

Anthropometric and Body Composition Profiles of European, Non-European, and Middle Eastern Sport Sciences Students

Perfiles Antropométricos y de Composición Corporal de Estudiantes de Ciencias del Deporte de Europa, Fuera de Europa y del Oriente Medio

Zahi Andraos¹; Dopsaj Milivoj²; Milic Radoje³ & Vodicar Janez³

ANDRAOS, Z.; DOPSAJ, M.; MILIC, R. & VODICAR, J. Anthropometric and body composition profiles of European, non-European, and Middle Eastern sport sciences students. *Int. J. Morphol.*, 44(4):1296-1303, 2026.

SUMMARY: Students enrolled in faculties of sport sciences are regularly exposed to structured physical activity; however, it remains unclear whether similar academic training is associated with comparable body composition profiles across different regions. To compare anthropometric and body composition characteristics across regions separately in male and female sport sciences students. A total of 907 university students (males and females) from faculties of sport sciences in Europe, Non-Europe, and the Middle East were assessed using standardized bioelectrical impedance analysis. Anthropometric variables (height, body mass, BMI) and body composition parameters (body fat mass, percentage body fat, fat-free mass, skeletal muscle mass, skeletal muscle mass index, percent skeletal muscle mass, fat mass index, and muscle-fat index) were analyzed within each sex using one-way ANOVA. Consistent regional patterns were observed in both males and females. Students from the Middle East exhibited higher adiposity-related indicators and lower muscle-related parameters compared with European and Non-European students, while the latter two groups showed largely similar profiles. Differences were more pronounced in body composition variables than in basic anthropometric measures. Percentage body fat demonstrated the greatest regional differentiation, followed by skeletal muscle mass index, whereas BMI showed comparatively limited discriminatory capacity. Morphological variation among sport sciences students is primarily related to tissue composition rather than total body mass. BMI alone may not adequately reflect morphological status in physically educated young adults. Direct body composition indicators, particularly percentage body fat and skeletal muscle mass index, should therefore be prioritized when evaluating and comparing physically active young adult populations.

KEY WORDS: Body composition; Sport sciences students; Regional differences; Skeletal muscle mass; Adiposity; BMI.

INTRODUCTION

Understanding human morphology and body composition across different geographical regions is fundamental for interpreting population-specific health, physical performance, and lifestyle characteristics. Body composition parameters such as fat mass, fat-free mass, skeletal muscle mass, and body mass index (BMI) are strongly influenced by genetic background, habitual physical activity, transportation patterns, dietary habits, and sociocultural norms (Wells & Shirley, 2016; Petreková *et al.*, 2024). Consequently, region-specific reference data are essential for accurate interpretation of anthropometric and body composition findings, particularly in young adult populations.

Comparative analyses between regions provide valuable insight into how environmental and lifestyle factors

shape morphological characteristics beyond genetic predisposition alone. Previous research has shown that even within Europe, significant differences exist in body composition profiles between populations, reflecting variations in physical activity levels, nutritional behaviors, and cultural approaches to sport and recreation (Ruiz *et al.*, 2019; Copic *et al.*, 2025). These differences become more pronounced when European populations are compared with non-European regions, such as the Middle East, where urbanization, sedentary behavior, and dietary transitions have markedly influenced body composition patterns in recent decades (Musaiger *et al.*, 2012; Andraos *et al.*, 2024).

Within Europe, countries belonging to the European Union (EU) are often characterized by structured public

¹ Faculty of Sport Sciences, Antonine University, Hadat-Baabda Campus, Lebanon.

² Faculty of Sport and Physical Education, University of Belgrade, Belgrade, Serbia.

³ Institute of Sport, Faculty of Sport, University of Ljubljana, Ljubljana, Slovenia.

transportation systems, higher daily incidental physical activity, and widespread participation in organized sport and recreational exercise. In the present study, Slovenia was selected as a representative EU country due to its well-documented anthropometric and physical activity profiles among university students and young adults (Petreková *et al.*, 2024). In contrast, Serbia represents a European country outside the EU framework, where lifestyle behaviors, nutritional habits, physical activity engagement, and body composition indicators show both similarities and notable differences compared with EU populations (Copic *et al.*, 2025). Including Serbia as a non-EU European reference allows for a more nuanced understanding of intra-European morphological variability.

