INNOVARE JOURNAL OF EDUCATION
Vol 11, Issue 4, 2023, 80-86
ISSN: 2347-5528
Research Article

Estimation of Body Composition and Health Status in Women, PE Students, on-site of Outdoor Activities on Gazivode Lake – A Case Study Report

Jasna Popović, Miloš Popović, and Goran Ranković

University of Priština in Kosovska Mitrovica, Faculty of Sport and Physical Education, Dositeja Obradovića b.b, 38218 Leposavić

Tijana Purenović-Ivanović and Ružena Popović

University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

Abstract

This paper is based on the results of the cross-sectional experiment that was implemented in the school year 2021/2022 among women students in the first year of bachelor studies at the Faculty of Sport and Physical Education (FSPE) in Leposavić, University of Priština (temporarily allocated in Kosovska Mitrovica). The study design model was implemented during the obligatory course Outdoor activities (2nd semester, weekly classes 1 + 4, and 15 + 60 classes per semester) for the first time. Body composition assessment was realized along with the pedagogical practice of summer outdoor activities camp on Gazivode Lake in Kosovo (as a practical exam study curriculum requirement). The sample includes seven women FSPE students. Based on the body composition and health status assessment, students' results are presented in figures (for the evaluation of measured variables) and diagrams for estimating the individual student's results. Comparative analysis of results within the group was used, considering the differences among examined students regarding calculated mean values, recorded min and max results, and confidence interval. The student profile model scores were selected according to the best results achieved in general placement in most variables and evaluated regarding the case study report. The results were evaluated based on the digital system for the assessment of body composition (Omron BF511) and the interpretation of results for the following variables: Body Fat (BF%), Visceral Fat (VF), Skeletal Muscles Percentage (SM%), Body Mass Index (BMI), and Resting Metabolic Rate (RMR). Health status assessments were performed by an electronic digital blood pressure monitor (Prizma YE660E) for the measurement of Systolic (SYS), Diastolic Blood Pressure (DIA), and Resting Heart Rate (RHR). The results show the expected intra-group differences in body composition parameters, which are not inherited conditionally, for all selected body parameters (except for BMI). However, most of the values are in the recommended range, especially those with small percentages of high BF% and BMI, as well as SM% values, indicating the heterogeneity of the participants, their sports orientation, health status, and level of physical activity.

Keywords: blood pressure, body composition, women students, health, profile model

Introduction

In most population-based studies that have provided information on the relationship between physical activity and health status, body composition has been estimated by measuring Body Height (BH) and weight and calculating Body Mass Index (BMI). For example, exercise training studies have preferred hydrostatic or underwater weighing to determine Body Fat (BF) and lean body mass (National Institute for Clinical Excellence, 2006). However, this method lacks accuracy in some subpopulations, including older persons and children (Lohman, 1986). In addition, anthropometric measurements (i.e., girths, diameters, and skinfolds) used for calculating BF percentage have varying degrees of accuracy and reliability (Popović et al., 2019).

Data now suggest that the distribution of BF, especially accumulation in the abdominal area, and total BF are significant risk factors for cardiovascular diseases and diabetes (Blumberg & Alexander, 1992). Researchers have determined the magnitude of this abdominal or central obesity by calculating the waist-to-hip circumference ratio or using new electronic methods to image regional fat tissue. New technologies that measure body composition include total body electrical conductivity, bioelectrical impedance, magnetic resonance imaging, and dual-energy x-ray absorptiometry (R. Popović et al., 2020). These new procedures have substantial potential to provide further information on how changes in physical activity affect body composition and fat distribution.

The size and body composition, primarily predetermined by genetic inheritance, may change when it comes to body size, or significantly, with proper diet (dietary regime) and exercise when it

DOI: https://dx.doi.org/10.22159/ijoe.2023v11i4.48463. Journal homepage: https://journals.innovareacademics.in/index.php/ijoe .

Acknowledgment: We thank the students and instructors in this study for their trust in our project. **Authors' Contributions:** Conceptualization, J.P. and R.P.; methodology, R.P. and T. P-I; investigation, J.P., R.P. and M.P.; data procession, and study results evaluation, T.P-I., M.P., and R.P.; writing—original draft preparation, J.P., R.P., and T.P.-I.; writing—review and editing, T.P-I. R.P.; supervision, J J.P., M.P., G.R., T.P.-I. and, R.P. **Conflict of Interest:** There are no conflicts of interest in this research. **Funding Source:** Nil.

Correspondence concerning this article should be addressed to Ružena Popović, University of Niš, Faculty of Sport and Physical Education, Niš, Serbia. **Email:** ruzenapop@gmail.com

comes to body composition. Body size means physical size, namely volume, weight and longitudinal parameters, and diameters (Komiya et al., 1996). Many studies testify that physical appearance or constitutional type is a basic framework (reference) when attempting to interpret a health status, a type of physical fitness, sport achievement, and personality traits of human beings. Many detailed aspects need to be examined and studied within the general framework of constitutional types for different interpretations.

