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Determining the morphological profile of junior and senior female judokas on the Algerian national team

تحديد البروفيل المورفولوجي للاعبات فريق الجودو الوطني

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Abstract

The research involved 23 female judokas from the Algerian national team, divided into two categories: cadets (13) and seniors (10), during the 2024-2025 season. The average age of the cadets was 16.31 years; their average weight was 63.29% [sic] and their average height was 1.62 m. In contrast, the seniors had a higher average age of 18.60 years, with an average weight of 68.14% [sic] and an average height of 1.65 m. Looking at the physical characteristics, we observe that the BMI is slightly higher in cadets (24.98) than in seniors (24.05). The muscle mass of the cadets is more significant (26.79% versus 24.08%), but the seniors show greater variability. Fat mass is higher in seniors (36.69%) compared to cadets (34.88%), while cadets have slightly higher bone mass (3.29% versus 3.12%). These results suggest that the cadets have a more homogeneous profile, while the seniors present a more marked heterogeneity, probably due to their age, their sporting experience, and individual differences.

الكلمات المفتاحية:

الجانب المورفولوجي؛ لاعبات الجودو.

ملخص

شملت الدراسة 23 لاعبة جودو من المنتخب الجزائري، قُسّمن إلى فئتين: الناشئات (13) والكبريات (10)، خلال الموسم الرياضي 2024-2025، بلغ متوسط عمر الناشئات 16.31 عامًا، ومتوسط وزنهن 63.29كغ، ومتوسط طولهن 1.62 مترًا، في المقابل بلغ متوسط عمر الكبريات 18.60 عامًا، بمتوسط وزن 68.14كغ، ومتوسط طولهن 1.65 مترًا، بعد عرض وتحليل النتائج نلاحظ أن مؤشر كتلة الجسم أعلى قليلًا لدى الناشئات (24.98) مقارنةً بالكبريات (24.05)، كما أن كتلة العضلات لدى الناشئات أعلى بشكل ملحوظ (26.79% مقابل 24.08%)، بينما تُظهر الكبريات تباينًا أكبر، تكون كتلة الدهون أعلى لدى الكبريات (36.69%) مقارنةً بالنشئات (34.88%)، بينما يتمتع الناشئات بكتلة عظمية أعلى قليلاً (3.29% مقابل 3.12%)، تشير هذه النتائج إلى أن الناشئات يتمتعن بخصائص أكثر تجانسًا، في حين يتظهر الكبريات تباينًا ملحوظًا، ربما بسبب أعمارهن وخبرتهن الرياضية والاختلافات الفردية.

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1. Introduction

Judo is a combat sport recognized at the Olympic Games, requiring a complex combination of physical strengths, technical skills, and mental qualities. Performance in this sport depends largely on the athletes' bodily attributes, which affect their power, speed, coordination, and ability to maintain an appropriate weight for their category (Franchini, Brito, & Artioli, 2014, p. 36). In this context, analyzing the body profile of judokas is a crucial way to grasp the physiological needs of this sport and adjust physical preparation according to age and experience level (Artioli, Franchini, & Lancha, 2010, p. 18).

In the field of female judo, body changes are linked to biological growth and sporting experience. Young female judokas, who are still growing, show significant differences in their body composition, especially regarding muscle mass and body fat. These variations can impact their performance and their ability to adapt to training (Claessens, Lefevre, Beunen, & Malina, 2011, p. 256). In contrast, senior female judokas, having already reached complete morphological and functional development, present more constant characteristics and are better prepared for the demands of high-level competitions (Franchini & Takito, 2016, p. 3).

The comparative study of the morphological characteristics of junior and senior female judokas highlights changes due to growth, sporting experience, and specialization. This approach aims to provide valuable information to coaches and physical trainers to personalize training plans and improve performance based on developmental phases in the sport (Detanico & Santos, 2012, p. 150).

The objective of the present research is:

The main goal of this research is to evaluate the morphological profile of cadet and senior female judokas of the Algerian national team. This will allow for the identification of potential differences related to age, experience, and physical maturity. This study will provide essential scientific references for planning training sessions and for spotting female talents in Algerian judo at a high level.

Hypotheses:

The typical morphological profile of cadet female judokas in Algeria is similar to what is mentioned in international studies for athletes of their age and competition level (Franchini, Brito, & Artioli, 2014; Detanico & Santos, 2012).

The typical morphological profile of senior female judokas in Algeria is also similar to what is described in international studies for athletes of their age and competition level (Franchini, Brito, & Artioli, 2014; Detanico & Santos, 2012).