The third region examined in this study is the Middle East, represented by Lebanon. Recent evidence indicates that Lebanese young adults display distinct body composition characteristics compared with their European counterparts, including higher adiposity levels and altered muscle-to-fat ratios, which have been attributed to sedentary lifestyles, car-dependent transportation, and evolving dietary habits (Fayyad *et al.*, 2024; Andraos *et al.*, 2024). Moreover, sex-specific differences in physical activity patterns and training goals have been reported, further influencing body composition outcomes among Lebanese university students (Fayyad *et al.*, 2024). These findings highlight the importance of examining Middle Eastern populations separately rather than extrapolating European reference values. To our knowledge, no previous study has compared body composition profiles of sport sciences students across EU, non-EU European, and Middle Eastern regions using identical methodology.

Therefore, the aim of the present study was to compare basic longitudinal anthropometric characteristics and body composition parameters among university students from three distinct regions: European Union countries (Slovenia), non-European Union European countries (Serbia), and the Middle East (Lebanon). By adopting a region-based comparative approach, this study seeks to contribute meaningful reference data and enhance understanding of how regional lifestyle, cultural, and environmental factors influence body composition in physically educated young adults.

SUBJECTS AND METHOD

Study Design

The present study was conducted as a non-experimental, applied scientific investigation with a cross-sectional multicentric design. Laboratory-based

measurement were selected as the primary method of data collection in order to ensure standardized and controlled measurement conditions. A random sampling approach was applied within each participating institution to obtain representative subsamples of university students enrolled in sport sciences programs.

All procedures were carried out in accordance with the ethical standards of the Declaration of Helsinki, and the study protocol received approval from the Ethics Committee of the Faculty of Sport and Physical Education, University of Belgrade (Approval No. 02-484-2).

Study Population

The study sample consisted of university students (all N = 907; Male N = 484, Female N = 423) enrolled in faculties of sport sciences from three distinct geographic regions: Europe, Non-Europe, and the Middle East. The European region was represented by students from Slovenia (Male N = 170, Female N = 192), the Non-European region by students from Serbia (Male N = 179, Female N = 145), and the Middle Eastern region by students from Lebanon (Male N = 135, Female N = 86). All participants were actively engaged in academic programs related to the major of sport sciences.

Only healthy individuals without acute or chronic medical conditions were included in the study. Participation was voluntary, and all subjects provided informed consent prior to testing. Recruitment was conducted through direct invitations and informational announcements within the respective institutions. The general anthropometric and body composition characteristics of the study population are presented in Tables I and II.

Anthropometric and Body Composition Assessment

Anthropometric and body composition assessments were performed in university laboratory settings following standardized measurement protocols described in previous methodological studies (Rakic *et al.*, 2019; Dopsaj *et al.*, 2020; Toskic *et al.*, 2024). All measurements were conducted by trained personnel with experience in body composition assessment during the period 2020 till 2024.

Body height was measured without shoes to the nearest 0.1 cm using a portable stadiometer (Seca 213). Body mass was measured to the nearest 0.1 kg with participants wearing light indoor clothing and no footwear. Each measurement was taken twice, and the mean value was used for analysis. The testing procedure of measuring body composition was carried out by the usage of bioelectrical

impedance analysis (BIA) by InBody 720 (Biospace Co., Ltd., Seoul, Korea) according to defined procedures (Dopsaj *et al.*, 2020; Andraos *et al.*, 2024).

Body composition variables were estimated using bioelectrical impedance analysis. In addition to body mass and body height, the following parameters were analyzed: body mass index (BMI, kg/m²), body fat mass (BFM, kg), skeletal muscle mass (SMM, kg), fat-free mass (FFM, kg), percentage body fat (PBF, %), percentage skeletal muscle mass (PSMM, %), fat mass index (FMI, kg/m²), skeletal muscle mass index (SMMI, kg/m²), index of body composition (IBC, Index Unit /IU/), and muscle–fat index (MFI, kg). These indices have been previously validated and used to characterize morphological profiles in young adult populations (Dopsaj *et al.*, 2020; Andraos *et al.*, 2024; Toskic *et al.*, 2024).

