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PHYSICAL ACTIVITY, BODY COMPOSITION AND ATTITUDES TOWARD EXERCISE AMONG COLLEGE STUDENTS

Arben OSMANI[1] and Dušan B. PERIĆ[2]

[1] AAB College, Pristine, Rr. Elez Berisha, Nr. 56, Kosove

[2] Faculty of Sport and Psychology, Educons University, Novi Sad, Serbia

ABSTRACT

Regular physical activity (PA) is important in maintaining health and quality of life. Persons who do not regularly exercise or who adopt sedentary behaviour are prone to becoming overweight or obese, with significant impact on morbidity, quality of life, and physical and mental health. Positive attitudes towards exercise can facilitate the behaviours and values of a healthy lifestyle. The study aim was to investigate the association of PA level, body composition and attitudes towards exercise in university students. Body dimensions (height, weight, body mass index and fat percentage) of 300 male and 300 female students were measured and PA levels assessed. Attitudes towards exercise were assessed using a questionnaire. Female students were significantly less involved in PA than their male counterparts, with 24% of male and 63% of female students reporting that they (almost) never exercise. Most students (70%) had normal body weight, but about 20% were overweight. Participant groups (athletes, recreational, inactive, male and female students) had similar moderately positive attitudes towards exercising, which was not associated with body composition or PA level. A positive attitude was insufficient for regular participation in PA, but should be supported by education, as well as by diversified sport and recreational offerings and encouragement to engage in these activities.

***Keywords**:* Body fat percentage; Body Mass Index; College students; Obesity; Physical activity; Physical education

INTRODUCTION

The sedentary lifestyle is a characteristic feature of the modern world and is a leading cause of numerous chronic non-communicable diseases (Atorkey *et al.,* 2019; Kandola *et al.,* 2020; Uddin *et al.,* 2020; Wagner and Brath, 2012). Physical inactivity has become a critical global health problem (WHO, 2018a). The sharp decline in physical activity (PA) is particularly pronounced during adolescence (15–19 years) and in young adults (20–25 years), which puts the college students (CS) at risk group (Romanov *et al.,* 2014). Insufficient PA among CS has been recognised in many countries; in the United Kingdom this phenomenon is popularly called "couch potato society", while in the Balkans it is referred to as the "homo-sedentary population" (Aleksovska-Veličkovska *et al.,* 2019). Despite awareness of the benefits of an active lifestyle, the studies indicates that the level of daily PA in the CS population is not satisfactory and that they are insufficiently involved in sports and physical activities (De Vahl *et al.,* 2005; Romanov *et al.,* 2014; Sullum *et al.,* 2010). The World Health Organization (2018b) indicated that 34.3%

of the CS reported having never exercised (male: 25%; female: 43%). Moreover, 32.5% of the CS who participated in PA did so fewer than three times per week (once per week: 15.8%; 2 – 3 times per month: 16.7%).

CS who insufficiently exercise and adopt sedentary behaviour (SB) are more likely to be overweight and obese (Rutkow *et al.,* 2016). The continuing increase in obesity (CDC, 2019; WHO, 2018c) should be met with trepidation due to the associated adverse health outcomes that afflict both individuals and society (Wang *et al.,* 2011). The prevalence of obesity has increased across all age levels, from children to adults and CS (ACHA, 2016, 2020). Such trends are concerning because obesity and its consequences greatly impact morbidity, quality of life, and physical and mental health (Gariepy *et al.,* 2010; Kushner and Foster, 2000; Luppino *et al.,* 2010).

Obesity can be classified using a range of methods; however, each method comes with its strengths and weaknesses (Norgan, 2007; Wilson *et al.,* 2019). In this study we used body mass index (BMI) and body fat percentage (BFP). BMI and gender are correlated with students' PA and SB. Higher BMI is associated with higher levels of SB and lower levels of PA (Cooper *et al.,* 2015; Jago *et al.,* 2020; Schwarzfischer *et al.,* 2019). Females are less physically active than males and spend more time in SB (Cooper *et al.,* 2015; Ishii *et al.,* 2015; Nader *et al.,* 2008).

