in the preparatory training camp held in Algiers in anticipation of the African Judo Championships, which took place in April 2025 in Côte d'Ivoire.

## 3. Research Methods:

The researchers used an InBody 770 device to take anthropometric measurements. Height was also measured using a tape measure.


Figure 1 - Measurement kit inbody770

## 4. Statistical Analysis:

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) v27 to calculate the following: arithmetic mean, standard deviation, repeated measures analysis (NR), and effect size.

## 5. Analysis and Discussion of Results:

### 5.1. Presentation of Hypothesis Testing Results:

**Hypothesis Statement**:

There is a significant effect of the variables of weight, body mass index (BMI), and fat mass, while there is no significant effect of the remaining morphological variables (muscle mass and lean mass) during a preparatory training camp held during Ramadan on the female wrestlers of the national judo team (senior level).

Presentation of the results of the one-way repeated measures analysis (NRA) for the research tests between the three measurements (pre-test, first post-test, and follow-up).

***Table No. (01): Shows the arithmetic mean, standard deviation, and one-way repeated measures analysis values and their significance between the pre-test, first post-test, and follow-up (tracking measurements) in the research tests.***

| TESTS | | Pre measurement | | Firste Post Measurement | | Tracking measurement | | Sig pillai's trace | Sig wilk-lambada | Statistical significance | Sig Mauchly's | Greenhouse-geisser | effect size | Differences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | S | X | S | X | S | | | | | | | Pre and Firste measuremnt | Firste poste m and tracking | Pre and traking ùm |
| age | N= 13 | 22.15 | 3.55 | 22.15 | 3.55 | 22.15 | 3.55 | . | . | . | . | . | . | . | . | . |
| height | N= 13 | 22.15 | . | 22.15 | . | 22.23 | . | . | . | . | . | . | . | . | . | . |
| weight | N= 13 | 68.73 | 13.68 | 68.53 | 13.72 | 70.01 | 13.74 | 0.00 4 | 0.00 4 | significal | 0.047 Unverified | (significal) 0.002 | (huge) 0.47 | 1 N. significal | 0.003 significal | significal0.04 |
| IMC | N= 13 | 24.79 | 4.41 | 24.80 | 4.38 | 25.35 | 4.39 | 0.00 8 | 0.00 8 | significal | 0.03 Unverified | 0.001 | (huge) 0.51 | 1 N. significal | 0.005 significal | 0.01 significal |
| Mass fat | N= 13 | 26.51 | 7.74 | 27.08 | 6.48 | 28 | 6.82 | 0.00 5 | 0.00 5 | significal | 0.001 Unverified | 0.14 N. significal | (big) 0.62 | 1 N. significal | 0.10 significal | 7 N. significal0.29 |
| Lean mass | N= 13 | 51.53 | 5.84 | 50.84 | 4.12 | 50.25 | 4.07 | 0.00 6 | 0.00 6 | significal | 0.001 Unverified | 0.18 (Nsignifical | (big) 0.14 | 1 N 1 significal | 0.09 significal | ( N. significal0.37 |
| Muscle mass | N= 13 | 34.95 | 5.18 | 33.98 | 2.92 | 33.51 | 3.16 | 0.00 8 | 0.00 8 | significal | 0.001 Unverified | 0.22 N. significal | (medium) 0.12 | 1 N. significal | 0.121 significal | |

X; arithmetic mean.

S ; standard deviation.

## 6. Discussion of Results:

Table (1) shows that there are no statistically significant differences in any of the studied morphological measurements between the pre-test and the first post-test. The researchers attribute this lack of difference to the fact that the effects of the training

program implemented during the preparatory camp had not yet begun to appear, especially as the athlete's body adapted after 10 days from the start of Ramadan (pre-test) and then after 18 days (first post-test). It should be noted that the intensity of the training during the first week of the camp was progressively increased in difficulty, which explains the absence of differences in the aforementioned measurements.

However, if we look at Table No. (01), we notice an increase in the weight of the wrestlers in the follow-up measurement compared to the pre-measurement by 1.48 kg. The results indicated significant differences between the first post-measurement and the follow-up measurement. Here, the researchers explain this significance because the wrestlers were in a closed training camp (in a hotel for 15 days) during the month of Ramadan, where the diet was characterized by a noticeable change in the timing of meals compared to the rest of the year. The meals were rich in complex carbohydrates and proteins due to the nature of the holy month and less distributed at the time of eating them, and due to the physical needs required by athletic performance, especially with the scheduling of two training sessions per day. This stimulates the body to form an energy reserve in the form of fat tissue, with a change in the metabolic process by maintaining it, which reduces energy expenditure during rest and promotes its storage, which is also affected by the number of hours of sleep. We noticed, especially during the second week of Ramadan, signs of fatigue and tiredness evident on the faces and bodies of the wrestlers due to lack of sleep and the effects of the month of Ramadan. It is observed during this holy month that there is a change in the biological clock related to the dietary system and the sleep system. The female wrestlers wait until their pre-dawn meal (suhoor) before going to sleep.

The researchers also believe that the hormonal changes associated with fasting, combined with physical exertion, affect the body's metabolism and appetite.

Looking at the results of the study by Shiha Fouad and the study by Tayeb et al., "The Effect of Aerobic Exercise During Ramadan on Some Physical and Biological Health Indicators in Women," the results showed a decrease in the average body mass index (BMI), a decrease in the percentage of fat mass, and an increase in lean mass. Similarly, the study by A., Al-Shammari K., Bartaji Z., et al. (2008), "Kinetics of Lipid Profile Markers During Intermittent Fasting in Ramadan Among Elite Judo Players Maintaining Their Usual Training Load," also showed a decrease in average BMI of 2% ($p < 0.01$) by the end of Ramadan, mainly due to a decrease of $0.65 \pm 0.68$ kg in body fat ($p < 0.05$). This decrease is attributed to changes in certain blood lipid levels.

Our interpretation of the lack of statistically significant differences between the three measurements of fat mass, muscle mass, and fat-free mass is that the overall training volume and intensity were insufficient during the two-week training period, which is practically inadequate for increasing muscle mass.

7. **Conclusions**: Based on the test results, their analysis, and discussion, we found statistically significant differences in weight and body mass index (BMI), while no significant differences were found in the other morphological variables (fat mass, fat-free mass, and muscle mass).

   Maintaining optimal physical and mental readiness is a requirement for high-level judo in preparation for various international competitions, along with continuous monitoring of the athlete's weight. The holy month of Ramadan may coincide with preparatory training camps for athletes, as our study showed, where the results indicated an increase in the weight of female wrestlers. This can negatively impact the wrestlers by creating additional psychological pressure, especially as it precedes a major event like the African Championships, where the focus is often on weight loss, sometimes neglecting other aspects, which can affect the wrestlers' performance during competition.

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