Assessment of body composition provides an excellent opportunity to pre-distribution a person's body size into two major structural components: BF and lean (non-fat) Body Mass (BM), i.e., relative BF and muscles are of extreme importance in practice (Cvetković et al., 2008). Although large amounts of BF are undesirable from a health perspective, it is impossible to determine precisely the optimal BF levels or body weight in a particular individual. Therefore, assessment of body composition in individuals and populations, or specifically selected samples, is vital for clinical trials, medical practices, and specific purpose needs, like evaluating applicants for the study at the Faculty of Sport and Physical Education (FSPE). Individuals engaged in active sports activities differ significantly in many somatic traits from those who practice a more sedentary lifestyle. In addition, in all previous studies, researchers found a significant relationship between PE students' physical status and their motor activity achievement (Bale, 1978, 1979, 1980), indicating the need to establish their physical status.

Objectives

This study aimed to determine the basic anthropometric parameters, women FSPE students' body composition status, and health status. The case study design was exciting regarding comparing the personal profile model results to estimated min-max results and mean value in FSPE women students. The additional purpose of this study is an among-group comparative analysis (with the results of the previously realized research) to examine the possible differences between those ages (study year) and give an insight into the status of the specific groups regarding the estimated results, which could also indicate possible omissions in the "primary evaluation process" on the entrance exam for FSPE studies.

Methodology

Participants

The total sample comprises seven undergraduate women FSPE students (aged 19-20) who participated in this study after receiving basic information about the research, its scientific importance, and personal benefits for them and in general. Table 1 shows the essential characteristics of the current sample (N = 7), as well as results of the previously realized studies on the representatives of FSPE women students from the University of Niš (Popović & Đurašković, 2014; Popović et al., 2019; Purenović-Ivanović et al., 2013, 2022; R. Popović et al., 2020).

Based on the cross-sectional study design, this research was realized in the 2021/2022 study year, with students in the first year of bachelor studies of FSPE of the University of Priština (temporarily located in Kosovska Mitrovica) included in the regular curriculum, within the required course Outdoor activities (second semester, weekly classes 1+4, and 15+60 classes per semester). Therefore, the total sample was assessed from May 15 to 18, 2022, along with the practical lessons' – summer outdoor activities camp, "on-site" Gazivode Lake in Kosovo (as pre-exam study curriculum requirements).

Measures and Procedures

The authors performed testing following the ethical standards of the declaration of Helsinki (World Medical Association, 2013). They performed with the same well-guided examiners (authors), in bright rooms with optimal microclimatic conditions, with the participants in their underwear. Collected data were entered in lists prepared for the research.

Anthropometric measurements were performed by International Biological Program (Weiner & Lourie, 1969) with an anthropometric instrument (Martin's anthropometer for measuring participants' BH, in 0.1 cm). The BM, in 0.1 kg of the participants, as well as their BMI (in 0.1. kg/m2), were determined by using a bioimpedance device, Omron BF511 (Kyoto, Japan), and after entering data of participant's age, gender, and BH. In addition, body composition parameters were also obtained by the same device: BF%, in 0.1%; VF, in levels, SM%, in 0.1%; and RMR, in kcal.

Participants' health status was assessed by digital tensiometer PRIZMA YE660E – a blood pressure digital monitor for the measurement of Systolic Blood Pressure (SYS, in mmHg), Diastolic Blood Pressure (DIA, in mmHg), and Resting Heart Rate, i.e., pulse (RHR, in bpm).

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences, version 21.0 (IBM SPSS 21.0, SPSS Inc, and Chicago, USA). In addition, the descriptive statistics (mean value, standard deviation, interval, minimum, and maximum) were summarized for all variables and individual results of a student, which represents the profile model for the case study report, were also presented.

Results

Table 1 shows the essential characteristics of the current sample age and anthropometry of FSPE students. Basic statistics parameters and comparison to previous similar study results on the different age-related representatives of FSPE students from the University of Niš (Popović & Đurašković, 2014; Popović et al., 2019; Purenović-Ivanović et al., 2013, 2022; R. Popović et al., 2020).

Table 1
Age and Anthropometry of women studying FSPE – Basic Statistics Parameters and Comparison to Previous Similar Study Results

Studies	Variables	*M* ± *SD*	Min-Max	Range
Current study	Age (years)	19.66 ± 0.35	19.0-20.0	1.0
N = 7	BH (cm)	172.57 ± 3.56	168.0– 178.0	10.0
	BM (kg)	59.61 ± 5.24	52.8– 68.1	15.3
Purenović-Ivanović et al.	Age (years)	20.36 ± 1.29	19.12–22.9	3.78
(2013)	BH (cm)	164.16 ± 7.83	155.5–179.0	23.5
N = 12	BM (kg)	60.86 ± 8.81	49.2–75.8	26.6
Popović et al. (2020)	Age (years)	23.6 ± 1.35	21.4–25.8	4.4
N = 30	BH (cm)	164.0 ± 8.13	150.0–182.5	32.5
	BM (kg)	60.0 ± 8.53	43.7–75.8	32.1
Purenović-Ivanović et al.	Age (years)	21.15 ± 1.46	18.7– 24.97	6.27
(2022)	BH (cm)	165.23 ± 6.31	153.0– 182.4	29.4
N = 53	BM (kg)	62.6 ± 8.67	46.0– 88.4	42.4
Бенић (2022)	Age (years)	21.04 ± 1.43	18.7–24.97	6.27
N = 59	BH (cm)	165.3 ± 6.21	153.0–182.4	29.4
	BM (kg)	61.88 ± 8.54	46.0–88.4	42.4

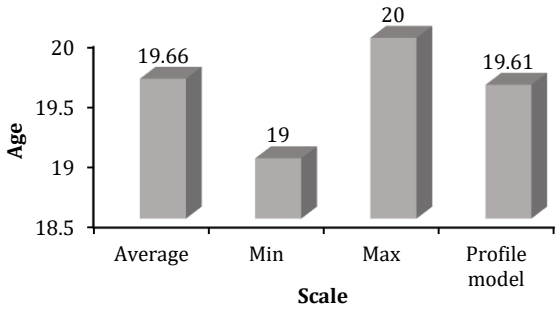
Note. Max = maximum value; Min = minimum value; BH = Body Height; BM = Body Mass; Range = the number of border values difference.