Statistical Analysis

Descriptive statistics were calculated for all variables and are presented as means (MEAN) and standard deviations (SD) for continuous data, and as frequencies and percentages for categorical variables. Prior to inferential analysis, data distribution was examined to ensure appropriateness of parametric testing.

Regional differences in anthropometric and body composition variables were analyzed separately for males and females using one-way analysis of variance (ANOVA). When a significant main effect was detected, Bonferroni correction for post-hoc between groups comparisons were performed to identify pairwise differences between regions.

To further characterize body mass status across regions, participants were classified into body mass index (BMI) categories according to World Health Organization (2000) reference standards: underweight (BMI < 18.5 kg/m²), normal weight (BMI 18.5–24.99 kg/m²), overweight (BMI 25.0–29.99 kg/m²), and obese (BMI ≥ 30.0 kg/m²). This categorical approach allowed for a clear and intuitive comparison of weight status distributions between regions. Differences in the distribution of BMI categories were examined using the Kruskal-Wallis nonparametric test with multiple comparisons and the test for power.

All statistical analyses were performed using SPSS 26, and the level of statistical significance was set at $p < 0.05$.

RESULTS

Table I presents the regional differences in anthropometric and body composition variables among male participants. Middle Eastern males had significantly higher BMI compared with both European and Non-European males ($p < 0.001$). Similarly, body fat mass, fat mass index, and percentage body fat were all significantly greater in the Middle Eastern group than in the other two regions ($p < 0.001$), while no differences were observed between European and Non-European participants for these variables.

In contrast, skeletal muscle mass and fat-free mass were significantly lower in Middle Eastern males compared with both European and Non-European males ($p < 0.001$). Non-European males showed slightly higher skeletal muscle mass and fat-free mass than European males ($p < 0.001$), whereas skeletal muscle mass index was lower in the Middle

Table I. Regional differences in anthropometric and body composition variables among males from Slovenia, Serbia, and Lebanon.

Variable	Europe (n = 170)	Non-Europe (n = 179)	Middle East (n = 135)	p-value
Age (years)	21.23 ± 2.32	22.40 ± 2.64	22.01 ± 2.76	< 0.001
BH (cm)	181.10 ± 6.33	182.92 ± 6.43	177.37 ± 7.42	< 0.001
BM (kg)	77.04 ± 9.17	79.55 ± 9.25	79.10 ± 15.08	0.210
BMI (kg/m ²)	23.46 ± 2.16	23.75 ± 2.31	25.07 ± 3.95	< 0.001
BFM (kg)	8.91 ± 3.44	9.23 ± 4.02	15.31 ± 8.65	< 0.001
SMM (kg)	39.03 ± 4.77	40.75 ± 4.71	35.99 ± 5.90	< 0.001
FFM (kg)	68.14 ± 7.94	70.31 ± 7.98	63.79 ± 9.15	< 0.001
FMI (kg/m ²)	2.73 ± 1.06	2.77 ± 1.23	4.85 ± 2.63	< 0.001
SMMI (kg/m ²)	11.87 ± 1.03	12.17 ± 1.22	11.42 ± 1.53	0.006
PSMM (%)	50.68 ± 2.29	51.30 ± 2.79	45.98 ± 5.26	< 0.001
PBF (%)	11.46 ± 3.83	11.48 ± 4.24	18.48 ± 7.47	< 0.001
IBC (IU)	2.31 ± 0.96	2.37 ± 1.09	1.56 ± 0.62	< 0.001
MFI (kg)	5.15 ± 2.59	5.26 ± 2.69	3.14 ± 1.86	< 0.001

Eastern group compared with both European and Non-European groups ($p = 0.006$). Percentage skeletal muscle mass was also significantly reduced in the Middle Eastern group relative to the other two regions ($p < 0.001$).

Regarding body height, Non-European males were taller than European males, and both were taller than Middle Eastern males ($p < 0.001$). No regional differences were found in body mass ($p = 0.210$).

Finally, index of body composition and muscle–fat index was significantly lower in Middle Eastern males compared with European and Non-European males ($p < 0.001$), while no differences were detected between the European and Non-European groups.

Overall, Middle Eastern males demonstrated a body composition profile characterized by higher adiposity and reduced muscularity compared with their European and Non-European counterparts.

