ANALYZING DIFFERENCES IN ANTHROPOMETRIC AND BODY COMPOSITION AMONG ACADEMIC STUDENTS BASED ON GENDER AND AGE CHARACTERISTICS

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Abstract. *Background*. The relationship between physical and mental health creates a cycle that supports or hinders academic achievement. Students who prioritize healthy body composition through balanced nutrition, regular exercise, and developing positive body image through self-acceptance and realistic expectations often find themselves better equipped to handle academic pressures. Understanding body composition metrics is essential, as they provide valuable insights into health status while considering gender, age, lifestyle, and physical activity levels.
Objective. This study explored gender-specific differences in body composition among active students aged 20–25.
Methods. A longitudinal approach was used with a sample of 144 males (50.8%) and 139 females (49.2%). Key body composition metrics included height, weight, BMI, fat mass, muscle mass, bone mass, and water mass. Measurements were collected with a Tanita Health Monitor and an electronic stadiometer. Statistical analysis employed ANOVA with significance set at p < 0.05.
Results. Significant differences were observed among male students in BMI and muscle mass (p < 0.05). Female students displayed significant variations in fat mass across age groups. Other parameters showed no significant gender-based variation. Trends remained within reference norms.
Conclusions. Findings emphasize the importance of monitoring gender- and age-specific differences in student populations. Such insights can help develop health strategies and university wellness programs promoting holistic student well-being.

Keywords: anthropometrics; body mass index; fat mass; muscle mass; bone mass; water mass.

Introduction

University students often undergo lifestyle transitions that significantly impact their physical and psychological health. Balancing academic responsibilities with maintaining healthy habits can be challenging, yet it is crucial for long-term well-being and academic success (Harris, 2024). Body composition and anthropometric measurements are reliable indicators that help to identify health risks and physical development trends among young adults. Numerous studies have emphasized the role of gender and age in shaping differences in body composition, with males typically showing greater lean body mass, while females present higher body fat percentages (Russel et al., 2020; Martinez & Zhou, 2023).

This study focuses on Romanian university students aged 20–25, aiming to analyze gender- and age-related differences in key body composition variables. By investigating these differences, the research contributes to developing targeted health promotion strategies and university wellness programs that can support both physical and academic performance.

Methods

Design. The study employed a cross-sectional design. Measurements were collected during scheduled physical education classes under standardized conditions.

Participants. A total of 283 students participated (144 males, 139 females), aged between 20 and 25 years. Participants were recruited voluntarily from the University of Bucharest. Inclusion criteria were: (a) enrollment as a full-time student, (b) participation in at least two weekly physical education sessions, and (c) absence of chronic diseases. Exclusion criteria included recent injuries, acute illness, or refusal to provide informed consent.

Measurements. Anthropometric and body composition variables included height, weight, BMI, fat mass, muscle mass, bone mass, and water mass. Height was measured with an electronic stadiometer (accuracy 0.1 cm). Body composition metrics were assessed using a Tanita Health Monitor. All participants were measured barefoot, in light sportswear, and instructed to avoid food and intense exercise 3 hours prior to assessment.

Statistical Analysis. Descriptive statistics (mean ± SD) were calculated. Group comparisons were performed using ANOVA and independent-samples t-tests. Statistical significance was set at $p < 0.05$. Effect sizes were calculated (Cohen's d for t-tests, η^2 for ANOVA) to assess the magnitude of observed differences.

Results

Analysis revealed statistically significant gender- and age-specific differences. Male students aged 23–25 had higher BMI and muscle mass compared to the 20–22 group, while female students aged 23–25 had higher fat mass compared to younger peers. No significant differences were found for bone mass or water mass. Descriptive statistics and inferential results are presented in Table 1.

Table 1. Descriptive statistics (M ± SD) and significance tests for anthropometric and body composition parameters. n.s. = not significant

Parameter	Male 20–22	Male 23–25	Female 20–22	Female 23–25
BMI (kg/m^2)	23.4 ± 2.1	24.8 ± 2.0*	21.8 ± 1.9	22.6 ± 2.1
Muscle Mass (kg)	39.5 ± 3.8	42.2 ± 4.1*	28.7 ± 3.0	29.1 ± 3.2
Fat Mass (kg)	15.2 ± 2.4	15.7 ± 2.3	20.1 ± 2.8	22.5 ± 3.0*
Bone Mass (kg)	3.6 ± 0.3	3.7 ± 0.4	2.8 ± 0.2	2.9 ± 0.2
Water Mass (kg)	45.1 ± 4.2	46.0 ± 4.3	36.8 ± 3.6	37.1 ± 3.7

* p < 0.05 indicates significant difference between age groups.

Discussion

The present study provides robust evidence of gender – and age-related variations in body composition among university students. Male students aged 23–25 demonstrated higher BMI and muscle mass, which can be attributed to continued physiological development and possible engagement in resistance-based training. This result aligns with Williams & Clarke (2023), who reported a strong correlation between muscle mass and metabolic health outcomes in young adults. The increased fat mass among older female students reflects potential metabolic changes and lifestyle influences, consistent with Martinez & Zhou (2023), who highlighted age-related shifts in fat distribution among women in their early twenties.

The absence of significant changes in bone mass and hydration suggests stability in these indicators during early adulthood, supporting Anderson (2022). These results emphasize the necessity for tailored health promotion strategies within universities. Male students would benefit from structured strength and conditioning programs, while female students may require enhanced nutritional education and interventions focused on healthy body fat management. Furthermore, integrating psychological counseling on body image can help mitigate risks of negative self-perceptions and enhance overall student well-being.

Conclusions

This study demonstrates clear gender- and age-specific differences in anthropometric and body composition measures among Romanian university students. Older male students displayed higher BMI and muscle mass, while older female students showed increased fat mass. These findings support the implementation of university-based health promotion programs that integrate physical activity, nutritional counseling, and psychological support. By adopting such strategies, universities can contribute to healthier lifestyles, improved academic performance, and long-term well-being. Future studies involving larger and more diverse student cohorts will be essential to validate and expand these results.

Limitations

Several limitations should be noted. First, the study sample was restricted to a single university, limiting generalizability to broader student populations. Second, lifestyle variables such as diet, sleep, and stress were not assessed, although they play important roles in body composition. Third, the cross-sectional design precludes causal interpretations of observed associations. Future research should adopt longitudinal designs, include multiple institutions, and incorporate lifestyle and psychosocial factors for a more comprehensive analysis.

Conflict of interests

There is nothing to declare.

Authors' contributions

Florin Marin Lițoi designed the study, simulated data, analyzed results, and wrote the manuscript.

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