The obtained data are presented by Figures (for each examined variable), which provide more transparent insight into the student profile model, who is also the best-placed student, according to results estimated and evaluated, and interpreted based on presented scales for all parameters for body composition assessment (Omron, 2013). The following Figures 1, 2, and 3 show recalculated mean values, compared with registered min–max data, regarding the years of age of the respondents, the results of anthropometric parameters (BH and BM), as well as measures for the assessment of body composition in the sample of women FSPE students and the results of the profile model (A.L.).

Chronological Age of Women FSPE Students (Age, in 0.1 years)

Figure 1 shows the chronological age values of women FSPE students, expressed in years (in 0.1 years). The average age of the students was 19.66 ± .35 years; the min value was recorded in the case of student T.Č. which was 19.3 years old on the day of testing, and the max value was noted in T.N. (she was 20.18 years old), while the profile model (A.L.) was 19.61 years old. The group's excellent homogeneity was estimated in terms of chronological age.

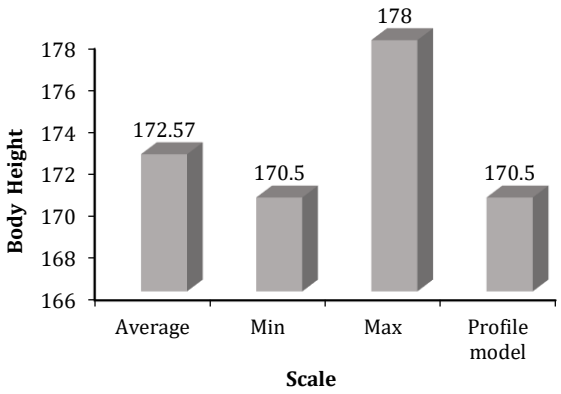
Figure 1
Age of Women FSPE Students and the Profile Model Student



Body Height of Women FSPE Students (BH, in 0.1 cm)

Figure 2 shows the measured BH values (in 0.1 cm) in women FSPE students. The average BH of the women FSPE students was 172.57 ± 3.56 cm; the min value was recorded in the case of student M.H. which is 168 cm, and the max value was noted in A.K. (she is 178 cm tall). At the same time, the profile model (A.L.), with 170.5 cm of BH, belongs to the below-average zone for this group of FSPE women students, which is considered a specifically selected sample concerning our country's general adult women population.

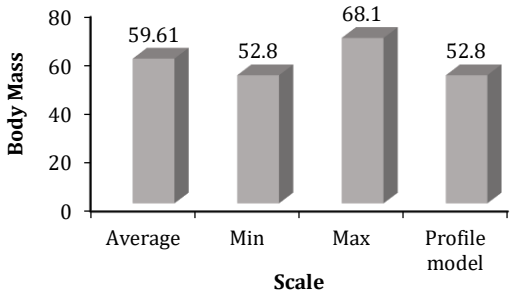
Figure 2
Body Height of Women FSPE Students and the Profile Model Student



Body Mass of Women FSPE Students (BM, in 0.1 kg)

Figure 3 shows the measured BM (in 0.1 kg) of the women FSPE students on the day of the testing (May 16, 2022). The average BM of the women FSPE students was 59.61 ± 5.24 kg; the max value was noted in A.K. (68.1 kg), and the min value (52.8 kg) is also a profile model student's BM, which belongs to the zone of below-average values within the specifically selected sample of women FSPE students.

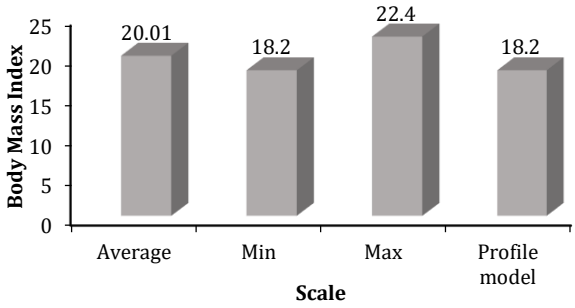
Figure 3
Body Mass of Women FSPE Students and the Profile Model Student



Body Mass Index of Women FSPE Students (BMI, in 0.1 kg/m²)

Figure 4 shows the BMI (in 0.1 kg/m²) of women FSPE students on the day of testing. The obtained mean value is 20.01 ± 1.51 kg/m², within the normal range based on the BMI cut-off point scale for adults (Ross & Janssen, 2007). The max BMI value (22.4 kg/m²) belongs to student S.Đ. and is also within the normal range of BMI values. The min value is also a profile model student's BMI (18.2 kg/m²) belonging to the underweighted person group (Ross & Janssen, 2007).