Previous studies demonstrate that students' attitudes towards exercise is an important factor that influences their participation in PA during their free time (Bailey, 2006; Hagger *et al.,* 2003; Kretschmann, 2015, Portman, 2003; Prochaska *et al.,* 2003). In addition, a positive attitude towards exercising can facilitate the adoption of behaviours and values characterising a healthy lifestyle (Kamtsios, 2011; Rikard & Banville, 2006; Subramaniam & Silverman, 2007; Zeng *et al.,* 2011).

Purpose of research

To this end, the aim of this research was to investigate the interrelationships of PA levels, body composition (BMI and BFP) and attitudes towards exercise of CS, based on the assumption that participants with a more favourable attitude towards exercise have a better body status and are more physically active.

METHODOLOGY

Ethical clearance

This transversal study is conducted on a sample of CS. The data were collected within the doctoral dissertation approved by the Ethics Committee of the University of Montenegro (protocol number: 1235/3). The data of body dimensions and attitudes towards exercise were collected using standardised instruments. The measurements were performed in accordance with the Helsinki Declaration (WMA, 2018). The obtained numerical data (descriptive statistical parameters) are included within the article. The source data (SPSS table with original measurements) used to support the findings of this study are available from the corresponding author upon request.

Sample

The CS were recruited from AAB University in Kosovo. According to the official data (Monti & Ask, 2021), there were a total of 95,300 students in all state and private universities in Kosovo at the time of data collection. The sample for this study was selected using convenience and quota methods from the overall population. Ultimately, the sample included 600 students (300 males and 300 females) from five different faculties (Economics, Law, Criminology, Philology, and Informatics) who willingly participated in the research. The University campuses are situated in various towns, so the measurements were taken in Prishtina, Ferizaj and Gjakova. The criteria for participation in the study were as follows: students needed to be between 19 and 21 years of age, full-time students, and enrolled in their first year of study (Table 1). When completing the questionnaire, participants were asked to perform a self-assessment regarding the level of their PA, namely as: (1) athletes (those who exercise every day and participate in sports competitions throughout the year); or (2) recreationals (those who exercise two to three times a week, for example, they walk, run, ride a bicycle, go to the gym or play futsal, street basketball, volleyball, etc.); or (3) inactive (those who never exercise or exercise as seldom as two to three times a year).

Table 1. **DESCRIPTIVE CHARACTERISTICS OF THE STUDY SAMPLE**

	Male		Female	
Characteristics	Mean	SD	Mean	SD
Age (years)	19.42	0.77	19.40	0.80
Body weight (kg)	75.84	12.28	59.61	9.49
Body height (cm)	178.82	6.45	166.75	5.94
Number of participants (N)	300		300	
Level of physical activity (frequency)				
Athletes	38 (12.66%)		22 (7.33%)	
Recreational	191 (65.66%)		90 (30.00%)	
Inactive	71 (23.66%)		188 (62.66%)	

Measurement of the body composition variables

The following four body variables were measured in each participant: (1) body height (BH), (2) body weight (BW), (3) BMI, and (4) BFP. All measurements were undertaken between 08h00 and 10h00 in accordance with the International Biological Program (IBP) standards (Lohman *et al.*, 1988). Participants were measured barefoot and in light clothing, with long trousers and sweaters not acceptable. Three trained people conducted the protocols; one measured BH, another measured BW and body composition and the third was a scorer. On average, 15–20 participants were assessed per day, resulting in all data being collected within a period of 2 months.

A telescopic height-measuring instrument (stadiometer – model SECA 220, Hamburg, Germany) to the nearest 1 mm was used to assess BH. Bioelectrical impedance analysis (BIA) was applied to assess body composition. A segmental monitor by Tanita (model BC-601, eight-electrode measurement) was used to measure BW and BFP. BMI was calculated automatica lly

by dividing weight by squared height (kg/m ^{2}). The Tanita BC-601 automatically offers more data, however only BMI and BFP were selected for this study.