Table II presents the regional differences in anthropometric and body composition variables among female participants. Middle Eastern females had significantly higher BMI compared with both European and Non-European females ($p = 0.001$). Similarly, body fat mass, fat mass index, and percentage body fat were significantly greater in the Middle Eastern group than in the other two regions ($p < 0.001$), while no differences were observed between European and Non-European participants for these variables.

Table II. Regional differences in anthropometric and body composition variables among Females from Slovenia, Serbia, and Lebanon.

Variable	Europe (n=192)	Non-Europe (n=145)	Middle East (n=86)	p-value
Age (years)	21.74 ± 1.92	22.45 ± 2.69	22.09 ± 3.33	0.038
BH (cm)	168.00 ± 6.41	168.10 ± 6.74	164.02 ± 6.45	< 0.001
BM (kg)	63.78 ± 8.78	61.48 ± 8.75	62.12 ± 11.84	0.074
BMI (kg/m ²)	22.55 ± 2.40	21.70 ± 2.44	23.09 ± 4.12	0.001
BFM (kg)	13.98 ± 4.88	13.38 ± 4.88	20.17 ± 8.29	< 0.001
SMM (kg)	27.71 ± 4.39	26.24 ± 3.71	20.77 ± 4.85	< 0.001
FFM (kg)	49.81 ± 7.23	48.10 ± 6.08	41.95 ± 5.76	< 0.001
FMI (kg/m ²)	4.97 ± 1.76	4.74 ± 1.73	7.53 ± 3.09	< 0.001
SMMI (kg/m ²)	9.78 ± 1.01	9.25 ± 0.90	7.69 ± 1.60	< 0.001
PSMM (%)	43.52 ± 3.68	42.80 ± 3.22	33.56 ± 5.85	< 0.001
PBF (%)	21.70 ± 6.06	21.42 ± 5.66	31.56 ± 7.40	< 0.001
IBC (IU)	1.14 ± 0.46	1.06 ± 0.23	0.75 ± 0.14	< 0.001
MFI (kg)	2.29 ± 1.23	2.17 ± 0.71	1.16 ± 0.51	< 0.001

In contrast, skeletal muscle mass and fat-free mass were significantly lower in Middle Eastern females compared with both European and Non-European females ($p < 0.001$). Skeletal muscle mass index and percentage skeletal muscle mass were also significantly reduced in the Middle Eastern group relative to the other two regions ($p < 0.001$). No significant differences were found between European and Non-European females for any muscle-related variable.

Regarding body height, Middle Eastern females were shorter than both European and Non-European females ($p < 0.001$), whereas body mass did not differ between regions ($p = 0.074$). For age, European females were younger than both Non-European and Middle Eastern females ($p = 0.038$).

Finally, index of body composition and muscle–fat index was significantly lower in Middle Eastern females compared with European and Non-European females ($p < 0.001$), while no differences were detected between the European and Non-European groups.

Overall, Middle Eastern females demonstrated a body composition profile characterized by higher adiposity and reduced muscularity compared with their European and Non-European counterparts.

The distribution of body mass index (BMI) categories differed across geographic regions (Table III). The majority of participants from Europe and Non-Europe were classified as having normal body weight (80.3 % and 79.3 %, respectively), whereas a substantially lower

proportion of participants from the Middle East fell within the normal-weight category (59.3 %). In contrast, the prevalence of overweight and obesity was markedly higher in the Middle Eastern group, with 29.0 % classified as overweight and 8.6 % as obese, compared with 17.1 % and 1.4 % in Europe, and 17.6 % and 0.9 % in the Non-

Europe group, respectively. Underweight prevalence was low across all regions (<4 %). Overall, these findings indicate a higher burden of excess body weight among participants from the Middle East compared with their European and Non-European counterparts.

Table III. Distribution of body mass index (BMI) categories across geographic regions.