Figure 4
Body Mass Index of Women FSPE Students and the Profile Model Student



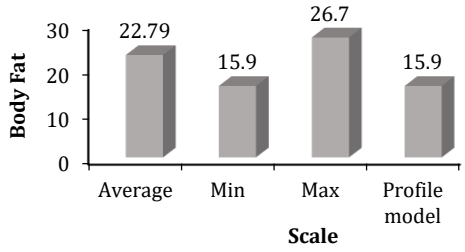
Body Composition Parameters- Body Fat in Women FSPE Students (BF%, in 0.1%)

Figure 5 shows the values of BF% of women FSPE students on the day of testing. The obtained mean value is 22.79 ± 4.09%, an expected value based on the BF% cut-off point scale for adult women (Omron, 2013). The max BF% value (26.7 %) is recorded in the case of student T.Č. It represents an expected value of this body composition parameter (every BF% value in the range between 21% and 32.9% is considered normal, according to Omron, 2013). The min value is also a profile model student's BF% value (15.9 %) which belongs to the low range of BF percentage values.

Body Composition Parameters- Visceral Fat Level (VF, in Levels)

Figure 6 shows the estimated levels of VF in women FSPE students; an average recorded value was 2.14 ± .69, which is the expected and normal VF level (Omron, 2013) for this age group of FSPE women students. Furthermore, the max VF value (level 3) was recorded in the case of two students (A.K. and S.Đ.), and it is also an average VF level. At the same time, the profile model student (A.L.) has the VF value, which is also, at the same time, a min value in this sample (level 1), and it belongs to the range of typical VF values (level 1–9, according to Omron, 2013).

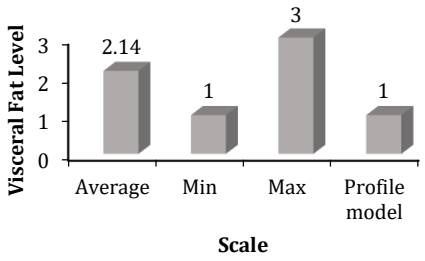
Figure 5
Body Fat Percentage of Women FSPE Students and the Profile Model Student



Body Composition Parameters-Visceral Fat Level (VF in Levels)

Figure 6 shows the estimated levels of VF in women FSPE students; an average recorded value was 2.14 ± .69, which is the expected and normal VF level (Omron, 2013) for this age group of FSPE women students. Furthermore, the max VF value (level 3) was recorded in the case of two students (A.K. and S.Đ.), and it is also an average VF level. At the same time, the profile model student (A.L.) has the VF value, which is also, at the same time, a min value in this sample (level 1), and it belongs to the range of typical VF values (level 1–9, according to Omron, 2013).

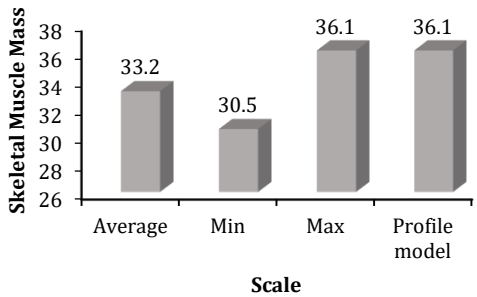
Figure 6
Visceral Fat Level of Women FSPE Students and the Profile Model Student



Body Composition Parameters-Skeletal Muscle Mass Percentage (SM%, in 0.1%)

Figure 7 shows the values of SM% of FSPE women students on the day of testing. The obtained mean value is 33.2 ± 1.99 % is a high value based on the SM% cut-off point scale for adult women (Omron, 2013). The min recorded SM% value (30.5 %) belongs to student T.Č., a lower limit in the range of high SM% values. The max SM% value (36.1 %) is also a profile model student's SM% value. It represents a very high value of this body composition parameter (every SM% value above 35.4% is considered high, according to Omron, 2013).

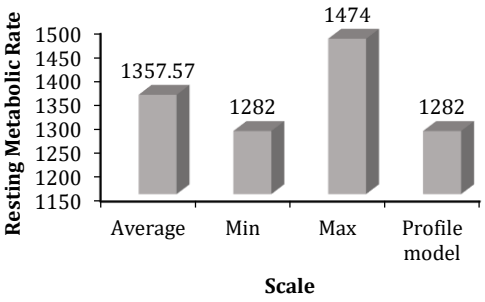
Figure 7
Skeletal Muscle Mass Percentage of Women FSPE Students and the Profile Model Student



Body Composition Parameters- Resting Metabolic Rate (RMR, in kcal)

Figure 8 shows the values of RMR in women FSPE students, estimated on the day of the testing event. The calculated mean value of RMR (1357.57 ± 66.54 kcal) within women FSPE students fall into the zone of typical values for this group (Omron, 2013). Min value of RMR (1282 kcal) within this sample is recorded in student A.L., who is also a profile model student, and this value is considered normal. The max RMR value (1474 kcal) belongs to student A.K. and is regarded as a very high RMR value (Omron, 2013).