2. Second Title Material and Method:

This study took place over a period of one year, from December 2021 to the month of December 2022, on the female judokas of the Algerian national team.

2.1 The included population:

23 female judokas divided into two groups: the first being that of the cadets (13) and the second being that of the seniors (10).

2.1.1. Exclusion criteria:

o Subjects presenting injuries.

o Subject who does not train regularly.

2.1.1. General Characteristics:

Are presented in the following table:

Table 1. General characteristics of the sample.

Group	N	Age (years)	Weight (%)	Height (m)
Cadets	13	16,31±0,63	63,29±17,32	1,62±0,07
séniors	10	18,60±0,52	68,14±12,37	1,65±0,069

Source: Values established by the authors

2.2 Ethical considerations:

The coaches and parents of the participants were assured that the information would be collected while respecting confidentiality and anonymity. This study presents no particular risk.

2.3. Data collection method:

Data collection was carried out through morphological measurements:

- Height measurement:

Equipment:

Stadiometer (height rod).

Height was measured in centimeters using the stadiometer fixed to the wall, with the subject in a standing position, barefoot, torso straight, and looking horizontally. The measurement is taken from the top of the head with a solid plastic ruler.

- Measurement of weight, fat mass, lean mass, and bone mass:

Equipment:

SCALE 500 glass impedance meter. Weight was taken using a SCALE 500 glass impedance meter scale, accurate to 0.1%. The subject stands on the scale barefoot, torso straight. 2 hours after eating a meal, with an empty bladder, and the temperature in the room must be constant. Using a large digital screen, the weight is displayed in kilograms (%). After 5 seconds, the rates of fat mass (MG), muscle mass (MM), and bone mass (MO) will be displayed successively in percentage (Decathlon, 2020). To obtain these three masses in kilograms, simply multiply the rate times the weight and divide by one hundred.

• MG (%) = (%MG x Weight)/100

• MM (%) = (%MM x Weight)/100

• MO (%) = (%MO x Weight)/100

2.4. Statistical analysis:

The data were analyzed using the SPSS statistical program (version 20.0).

Quantitative parameters are presented in the form of mean ± standard deviation.

3. Results

3.1. The distribution of parameters:

The table shows that the test value (Shapiro-Wilk) is significant (greater than 0.05), in all parameters studied for seniors as well as for cadets, therefore the two groups are homogeneous.

Table 3. Normality Tests

Functional parameters		Shapiro-Wilk			
Statistic		df	Sig.		
BMI	Seniors	0,908	10	0,265	S
	Cadets	0,912	13	0,297	S
| Muscle Mass	Seniors	0,867	10	0,092	S
	Cadets	0,885	13	0,151	S
Fat Mass	Seniors	0,862	10	0,081	S
	Cadets	0,899	13	0,215	S
Bone Mass	Seniors	0,922	10	0,376	S
	Cadets	0,963	13	0,817	S

Source: Values established by the authors

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

S : significatif. NS : Non significatif

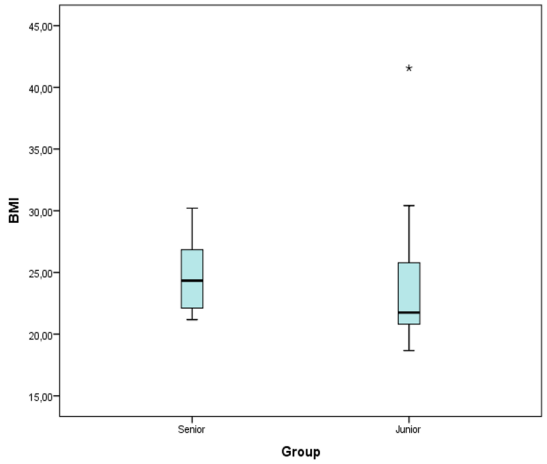
3.2. Morphological characteristics:

	Group	*N*	*Mean*	*Std. Deviation*	*Min*	*Max*	*Range*
BMI	*Cadets*	*10*	*24,98*	*3,21*	*21,18*	*30,20*	*9,03*
	Seniors	*13*	*24,05*	*6,34*	*18,67*	*41,56*	*22,90*
Muscle Mass	*Cadets*	*10*	*26,79*	*4,91*	*21,80*	*34,70*	*12,90*
	Seniors	*13*	*24,08*	*9,69*	*16,40*	*51,50*	*35,10*
Fat Mass	*Cadets*	*10*	*34,88*	*2,29*	*31,20*	*37,10*	*5,90*
	Seniors	*13*	*36,69*	*4,17*	*25,00*	*40,00*	*15,00*
Bone Mass	*Cadets*	*10*	*3,29*	*0,41*	*2,70*	*4,20*	*1,50*
	Seniors	*13*	*3,12*	*0,39*	*2,40*	*3,70*	*1,30*