BMI Category	Europe (n = 362)	Non-European (n = 324)	Middle East (n = 221)
Underweight (<18.5 kg/m ²)	4 (1.1 %)	7 (2.2 %)	7 (3.2 %)
Normal weight (18.5–24.9 kg/m ²)	291 (80.3 %)	257 (79.3 %)	131 (59.3 %)
Overweight (25.0–29.9 kg/m ²)	62 (17.1 %)	57 (17.6 %)	64 (29.0 %)
Obesity (≥30.0 kg/m ²)	5 (1.4 %)	3 (0.9 %)	19 (8.6 %)

The distribution of body mass index (BMI) categories differed across geographic regions (Table IV) according to sex, showing that most male subjects from Europe and Non-Europe were classified as having normal body weight (78.2 % and 75.4 %, respectively). In contrast, a lower proportion of Middle Eastern males fell within the normal-weight category (54.1 %). The prevalence of overweight and obesity was higher among Middle Eastern males (34.8 % and 10.4 %) compared with European (20.0 % and 1.8 %) and Non-European males (23.5 % and 1.1 %), while underweight prevalence was minimal across all male groups.

Results of the Kruskal-Wallis H test indicated that there is a significant difference in the males between the BMI classes distribution at explored males' groups, $\chi^2(2) = 29.32$, $p < .001$, with a mean rank score of 285.49 for Middle East Group, 218.97 for Europe Group, and 232.43 for Non-European Group, where the test priori power was strong at level of 0.9969. The post-hoc Dunn's test using a Bonferroni corrected alpha of 0.017 indicated that the mean ranks of the following pairs are significantly different: Middle Eastern Group vs European Group at p level value at 0.000, and Middle Eastern Group vs Non-European Group at p level value at 0.000. Between European Vs Non-European Groups no statistically significant differences were found ($p = 0.129$).

A similar pattern was observed among females. Most European and Non-European females were classified as normal weight (82.3 % and 84.8 %, respectively), whereas

a smaller proportion of Middle Eastern females were within this category (67.4 %). Overweight prevalence was higher in Middle Eastern females (19.8 %) compared with European (14.6 %) and Non-European females (9.7 %). Obesity remained relatively uncommon in females but occurred more frequently in the Middle Eastern group (5.8 %) than in European (1.0 %) and Non-European females (0.7 %). Underweight prevalence was also higher among Middle Eastern females (7.0 %) compared with the other regions.

Results of the Kruskal-Wallis H test indicated that there is a significant difference in females between the BMI classes distribution at explored female's groups, $\chi^2(2) = 10.41$, $p < .005$, with a mean rank score of 235.21 for Middle East Group, 212.72 for Europe Group, and 197.28 for Non-European Group, where the test priori power was strong at level of 0.9770. The post-hoc Dunn's test using a Bonferroni corrected alpha of 0.017 indicated that the mean ranks of the following pairs are significantly different between: Middle Eastern Group vs European Group at p level value = 0.045, and Middle Eastern Group vs Non-European Group at p level value = 0.001, while between European vs Non-European Groups no statistically significant differences were found ($p = 0.105$).

Overall, both male and female participants from the Middle East demonstrated a greater representation in higher BMI categories relative to their European and Non-European counterparts.

Table IV. Distribution of body mass index (BMI) categories across geographic regions according to sex.

BMI Category	Males			Females		
	Europe (n=170)	Non-European (n=179)	Middle East (n=135)	Europe (n=192)	Non-European (n=145)	Middle East (n=86)
Underweight (<18.5 kg/m ²)	0 (0.0 %)	1 (0.6 %)	1 (0.7 %)	4 (2.1 %)	7 (4.8 %)	6 (7.0 %)
Normal weight (18.5–24.9 kg/m ²)	133 (78.2 %)	135 (75.4 %)	73 (54.1 %)	158 (82.3 %)	123 (84.8 %)	58 (67.4 %)
Overweight (25.0–29.9 kg/m ²)	34 (20.0 %)	42 (23.5 %)	47 (34.8 %)	28 (14.58 %)	14 (9.7 %)	17 (19.8 %)
Obesity (≥30.0 kg/m ²)	3 (1.8 %)	2 (1.1 %)	14 (10.4 %)	2 (1.0 %)	1 (0.7 %)	5 (5.8 %)

DISCUSSION

The present study investigated regional differences in anthropometric and body composition characteristics among university students enrolled in faculties of sport sciences from Europe, Non-Europe, and the Middle East. Despite comparable academic exposure to physical activity and human movement sciences, consistent morphological differences were observed across regions in both males and females. Participants from the Middle East demonstrated higher adiposity-related indicators (BMI, BFM, %BF, FMI) and lower muscle-related parameters (SMM, FFM, SMMI, PSMM, MFI) compared with their European and Non-European counterparts. These findings indicate that formal sport sciences education alone does not homogenize body composition profiles and that regional context influences morphological characteristics even in physically educated populations.