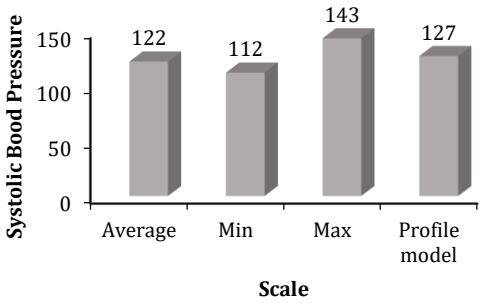
Figure 8
Resting Metabolic Rate of Women FSPE Students and the Profile Model Student



Health Status Parameters- Systolic Blood Pressure in Women FSPE Students (SYS, in mmHg)

Figure 9 shows the estimated SYS pressure values in women FSPE students measured on the day of the testing. The mean value recorded in this sample is 122.00 ± 10.55 mmHg, which falls into the zone of typical SYS values for this age and gender group (according to the PRIZMA scale for adult women persons). However, according to American Heart Association (AHA, 2018), it is elevated blood pressure. The recorded min SYS value (112 mmHg) belongs to student A.K. and is also a typical value. The highest SYS value is recorded in student Al.L. (max = 143 mmHg), considered hypertension stage 2 (AHA, 2018). Min SYS value is recorded in profile model student (112 mmHg), representing normotensive value

Figure 9
Systolic Blood Pressure of Women FSPE Students and the Profile Model Student

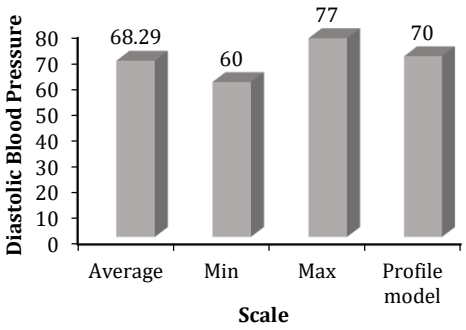


Health Status Parameters- Diastolic Blood Pressure (DIA, in mmHg)

Figure 10 shows the DIA values in women FSPE students measured on the day of testing. The mean value recorded in this sample is 68.29 ± 6.65 mmHg. Therefore, it falls into the zone of typical DIA values for this age and gender group (according to the PRIZMA scale for adult women persons and according to AHA, 2018). The recorded min DIA value (60 mmHg) belongs to the

student AK. It is also in the expected value range. The highest DIA value is recorded in student Al.L. (max = 77 mmHg), which is considered elevated blood pressure when in combination with elevated SYS (AHA, 2018), which is this case. The student (A.K., the profile model) recorded a typical DIA value (70 mmHg).

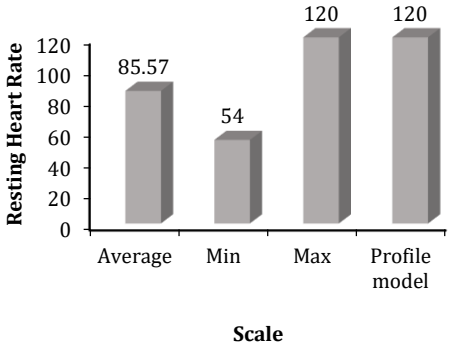
Figure 10
Diastolic Blood Pressure of Women FSPE Students and the Profile Model Student



Health Status Parameters-Resting Heart Rate/Pulse (RHR, in bpm)

Figure 11 are presented the values of RHR. The average RHR value recorded in this sample is 85.57 ± 22.39 bpm, considered a standard pulse value. The min RHR value is recorded in student S.Đ. (54 bpm) and is classified as bradycardia (RHR < 60 bpm). The highest RHR value is recorded in the student profile model (RHR = 120 bpm) and is classified as tachycardia.

Figure 11
Resting Heart Rate of Women FSPE Students and the Profile Model Student



Discussion

The measurements of individual segments of anthropological status in athletes, as well as the determination of the constitution, somatotype, and body composition of the high-level athletes, are essential in the process of the primary selection, as well as the second choice to the particular sport, or discipline orientation, for monitoring and evaluating the training process, for objective assessment of general physical development, control of the athlete's nutritional status (J. Popović et al., 2020), and monitoring of the athlete's recovery in the rehabilitation process (Popović et al., 2019). Besides talent, adequate morphological characteristics, body composition, and health status in good condition are prerequisites for success in sports and PE studies, which are very complex. Thus, in addition to meeting all the requirements for entry into any other faculties, the FSPE study's entrance exam considers the candidate's physical abilities, actual health status, and technical preparation in some sports disciplines (Popović et al., 2014).

The women FSPE students in the current study are a very homogeneous group regarding their age, which is expected because they are all members of the corresponding generation when enrolling in the study of FSPE. When compared with different samples of women students of the FSPE of the University of Niš (Popović & Đurašković, 2014**;** Popović et al., 2019; R. Popović et al., 2020; Purenović-Ivanović et al., 2013, 2022), this sample is the youngest. Regarding the BH, all participants are distributed within the same central class, within the min–max interval of 168 cm to 178 cm. Comparing anthropometric parameters with other samples of women FSPE students (R. Popović et al., 2020; Purenović-Ivanović et al., 2013, 2022) indicates the existence of particular, among groups, differences in BH with the highest numeric mean value in the current study sample. For example, according to Martin's BH reference values, distributed into seven categories, 50% of women FSPE students are high, 33.33% are above average, 8.3% are below average BH, and 8.3% are very high (Simić et al., 2010). Regarding BM**,** estimated results of women FSPE students are distributed within min–max results (52.8 kg – 68.1 kg) with a considerable confidence interval of (15.3 kg), indicating significant inter-group differences. As a result, the calculated mean value (59.6 kg) is the lowest compared with other samples of women FSPE students (Purenović-Ivanović et al., 2013, 2022; R. Popović et al., 2020).