Dehydration is a recognised factor affecting BIA measurements as it causes an increase in the body's electrical resistance, so has been measured to cause a 5 kg underestimation of fat -free mass, i.e., an overestimation of body fat (Lukaski *et al.,* 1986). Body fat measurements are lower when measurements are taken shortly after consumption of a meal, causing a variation between highest and lowest readings of BFP taken throughout the day of up to 4.2% of body fat (Slinde & Rossander-Hulthén, 2001). Moderate exercise before BIA measurements leads to an overestimation of fat-free mass and an underestimation of BFP due to reduced impedance (Kushner *et al.,* 1996). Therefore, participants received the recommendation to avoid exercise 24 hours before BIA, to approach to the test after a night of sleep, and to not consume any foods or drinks for at least 2 hours before the measurement.

Assessment of attitudes towards exercise

For the purpose of this research, a questionnaire was designed: the Students' Attitudes Towards Exercise (SATE). The instrument was developed by adapting the existing surveys that tested attitudes toward physical education (PE) in schools. Various instruments have been developed in previous decades, including scales for measuring attitude towards PA (Kenyon, 1968), children's attitudes toward PA (Simon and Smoll, 1974), attitude towards physical education in elementary school (Martens, 1979), student's attitudes towards PE (Subramaniam & Silverman, 2000) and a PE attitude scale for adolescents (Orlić *et al.,* 2017). The base model for the instruments in the above-mentioned scales is Wea r's inventory (Wear, 1951), which was designed to measure the attitudes of junior high school students towards PE.

The initial Wear's attitude inventory consisted of 120 items, but it was later condensed into a shorter form containing only 30 items. We used the latter version (Part A) and adapted it for the purposes of the present study. Only 24 items (statements) related in general to PA were selected, while those that could be associated to school PE were omitted. This 24 -item instrument (Table 2) has not been used in the territory of Kosovo before, thus its reliability needed to be verified. Cronbach's alpha obtained on the whole sample was 0.798, which is higher than the recommended theoretical value of 0.7 (De Vellis, 2012), and this showed that the initial instrument had good internal reliability.

The Likert technique was employed for scoring purposes. Participants were asked to respond as quickly as possible to the questions by indicating their level of agreement or disagreement, ranging from "Strongly Disagree" to "Strongly Agree". The response options includ ed "Disagree", "Undecided or No Opinion", and "Agree" in between. The responses to the statements were assigned arbitrary weights, and an individual's score on the inventory was calculated as the sum of the scores obtained from the various statements. The response most favourable to PA received a score of five, while the least favourable response received a score of one. Some of the items were worded positively and others negatively. Prior to the sum calculation procedure an inversion of scalar values for negative statements was required (recoding: 1→5, 2→4, 4→2 and 5→1).

Table 2. **RESULTS OF SCALE RELIABILITY ANALYSIS FOR INITIAL QUESTIONNAIRE**

No	Items (statements)	Cronbach's alpha if item deleted	Mean	SD
1.	Physical activities provide no chance for learning to control strong feelings, such as anger.	0.807	2.50	1.26
2.	Taking part in lively physical activities gets one interested in using health habits.	0.792	4.39	0.75
3.	Sport activities help to teach and practice acceptable rules of behaviour with other people.	0.797	3.90	1.02
4.	Time spent in dressing, showering and playing in sport activities could be more valuable if spent in other ways.	0.790	3.48	1.23
5.	Very active play works off harmful strong feelings, such as anger.	0.800	3.95	1.03
6.	A person's body usually has all the strength it needs without taking part in sport activities.	0.788	3.77	1.20
7.	Taking part in physical activities tends to make one more likeable and better able to get along with other people.	0.795	3.83	0.96
8.	Because physical skills seem very important in youth, it is necessary that a person be helped to learn and to improve them.	0.794	4.29	0.77
9.	Developing a physical skill will relax your mind.	0.789	3.97	0.88
10.	Taking part in sport activities gives no help in developing the ability to feel calm in strange situations.	0.794	3.38	1.19
11.	Exercises taken regularly are good for one's general health.	0.789	4.44	0.82
12.	Sports activities do more harm than they do good.	0.783	4.29	1.14
13.	Physical activity provides nothing which will be of value outside of training session.	0.780	4.04	1.11
14.	Sport activities provide no chance for learning to respect the rights of others.	0.785	3.75	1.16
15.	Physical activity is not valuable enough to make it worth the time spent.	0.781	4.15	1.06
16.	Physical activity is an important subject in helping a person gain and keep all around good health.	0.788	4.41	0.83
17.	Physical activity situations are among the poorest for making friends.	0.784	3.96	1.10
18.	Belonging to a group, for which opportunity is provided in team activities, is a desirable experience for a person.	0.806	3.69	0.95
19.	No definite good results come from taking part in physical activities.	0.782	4.21	0.95
20.	Taking part in team physical activities is helpful in learning how to get along with people and how to make friends.	0.793	3.87	1.03
21.	Sport activities tend to upset a person's feelings – for example, make him angry.	0.792	3.67	1.21
22.	Physical activity sessions are poor in chances to learn how to get along with other people.	0.792	3.49	1.20
23.	I would advise anyone who is able to take part in physical activities.	0.789	4.40	0.88
24.	Physical activity is helpful in building up enough extra strength and in improving the ability to keep going for daily living.	0.787	4.23	0.89
	Cronbach's alpha	0.798		