An important observation is that regional differences were substantially greater in body composition variables than in basic anthropometric measures. Body mass showed minimal variation between regions, whereas percentage body fat, skeletal muscle mass index, and muscle–fat index demonstrated pronounced divergence. This suggests that the populations differ primarily in tissue distribution rather than overall body size. Consequently, individuals with similar body mass and even comparable BMI values may present markedly different morphological profiles. In physically educated populations, morphological status appears to depend more on the relative proportion of muscle and fat tissues than on total body mass.

The present findings also highlight the limited interpretative value of BMI in sport sciences students. Although BMI differed statistically between regions, the magnitude of change was smaller than that observed for percentage body fat and muscle-related indices. This indicates that BMI may mask meaningful morphological differences in populations exposed to regular physical activity. Therefore, reliance on BMI alone may lead to inaccurate interpretation of morphological status in young adults with similar body mass but distinct tissue composition. Body composition indicators provide a more physiologically relevant assessment of morphological characteristics in physically active populations.

These findings have practical implications for sport science practice and education. Students enrolled in sport sciences programs are commonly assumed to possess adequate morphological readiness due to regular exposure to physical activity. However, the present results demonstrate that similar academic training does not ensure comparable body composition profiles. Accordingly, evaluation of physical

preparedness in educational and sport settings should incorporate direct body composition assessment rather than relying solely on anthropometric screening indicators.

The consistent pattern observed in both sexes indicates a regional shift in muscle–fat balance rather than isolated changes in adiposity or muscularity alone. Middle Eastern students demonstrated a profile characterized by higher relative fat accumulation combined with reduced relative muscle representation, whereas European and Non-European students showed a more favorable balance between contractile and non-contractile tissue. This supports interpreting morphological status as a functional relationship between muscle and fat tissues rather than independent evaluation of single variables. The muscle–fat relationship may therefore represent a more sensitive descriptor of population differences than traditional anthropometric indicators.

The regional differences observed in Lebanese participants should be interpreted within the context of population-level influences rather than direct sex comparisons. Previous research suggests that body composition among Lebanese young adults is influenced by habitual physical activity patterns, training orientation, and environmental constraints (Fayyad *et al.*, 2024; Andraos *et al.*, 2024). Compared with European countries, lower daily incidental physical activity due to greater reliance on motorized transportation and reduced active commuting may contribute to increased fat accumulation. Additionally, regional dietary habits characterized by higher energy density and elevated fat and sugar intake have been associated with increased body fat levels in Middle Eastern populations (Musaiger *et al.*, 2012). These findings support previous evidence showing higher adiposity and altered muscle–fat balance in Lebanese university students compared with other populations (Fayyad *et al.*, 2024; Andraos *et al.*, 2024).

European Union and non-European Union students showed comparable body composition profiles despite different geographic contexts. This suggests that participation in sport sciences education and structured physical activity may promote convergence toward a similar morphological pattern when environmental conditions are comparable. Accordingly, the divergence observed in Middle Eastern students may reflect broader environmental influences acting outside the educational setting rather than differences inherent to sport sciences training itself.

The body composition profiles of European and Non-European participants were largely consistent with previously reported normative data. Slovenian male students exhibited skeletal muscle mass and fat-free mass comparable

to Central European populations, while female students showed adiposity ranges similar to regional surveys (Copic *et al.*, 2025). Serbian students also demonstrated morphological patterns consistent with reference data for young adults in Serbia (Rakic *et al.*, 2019). These comparisons reinforce the validity of the present results and provide a reference framework for interpreting the distinct morphological profile observed in Middle Eastern students.