The BMI of all participants indicates uniform measured values. In the third year of study students (R. Popović et al., 2020), the calculated average is 21.5 kg/m^2 with an interval of 8 kg/m^2, while in the younger group of participants (Purenović-Ivanović et al., 2013), a slightly higher average value (22.6 kg/m^2) was calculated, with an interval of 7.9 kg/m^2. Both average results are in the standard range (18-25) for this age scale of adult women. In the research carried out on a sample of FSPE students from Belgrade University (Moskovljević, 2013), a slightly lower BMI value was recorded (21.17 ± 1.93 kg/m^2), as in the study carried out on the women students of the FSPE from Niš (R. Popović et al., 2020). However, on the contrary, a higher average BH was recorded (169.3 ± 5.15 cm). Regarding BM, women students from Belgrade University have noticed a slightly lower average value (60.32 ± 5.86 kg).

The comparative analysis of the situation regarding BF% is slightly different. The calculated average value (22.79 ± 4.09%) indicates less relative BF values but also a moderate non-uniformity of the group, with an interval of 10.8%, compared to other groups of FSPE students (Purenović-Ivanović et al., 2013), which have a higher percentage of relative BF (30.7%), but also a higher group non-uniformity, with an interval of 17.5%. Regarding the VF level, all participants are in the range of the regular scale, according to Omron (2013). Still, some differences between samples are recorded: the current selection of participants has an average value of 2.14 with an interval of 2. In contrast, respondents of the other group (Purenović-Ivanović et al., 2013) have an average value of 3.7 with an interval of 3. Regarding relative SM mass, the calculated average value is approximately the same in both samples. However, the current selection of respondents has an average value of 33.2% with an interval of 6.4%, which makes it more homogeneous than the other group, with an average of 29.6% and an interval of 13.1% (Purenović-Ivanović et al., 2013). The obtained average value of RMR is 1357 kcal, with an interval of 192 kcal, which indicates a significant inter-group uniformity and makes it more homogeneous than those in the older sample of women students (R. Popović et al., 2020). Adolescence is a difficult period for precise assessment regarding RMR (as cited in Bubanj et al., 2013). The predicted daily RMR for individuals or groups aged 15–18 ranged between 1445–1490 kcal for women. In that sense, the mean values in the current research are slightly below (1357 kcal) the values presented by those students of younger (Purenović-Ivanović et al., 2013) and older age (R. Popović et al., 2020).

The study results show the expected intra-group differences in body characteristics, which are not inherited conditionally, for all of the selected body composition parameters (except for BMI). However, although most of the values were in the standard range, those low percentages of high BF% and BMI, and SM% values indicate the heterogeneity of this women's student population, their sports orientation, and their level of physical activity. Therefore, the reasons can be malnutrition or poor diet habits (they studied outside their birthplace). Also, the reasons for this may be the range of conducting the entrance exam and even the

insufficiently high criteria for enrollment in the PE studies (except for active and former athletes). Therefore, it is necessary to find out a more appropriate evaluation system for the entrance exam for the PE studies than the applied (point) system, which limits in a significant way the possibility of the adequate assessment of candidates (Popović, 2015).

When it comes to participants' health status parameters, the highest percentage of students (57.14%, or 4 out of 7) have normotension (90 < SBP < 120 mmHg), two participants (28.6%) have increased blood pressure (120 < SBP < 129 mmHg) and first stage hypertension (130 < SBP < 139 mmHg), and one (14.3%) have second stage hypertension, i.e., 143/77 mmHg [it is not unusual for individuals between the ages of 15 and 25 to have increased systolic blood pressure and typical diastolic values (O'Rourke et al., 2000). A similar situation occurred among FSPE students from Niš (Purenović-Ivanović et al., 2022), i.e., second-stage hypertension in two participants (3.85%) and one with a blood pressure of 143/92 mmHg (a student with a very high percentage of adipose tissue, i.e., BF% was 42%). Compared the results of blood pressure of 2828 physically active American women non-athlete students (Pribis et al., 2010) determined slightly lower SYS values (118.4 ± 14.1 mmHg) but higher DIA values (73.5 ± 9.4 mmHg) to those evidenced in our sample of examinees (122.00 ± 10.55 mmHg for SYS and 68.3 ± 6.65 mmHg for DIA). However, American non-athlete students have a slightly lower percentage of BF tissues (22.4 ± 6.7% vs. 22.79 ± 4.09%). Regarding the RHR values, it was on the lower limit of the healthy range (85.57 ± 22.39 bpm), which is higher than that recorded in non-athlete women students from America, in whom RHR in average was 78.7 ± 12.9 bpm (Pribis et al., 2010). However, within the majority of our participants (4 out of 7 or 57.14%), standard/below average RHR values were recorded; in two students (28.57%), slightly increased RHR values were recorded (tachycardia), and bradycardia (54 bpm) only in one participant, and she is in the field athletics [bradycardia (RHR < 60 bpm) is a common physiological phenomenon among sports population, especially in endurance sport, such as athletics (Doyen et al., 2019) as the chronic answer to the cardiovascular system on the training load (Bahrain et al., 2016)]. The obtained data on RHR are surprising. A possible explanation for such a small percentage of the evidence for good training preparation among athletic women students is that many of them are already former athletes whose physical activity is reduced only to the attendance of practical classes at FSPE.