Of the initial 24 items, after the validation process, 20 items were retained in the final version of our questionnaire (10 positive and 10 negative). This means that the Likert method of scoring showed the poorest possible score was 20, while a highly favourable attitude could score the maximum of 100 points. In between was the neutral position, which could result in a score of 60 points. Based on these values, five following levels were defined for the estimation of attitudes towards exercise: Very Negative (≤35 points); Moderate Negative (36 –51 points), Neutral (52–67 points), Moderate Positive (68–83) and Very Positive (≥84 points).

Statistical analysis

All statistical analyses were performed using IBM SPSS v.21 statistical software package (License Stats Prem: 761b17dcfd1bf20da576 by Hearne software), and statistical significance was set at $p<0.05$. Mean, standard deviation or percentages are presented as descriptive statistics. The distribution of the continuous variables was assessed by the Kolmogorov-Smirnov test of normality and additionally by histograms, normal Q-Q plots, detrended normal Q-Q plots and boxplots.

The questionnaire validity was assessed by factor analysis (model: principal components analysis, PCA), using Direct Oblimin method of rotation and Kaiser normalisation. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's test of sphericity were used to test if empirical data were factorisable.

Two-way analysis of variance (ANOVA) (Tabachnick & Fidell, 2019) was applied to test the effect of gender and PA level on the differences between the mean values in different sub-groups. ANOVA included test for homogeneity of variance using the Levene's test and calculation of the observed test power. The effect size of independent variables to empirical differences was estimated by partial eta squared (η^2). The Bonferroni post hoc test was used to reveal the source of the difference between different groups. The achieved power of the test was calculated by the software. Chi-square test was applied to analyse differences between frequency distribution in different sub-groups. The strength of the relationship between body characteristics and attitudes towards exercise was tested by Pearson correlation analysis.

RESULTS

Physical activity among male and female College Students

The frequency distribution of students with different levels of PA differed significantly according to gender (chi-square=93.422; $p<0.001$; Cramer's V=0.395). Two and a half times more female students declared that they never exercise (or are physically inactive) than male students. In the remaining two categories (athletes and recreationists), there were almost twice as many males as females (Table 1). These findings unequivocally show that female students are significantly less involved in PA than their male colleagues.

Body composition of the participants

The anthropometric variables (BH, BW, BMI and BFP) are continuous and were distributed normally. The Kolmogorov-Smirnov test did not confirm the assumption of normality of continuous variables ($p>0.05$), which is quite common in large samples (Pallant, 2013). However, additional checks (histograms, normal Q-Q plots, detrended normal Q-Q plots and

boxplots) showed that the continuous variables were nevertheless normally distributed and allowed the application of parametric statistics.

The homogeneity of variance was confirmed for both anthropometric variables analysed, using the Levene's test (for BMI: F=0.35, p=0.879; for BFP: F=1.566, p=0.168), thus fulfillin g another important assumption for applying the two-way ANOVA.

BMI data showed that the BW status of male and female students differed significantly (Table 3). Female students had lower BMI values than males (Figure 1). There were significantly more participants with healthy weight and fewer that were overweight and obese among the female students. The ANOVA results confirmed this because only the participants' gender had significant impact on BMI and BFP (Tables 4 and 5).