Finally, the body composition patterns observed in Lebanese students align with findings from other Arab populations. Female university students in Dubai demonstrated a high prevalence of overweight and elevated body fat levels (Al Sabbah, 2020). Similarly, studies in Saudi adults reported differences in BMI, fat mass, and skeletal muscle mass consistent with the higher adiposity observed in our Middle Eastern participants (Al Dokhi & Habib, 2013). University populations from Gulf countries have also shown elevated overweight prevalence associated with lifestyle-related factors (Iqbal *et al.*, 2014). Saudi physical education students exhibited higher fat mass and lower muscle-related parameters comparable to the Lebanese sample (Alahmadi, 2021). Taken together, the present results suggest that regional context influences morphological phenotype even in populations engaged in regular physical education. The observed differences therefore reflect population-specific adaptation patterns rather than simple variation in body size, emphasizing the importance of evaluating tissue composition when comparing physically active groups across regions.

CONCLUSION

The present study identified clear regional differences in body composition among sport sciences students despite similar academic exposure to physical activity and human movement sciences. Students from the Middle East consistently exhibited higher adiposity indicators and lower muscle-related parameters compared with their European and Non-European counterparts, while the latter two groups showed comparable morphological profiles. These findings indicate that formal sport sciences curriculum and education alone do not equalize morphological characteristics across populations.

Importantly, percentage body fat (%BF) showed the greatest regional differentiation, followed by skeletal muscle mass index (SMMI), whereas BMI demonstrated comparatively limited discriminatory capacity. This suggests that regional variation is primarily driven by tissue composition rather than total body mass. Consequently, BMI alone may not adequately reflect morphological status in physically educated young adults.

From an applied perspective, evaluation of sport sciences students and physically active young adult populations should prioritize direct body composition indicators, particularly %BF and SMMI, rather than relying solely on BMI. The study therefore provides initial region-specific reference data and supports the use of composition-based assessment when comparing populations with similar educational and training backgrounds.

ANDRAOS, Z.; DOPSAJ, M.; MILIC, R. & VODICAR, J. Perfiles antropométricos y de composición corporal de estudiantes de ciencias del deporte de Europa, fuera de Europa y del Oriente Medio. *Int. J. Morphol.*, 44(4):1296-1303, 2026.

RESUMEN: Los estudiantes matriculados en facultades de ciencias del deporte participan regularmente en actividades físicas estructuradas; sin embargo, aún no queda claro si una formación académica similar se asocia con perfiles de composición corporal comparables en diferentes regiones. El objetivo fue comparar las características antropométricas y de composición corporal entre regiones, por separado, en estudiantes hombres y mujeres de ciencias del deporte. Se evaluó a un total de 907 estudiantes universitarios (hombres y mujeres) de facultades de ciencias del deporte de Europa, fuera de Europa y Oriente Medio mediante análisis estandarizado de impedancia bioeléctrica. Se analizaron variables antropométricas (estatura, masa corporal, IMC) y parámetros de composición corporal (masa grasa corporal, porcentaje de grasa corporal, masa libre de grasa, masa muscular esquelética, índice de masa muscular esquelética, porcentaje de masa muscular esquelética, índice de masa grasa e índice músculo-grasa) dentro de cada sexo mediante ANOVA unidireccional. Se observaron patrones regionales consistentes tanto en hombres como en mujeres. Los estudiantes de Oriente Medio exhibieron indicadores relacionados con la adiposidad más altos y parámetros musculares más bajos en comparación con los estudiantes europeos y no europeos, mientras que estos dos últimos grupos mostraron perfiles en gran medida similares. Las diferencias fueron más pronunciadas en las variables de composición corporal que en las medidas antropométricas básicas. El porcentaje de grasa corporal demostró la mayor diferenciación regional, seguido del índice de masa muscular esquelética, mientras que el IMC mostró una capacidad discriminatoria comparativamente limitada. La variación morfológica entre los estudiantes de ciencias del deporte está relacionada principalmente con la composición tisular más que con la masa corporal total. El IMC por sí solo puede no reflejar adecuadamente el estado morfológico en adultos jóvenes con educación física. Por lo tanto, al evaluar y comparar poblaciones físicamente activas, se debe priorizar el uso de indicadores directos de composición corporal, en particular el porcentaje de grasa corporal y el índice de masa muscular esquelética.

PALABRAS CLAVE: Composición corporal; Estudiantes de ciencias del deporte; Diferencias regionales; Masa muscular esquelética; Adiposidad; IMC.

