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Bone Mineral Density and Body Composition among Individuals Who Practice Sports with Mechanical Impact and Sedentary Activities †

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Abstract: The purpose of this study was to evaluate indicators of bone health associated with sports practice in male adolescents using dual-energy X-ray absorptiometry (DXA) to measure bone mineral content (BMC), density (BMD), and body composition (BC) for the whole body (WB) and specific regions. This cross-sectional study involved 65 individuals (18–35 years). Athletes had higher BMD for WB (1.064 ± 0.121 g/m^{-2}) than sedentary individuals (0.753 ± 0.129 g/cm^{-2}). Differences were also observed within specific regions such as the trunk, upper and lower limbs. Individuals who practice regular sports present improved bone health indicators compared to their sedentary peers.

Keywords: skeletal health; bone mass; growth; maturation; body composition

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1. Introduction

Throughout the life cycle, with advancing age, bone mineral density (BMD) and the general structure of the skeletal system decreases and weakens [1], increasing the risk of osteoporotic fractures [2] with implications for reduced quality of life [3]. The skeletal system adapts during the process of growth and biological maturation, increasing BMD, in parallel with qualitative transformations in each of the tissues [4].

Soft lean tissue and the skeletal system influence each other, and sports practice appears to actively contribute to the growth of both [5,6], contrasting with a sedentary lifestyle [1]. The practice of sports is consensually considered to be a factor influencing the properties of the bone matrix due to structural and geometric changes [7,8].

2. Materials and Methods

The present study is observational and cross-sectional in nature, with athletes recruited randomly from sports clubs in the Algarve region with a minimum of five years of professional practice. The control group was composed of individuals who had not practiced professional sports or regular physical activity in the last five years. Descriptive statistics were determined for the total sample. The student's *t* test for independent samples was used to compare the means between sedentary people ($n = 33$) and athletes ($n = 32$). The effect size of comparisons between groups was estimated by Cohen's d (0.2; 0.6; 1.2; 2.0; 4.0) as either trivial, small, moderate, large, very large or extremely in order to assess the magnitude of differences Statistical analysis was performed using the IBM Statistical Package for Social Sciences (SPSS), version 27.0 (SPSS, Inc., Chicago, IL, USA) and GraphPad Prism 8 v8.0.2.263 (2019) (GraphPad Software, Inc., La Jolla, CA, USA) with the significance level set at 5%.

3. Results

The sample presented a mean age of 27.9 ± 5.5 and 28.8 ± 4.6 years old for sedentary individuals and athletes, respectively. For stature, there were no significant differences between groups, but for body mass, there was a moderately sized effect, with the athletes having a higher body mass of 77.0 ± 8.4 kg (Table 1).

Table 1. Descriptive statistics (mean ± standard deviation) for chronological age and anthropometry between sedentary individuals (n = 33) and athletes (n = 32).

	Group		***t*-Student**		**Effect Magnitude**	
	Sedentary	**Athletes**	***t*-Value**	***p***	**Cohen's d**	
Age (years)	27.9 ± 5.5	28.8 ± 4.6	−0.657	0.514	0.179	Small
Stature (cm)	177.0 ± 4.9	177.7 ± 6.3	−0.465	0.644	0.127	Small
Body Mass (kg)	73.8 ± 8.5	77.0 ± 8.4	−1.376	0.005	0.376	Moderate

To better understand differences between sedentary individuals and athletes, BMD and body composition was assessed for the whole body and specific regions. Athletes presented a higher BMD for the whole body (1.219 vs. 1.081 g/cm^2, p = 0.04), and when measured by specific regions, the results remained consistent, i.e., higher in athletes (Figure 1).