Cardiovascular arrhythmias, such as bradycardia and tachycardia, are common among athletes. Long-term exercise causes structural and electric cardiac remodeling, or "sports heart," which is a specific condition (Prior & La Gerche, 2012) characterized by dilatation and hypertrophy in all four heart chambers and enhanced tone of vagus in rest (Miljoen et al., 2019). In the same study (Miljoen et al., 2019), realized on a sample of 85 athletes, it was established that every second athlete had tachycardia. However, given that RHR is a very accessible but also sensitive parameter that exhibits significant variations at rest (depending on gender, age, level of training, ambient temperature, body position, diet, hydration levels, caffeine levels, use of medication, emotional state, illness, etc.), we believe that these four recorded high values of RHR of the participants are likely only a reflection of their current (emotional) state, or possibly dehydration, or even possible device error (Padwal et al., 2001).

Conclusion

This research aimed to determine the age, essential anthropometry characteristics, selected body composition, and health status parameters in women students after completing the first year of bachelor studies at the Faculty of Sports and Physical Education in Leposavić during their stay in the summer camp on-site Gazivode lake for practical classes of course Outdoor activities. Namely, FSPE students are specifically selected, i.e. a FSPE entrance exam is mandatory. It involves the selection of candidates with proportional morphological characteristics, without body deformities, with parameters of body composition that are within average values and indicators of good health, without any risk factors that an increased volume of physical activity could provoke during the implementation of practical classes of different courses. Outdoor activities are mandatory course with specially programmed, concentrated, subfigure lessons, which were realized at the end of the second semester in highly favorable climatic conditions, but with an increased volume of physical and mental workload of the students. This situation could have caused increased values of some health status parameters that could be considered cardiovascular risk factors. The established position on the spot, where all women students were subjected to the same load in the conditions of the daily schedule (increased volume of physical activities, diet, and rest regime), may indicate some omissions in selecting candidates for the demanding FSPE study. Firstly, the average BM of the participants was 59.6 kg, with an interval of 15.3 kg. Such results indicate increased BM values compared to the general population of women of the same age (the profile model student's BM was minimal). However, their BMI indicates that they are typically weighted persons, except the profile model student, who is underweight and with a low percentage of BF (in contrast to the rest of the participants). The rate of SM mass is high, mainly with the profile model student, which is expected. Namely, the increased volume of sports and physical activities before and after enrolling in studies caused the increase of these parameters' values compared to the general population, primarily due to the higher percentage of muscle mass, characteristic of a specially selected sample of FSPE students. The chosen health status parameters mainly indicate that participants are healthy young persons, except for three students–two with elevated blood pressure, i.e., 120 < SYS < 129 mmHg and 60 < DIA < 80 mmHg (one of these two is profile model student) and one (the profile model student's twin sister) with hypertension stage 2 (BP = 143/77 mmHg); tachycardia (RHR > 100 bpm) was recorded in profile model student and her twin sister which leads us to attribute this to genetics. These health status parameters are only results of the profile model student that do not fall within the expected, i.e., typical and average values, and might be the consequence of heavy workload, reflection of their current emotional state, or is a matter of inheritance. All other measured variables are in favor of the profile model student.

References

American Heart Association. (2018). Understanding blood pressure readings. https://www.heart.org/en/health-topics/high-blood-pressure/understanding-blood-pressure-readings

Bale, P. (1978). The physiques of physical education students and their relationships to performance. *Research Papers in Physical Education*, *3*(4), 30–33.

Bale, P. (1979). The relationship between physique and basic motor performance in a group of women physical education students. *Research Papers in Physical Education*, *1*, 26–32.

Bale, P. (1980). The relationship of physique and body composition to strength in a group of physical education students. *British Journal of Sports Medicine*, *14*(4), 193–198. http://doi.org/10.1136/bjsm.14.4.193

Blumberg, V. S., & Alexander, J. (1992). Obesity and the heart. In P. Bjorntorp & B. N. Brodoff (Eds.), *Obesity* (pp. 517–531). Lippincott.

Bubanj, S., Živković, M., Stanković, R., Obradović, B., Purenović-Ivanović, T., & Đošić, A. (2013). Body composition in high school population of athletes and non-athletes. *Facta Universitatis, Series: Physical Education and Sport*, *11*(3), 197–208.

Cvetković, M., Obradović, J., & Kalajdžić, J. (2008). Effects of Pilates on morphological characteristics of women students of the faculty of physical education. *Glasnik Antropološkog Društva Srbije*, *43*, 605–613.

Doyen, B., Matelot, D., & Carré, F. (2019). Asymptomatic bradycardia amongst endurance athletes. *Physician and Sportsmedicine*, *47*(3), 249–252. https://doi.org/10.1080/00913847.2019.1568769

Komiya, S., Masuda, T., Ube, M., & Mitsuzono, R. (1996). Body size and composition in different somatotypes of Japanese college-aged women. *Applied Human Science*, *15*(1), 5–11. https://doi.org/10.2114/jpa.15.5

Lohman, T. G. (1986). Applicability of body composition techniques and constants for children and youths. *Exercise and Sport Sciences Reviews*, *14*, 325–357. https://doi.org/10.1249/00003677-198600140-00014