REFERENCES

- Al Dokhi, L. & Habib, S. S. Assessment of gender differences in body composition and physical fitness scoring in Saudi adults by bioelectrical impedance analysis. *Acta Clin. Croat.*, 52(2):189-94, 2013.
- Alahmadi, M. A. Health-Related Physical Fitness Components in Saudi Female Physical Education and Sport Sciences University Students. *EC Nutrition* 16(4):39-47, 2021.
- Al Sabbah, H. Prevalence of overweight/obesity, anaemia and their associations among female university students in Dubai, United Arab Emirates: a cross-sectional study. *J. Nutr. Sci.*, 9:e26, 2020.
- Andraos, Z.; Dagher, M.; Richa, C. & Dopsaj, M. Body typology of Lebanese adults: Initial cluster cross-selection study. *Int. J. Morphol.*, 42(3):561-6, 2024.
- Copic, N.; Petronijevic, S.; Ferrando Terradez, I.; Bertaccini, M. E. & Prebeg, G. Comparative analysis of body composition of females from three European countries (Serbia, Italy and Spain). *Sport Media Bus.*, 11(3):25-40, 2025.
- Dopsaj, M.; Djordjevic-Nikic, M.; Khafizova, A.; Eminovic, F.; Markovic, S.; Yanchik, E. & Dopsaj, V. Structural body composition profile and obesity prevalence among female students of the University of Belgrade measured by multichannel bioimpedance protocol. *Hum. Sport Med.*, 20(2):53-62, 2020.
- Fayyad, F.; Dopsaj, M.; Cherepov, E. A.; Episheva, A. A.; Cherepova, I. V. & Sarsynbaev, A. V. Body composition status of Lebanese university students according to gender and academic specialism. *Hum. Sport Med.*, 23(S2):36-45, 2024.
- Iqbal, M.; Al Regaiey, K. A.; Ahmad, S.; Al Dokhi, L.; Al Naami, M. & Habib, S. S. Body composition analysis to determine gender-specific physical fitness equations in a cohort of the Saudi population. *Pak. J. Med. Sci.*, 30(4):798-803, 2014.
- Musaiger, A. O.; Al-Hazzaa, H. M.; Takruri, H. R. & Mokhatar, N. Change in nutrition and lifestyle in the Eastern Mediterranean region: Health impact. *J. Nutr. Metab.*, 2012:436762, 2012.
- Petr̃eková, K.; Borzenko, N.; Kovalová, M. & Gottfriedová, N. Assessment of body mass index, body composition, physical activity and dietary preferences in university students: A pilot study. *Obesities*, 4(1):35-44, 2024.
- Rakic, S.; Dopsaj, M.; Djordjevic Nikic, M.; Vasiljevic, N.; Dopsaj, V.; Maksimovic, M.; Tomanic, S. M. & Miljus, D. Profile and reference values for body fat and skeletal muscle mass percent in females aged 18.0–69.9 years measured by multichannel segmental bioimpedance method: Serbian population study. *Int. J. Morphol.*, 37(4):1286-93, 2019.
- Ruiz, J. R.; Ortega, F. B.; Martínez-Gómez, D.; Labayen, I.; Moreno, L. A.; De Bourdeaudhuij, I. & Sjöström, M. Objectively measured physical activity and sedentary time in European adolescents. *Am. J. Epidemiol.*, 188(7):1298-308, 2019.
- Toskic, L.; Markovic, M.; Simenko, J.; Vidic, V.; Cikriz, N. & Dopsaj, M. Analysis of body composition in men and women with diverse training profiles: A cross-sectional study. *Int. J. Morphol.*, 42(5):1278-87, 2024.
- Wells, J. C. K. & Shirley, M. K. Body composition and the monitoring of non-communicable chronic disease risk. *Glob. Health Epidemiol. Genom.*, 1:e18, 2016.
- World Health Organization. *Obesity: Preventing and managing the global epidemic*. WHO Technical Report Series No. 894. Geneva, World Health Organization, 2000.

Corresponding author:

Assoc. Prof. Janez Vodicar, PhD.
Vice-Dean for Economic Activities
Head of the Institute of Sport
Sport Faculty
University of Ljubljana
Ljubljana
SLOVENIA

E-mail: Janez.Vodicar@fsp.uni-lj.si