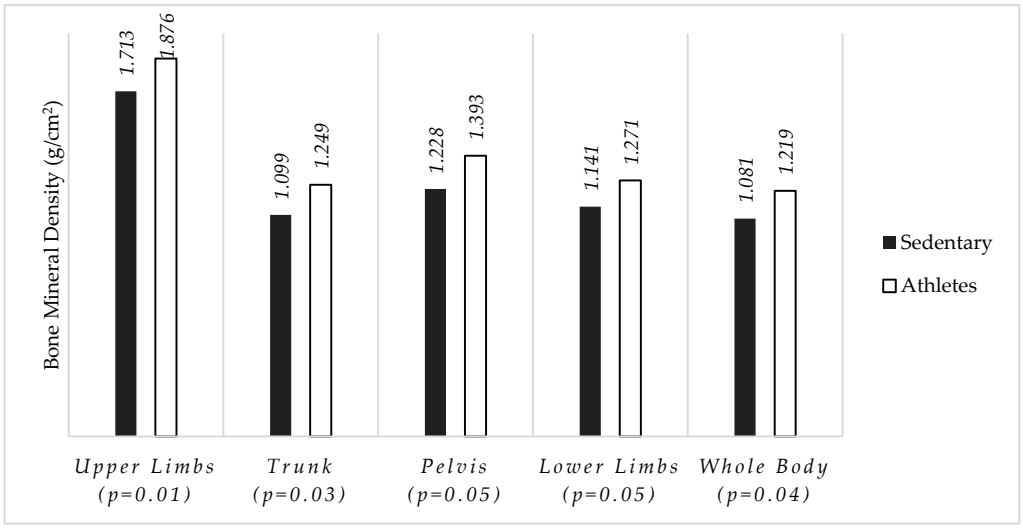

Figure 1. Bone mineral density (g/cm^2) for specific regions and the whole body for sedentary subjects (n = 33) and athletes (n = 32).

Lean mass, which provides the best measure of overall muscle tissue, shows higher values for athletes (56,102 vs. 52,425 g, p = 0.02) as well as for specific regions of the body, with only the upper limbs registering similar values between both groups (Figure 2).

In terms of fat mass, sedentary individuals have higher values for the whole body (24,825 vs. 22,452 g, p = 0.01) as well as for all specific regions of the body when compared to athletes (Figure 3).

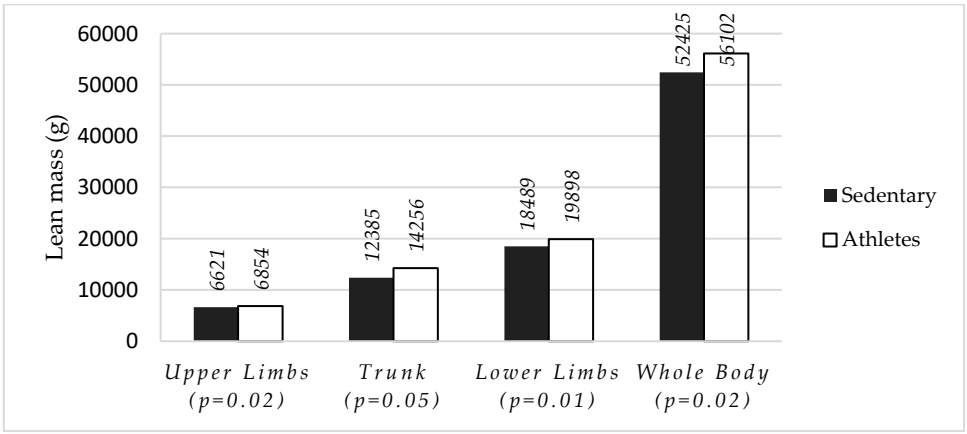

Figure 2. Lean mass (g) for specific regions and the whole body for sedentary subjects (n = 33) and athletes (n = 32).

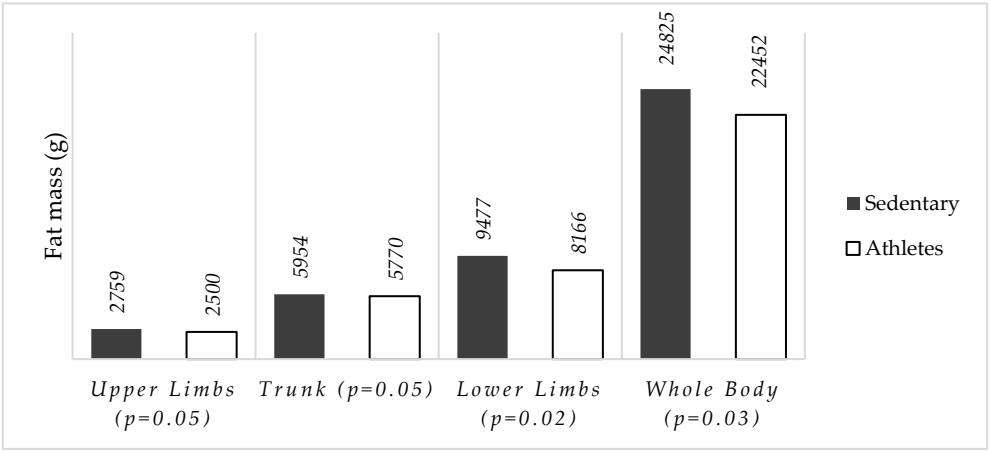

Figure 3. Fat mass (g) for specific regions and the whole body for sedentary subjects (n = 33) and athletes (n = 32).

4. Conclusions

Athletes have a higher BMD for the whole body and specific regions, as well as lean mass. Regarding fat mass, the sedentary group has higher values for all segments of the body compared to athletes. Given the results, we conclude that practicing sports may have a positive osteogenic effect, alongside with higher lean mass values. Physical activity plays a major role in the overall health of individuals, and maintaining regular physical activity has a positive effect on bone and muscle health.

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Conflicts of Interest: The authors declare no conflict of interest.

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