Miljoen, H., Ector, J., Garweg, C., Saenen, J., Huybrechts, W., Sarkozy, A., Willems, R., & Heidbuchel, H. (2019). Differential presentation of atrioventricular nodal re-entrant tachycardia in athletes and non-athletes. *Europace*, *21*(6), 944–949. https://doi.org/10.1093/europace/euz001

Moskovljević, L. (2013). *Faktori uspešnosti usvajanja programskih sadržaja ritmičke gimnastike kod osoba različitog pola* [Success factors of Rhythmic Gymnastics syllabus acquisition in persons of different gender] [Doctoral dissertation, University of Belgrade, Faculty of Sport and Physical Education]. https://nardus.mpn.gov.rs/bitstream/handle/123456789/3121/Disertacija.pdf

National Institute for Clinical Excellence. (2006). Hypertension: Management of hypertension in adults in primary care. https://www.nice.org.uk/guidance/cg34

O'Rourke, M. F., Vlachopoulos, C., & Graham, R. M. (2000). Spurious systolic hypertension in youth. *Vascular Medicine*, *5*(3), 141–145. https://doi.org/10.1177/1358836X0000500303

Omron. (2013). Body composition monitor: Instruction manual. https://www.manualslib.com/manual/887289/Omron-Bf511.html.

Padwal, R., Straus, S. E., & McAlister, F. A. (2001). Evidence based management of hypertension. Cardiovascular risk factors and their effects on the decision to treat hypertension: Evidence based review. *BMJ*, *322*(7292), 977–980. https://doi.org/10.1136/bmj.322.7292.977

Popović, J., Popović, M., & Popović, R. (2020). Comparative analysis of the physical activity, nutrition and health behaviour in physical education students: Gender differences. *Britain International of Linguistics Arts and Education Journal*, *2*(2), 676–687. https://doi.org/10.33258/biolae.v2i2.287

Popović, R. (2014). Discriminability of entrance-exam enrollment criteria for the physical education study selection of women applicants. In S. Pantelić (Ed.), *Book of Proceedings of the XVII Scientific Conference 'FIS COMMUNICATIONS 2014' in physical education, sport and recreation, and II International Scientific Conference* (pp. 248–258). Faculty of Sport and Physical Education of University of Niš.

Popović, R. (2015). Analysis of the entrance-exam objectivity criteria for the physical education study applicants selection: An overview for the period last up 1970th to 1990th. *Czech Kinanthropology*, *19*(1), 46–60.

Popović, R., & Đurašković, R. (2014). Body composition of the physical education women students. In M. McGreevy & R. Rita (Eds.), *CER Comparative European Research 2014* (pp. 134-137). Sciemcee Publishing.

Popović, R., Aleksić-Veljković, A., Purenović-Ivanović, T., & Popović, A. (2019). Assessment of body composition in sport and physical education women students of the University of Niš: A case study. In V. Stanković & T. Stojanović (Eds.), *Anthropological and teo-anthropological views of physical activity from the time of Constantine the Great to modern times* (pp. 106–118), The Faculty of Sport and Physical Education, University of Priština in Kosovska Mitrovica.

Popović, R., Aleksić-Veljković, A., Purenović-Ivanović, T., & Popović, A. (2020). Assessment of body composition in physical education women students of University of Niš. *Advances in Sciences and Humanities*, *6*(1), 36–51. https://doi.org/10.11648/j.ash.20200601.15

Pribis, P., Burtnack, C. A., McKenzie, S. O., & Thayer, J. (2010). Trends in body fat, body mass index and physical fitness among male and women college students. *Nutrients*, *2*(10), 1075–1085. https://doi.org/10.3390/nu2101075

Prior, D. L., & La Gerche, A. (2012). The athlete's heart. *Heart*, *98*(12), 947–955. http://doi.org/10.1136/heartjnl-2011-301329

Purenović-Ivanović, T., Popović, R., Đorđević, M., & Živković, D. (2013). Body type and composition of the PE students. In S. Pantelić (Ed.), *Book of Proceedings of the XVI Scientific Conference 'FIS Communications 2013' in physical education, sport and recreation, and I International Scientific Conference* (pp. 405–412). Faculty of Sport and Physical Education, University of Niš.

Purenović-Ivanović, T., Stojanović, S., Veličković, V., Živković, D., & Đošić, A. (2022). Cardiovascular risk factors in physically active women university students. *Facta Universitatis, Series: Physical Education and Sport*, *20*(2), 101–112. https://doi.org/10.22190/FUPES220310009P

Ross, R., & Janssen, I. (2007). Physical activity, fitness and obesity. In C. Bouchard, S. N. Blair & W. L. Haskell (Eds.), *Physical Activity and Health* (173–189). Human Kinetics Publishers.

Simić, S., Vasić, G., & Jakonić, D. (2010). Body height, body mass, and nutrition status of students of the University of Novi Sad. *Medicina Danas*, *9*(4–6), 141–146.

Weiner, J. S., & Lourie, J. A. (1969). *Human biology, a guide to field methods. International biological programme*. Blackwell Scientific Publications.

World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA, 310*(20), 2191–2194. http://doi.org/10.1001/jama.2013.281053

Бенић, З.Ј. (2022). *Кардиоваскуларни фактори ризика физички активних студенткиња* [Cardiovascular risk factors of physicaly active female students] [Unpublished master's thesis]. Faculty of Sport and P.E. University of Niš.

Received: 20 March 2023
Revised: 29 May 2023
Accepted: 14 June 2023