Source: Values established by the authors

Examination of the BMIs indicates that the Cadets, with an average of 24.98, and the Seniors, who display a score of 24.05, possess similar average values, both within the "normal weight" range. Nevertheless, the variation is considerably more marked among the Seniors, whose standard deviation, at 6.34, largely exceeds that of the Cadets, which is 3.21. This highlights a great bodily diversity. The differences in range reinforce this conclusion, with a gap of 9.03 among Cadets compared to 22.90 among Seniors, including a case of severe obesity. The Cadets distinguish themselves by stronger uniformity as a group, while the Seniors show very diversified profiles. These results highlight the need for a more personalized approach for the monitoring and training of Seniors.

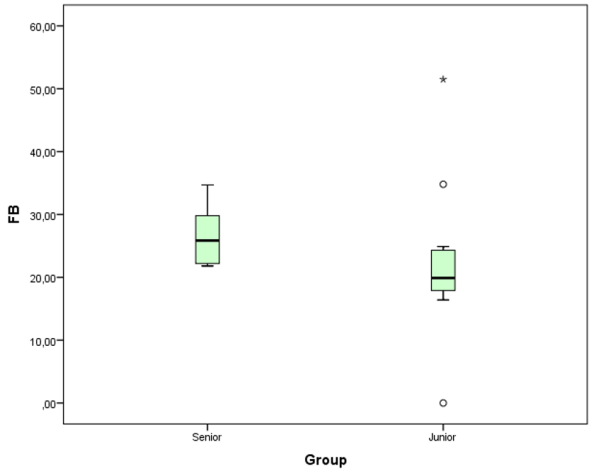
Figure 01: Box plot presenting the distribution of BMI of the two groups



Source: Box plot established by the authors

The analyses indicate that the average muscle mass of the Cadets, which is 26.79%, is a little higher than that of the Seniors, at 24.08%. However, the most striking point is the variability, which is much more significant among the Seniors, with a standard deviation of 9.69 compared to 4.91 for the Cadets. The range of this variability is also visible, showing 35.10 for the Seniors and 12.90 for the Cadets. Among the Seniors, there are muscular profiles ranging from low mass to very high levels reaching up to 51.50%. Thus, the Cadets represent a group that is more uniform, probably due to similar age and training conditions. These results highlight the importance of personalized monitoring for Seniors in order to improve their physical preparation.

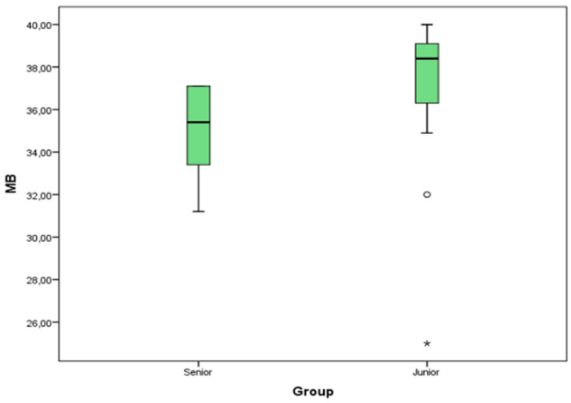
Figure 02: Box plot presenting the distribution of muscle mass of the two groups



Source: Box plot established by the authors

The data indicates that the percentage of fat mass of the Seniors, which is 36.69%, slightly exceeds that of the Cadets, which is 34.88%. This could mean that there is a normal increase in fat mass while growing up. The Cadets display low variability (standard deviation = 2.29) and a reduced range (5.90), which suggests that this group is quite uniform. In contrast, the Seniors show great dispersion (standard deviation = 4.17, range = 15.00), indicating greater diversity within their group. The minimum observed among the Seniors is 25%, which is well below that of the Cadets, highlighting that there are particularly lean athletes in this group. Overall, the fat masses of the two groups are quite high but remain similar for female athletes. These variations could be linked to factors such as age, training level, or individual differences in lifestyles and sporting activities.

Figure 03: Box plot presenting the distribution of fat mass of the two groups

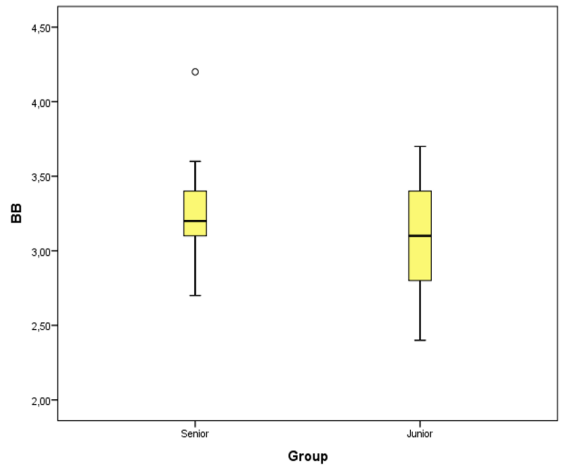


Source: Box plot established by the authors

The average bone mass of the Cadets, which is 3.29%, slightly exceeds that of the Seniors, which is 3.12%. This may be due to variations in body composition that relate to age or maturation. The variation in measurements is quite low in each of the groups, with a standard deviation of 0.41 for the Cadets and 0.39 for the Seniors, which shows a certain homogeneity of individual values. The minimum and maximum values show that among the Cadets, the range is a little wider, reaching 1.50% against 1.30% for the Seniors. This indicates that there are some very high values in the Cadet group. Certain results reveal that some Cadets have a bone mass that is clearly more significant than that of the Seniors, which could be linked to their growth and bone development. In

general, the bone masses of the two groups are quite similar, without notable differences, which indicates a bone composition that remains relatively stable between these two groups.

Figure 04: Box plot presenting the distribution of bone mass of the two groups



Source: Box plot established by the authors

4. Discussion

The objective of this research was to analyze the morphological profile of cadet and senior female judokas of the Algerian national team. The results reveal striking differences between the two categories, due to biological maturation, sporting experience, as well as specific adaptations related to judo.

4.1. BMI

The cadets display an average BMI that is slightly higher than that of the seniors, although the values remain globally similar. The greater variability observed among the seniors indicates a more pronounced morphological diversity, undoubtedly due to weight management strategies specific to elite categories. Claessens and his colleagues (1994) note that BMI often has a more homogeneous distribution among young athletes because of standardized training programs, unlike adult athletes whose paths are more varied.

4.2. Muscle mass

The cadets have an average muscle mass that is slightly higher and much more uniform than that of the seniors. This finding can be interpreted by the fact that young athletes often experience active growth of their musculoskeletal system, especially when they practice combat sports. Research indicates that young athletes can have rapid muscle development, which is attributable to maturation and training intensity (Malina et al., 2004). Among the seniors, the wide variation in muscle mass may reflect differences in experience, training volume, or history of injuries.

4.3. Fat mass

Older individuals show a slightly higher quantity of fat, with great variability. This corresponds to the research of Franchini et al. (2011), which shows that adult judokas have bodily adaptations that depend largely on how they manage their weight and their competitions. The variation observed in this group indicates that certain athletes maintain better physical shape, while others seem to be going through a period of change or are encountering difficulties in their physical training.

4.4. Bone mass

A slightly higher bone mass in young female judokas reflects that bone density increases up to about 18-20 years of age in women (Baxter-Jones et al., 2011). However, the fairly similar results in the two groups highlight that the physical constraints of judo, which are known to strengthen bone health, have a positive effect on bone structure, regardless of age (Nikander et al., 2010).

Overall, the young athletes show a more uniform morphological profile, typical of developing groups, where training is standardized and growth is still ongoing. Their greater quantity of muscle and their slightly decreased percentage of fat give them an advantage in combat sports. On the other hand, the senior athletes display much greater variability, which is in agreement with the results observed among high-level adult athletes in several studies (Franchini et al., 2014).

This diversity can be due to various elements such as:

repeated cycles of weight gain and loss,

o variations in training volume,

o personal sporting experiences,

o persistent fatigue or injuries.

These results highlight the importance of personalized morphological monitoring, especially for senior athletes, to maintain an ideal body composition that improves performance while reducing the risk of injuries.

5. Conclusion

The research reveals important differences between cadet and senior female judokas, showing the impacts of physical growth and modifications related to the sport. The cadet female judokas show a more constant physical structure, whereas the senior female judokas display more varied characteristics which require more adapted monitoring.

Conflict of Interest

The authors declare that they have no conflict of interest

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