Table 3. **DISTRIBUTION OF PARTICIPANTS BY BODY WEIGHT AS ESTIMATED BY BODY MASS INDEX**

Sample	Underweight (BMI ≤18.5 kg/m^2)	Healthy weight (BMI 18.6–25 kg/m^2)	Overweight (BMI 25.1–29.9 kg/m^2)	Obesity (BMI ≥30 kg/m^2)	Total
			n (%)		
Male	14 (4.7)	189 (63.0)	86 (28.7)	11 (3.7)	300 (100)
Female	40 (13.3)	226 (75.3)	28 (9.3)	6 (2.0)	300 (100)
	Pearson chi-square = 46.797		p<0.001	Cramer's V=0.279	
Athletes	6 (10.0)	37 (61.7)	14 (23.3)	3 (5.0)	60 (100)
Recreation	20 (7.1)	184 (65.5)	67 (23.8)	10 (3.6)	281 (100)
Inactive	28 (10.8)	194 (74.9)	33 (12.7)	4 (1.6)	259 (100)
	Pearson chi-square = 16.826		p=0.010	Cramer's V=0.118	
Total	54 (9)	415 (69.2)	114 (19)	17 (2.8)	600 (100)

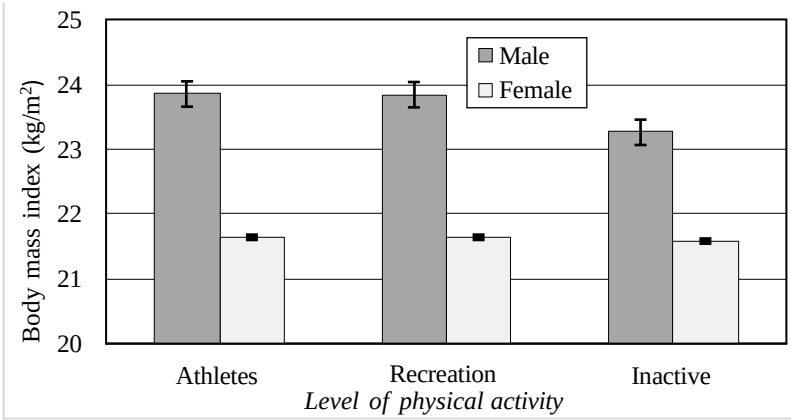

Figure 1. **BODY MASS INDEX OF SUB-GROUPS**

Table 4. **DESCRIPTIVE PARAMETERS OF BODY COMPOSITION VARIABLES OBTAINED IN DIFFERENT SUB-GROUPS**

			Body mass index (kg/m^2)		Body fat (%)	
Group	Gender	N	Mean	SD	Mean	SD
Athletes	Male	38	23.85	3.54	17.39	5.28
	Female	22	21.64	4.23	26.31	6.60
Recreation	Male	191	23.84	3.59	17.21	6.24
	Female	90	21.64	3.44	28.02	8.92
Inactive	Male	71	23.26	3.42	17.34	6.25
	Female	188	21.58	5.34	27.10	6.50

Table 5. **STATISTICS OF ANOVA FOR THE BODY COMPOSITION VARIABLES**

Variable	Impact	df	F	**p**	η^2	Achieved power
BMI (kg/m^2)	PA level*Gender	2	0.239	0.787	0.001	0.088
	PA level	2	0.347	0.707	0.001	0.106
	Gender	1	19.548	<0.001	0.032	0.993
BFP (%)	PA level*Gender	2	0.617	0.540	0.002	0.153
	PA level	2	0.380	0.684	0.001	0.111
	Gender	1	177.523	<0.001	0.230	1

BMI = Body mass index; BFP = body fat percentage; PA = physical activity; η^2 = partial eta squared.

The unexpected finding was that the PA level did not significantly impact the body status of the participants, both in males and females (Figure 2). This means that groups with different PA level (athletes, recreational and inactive) had almost the same body composition. The majority of participants were of a healthy weight in all groups, with only few obese. However, about 20% of the sample was overweight.

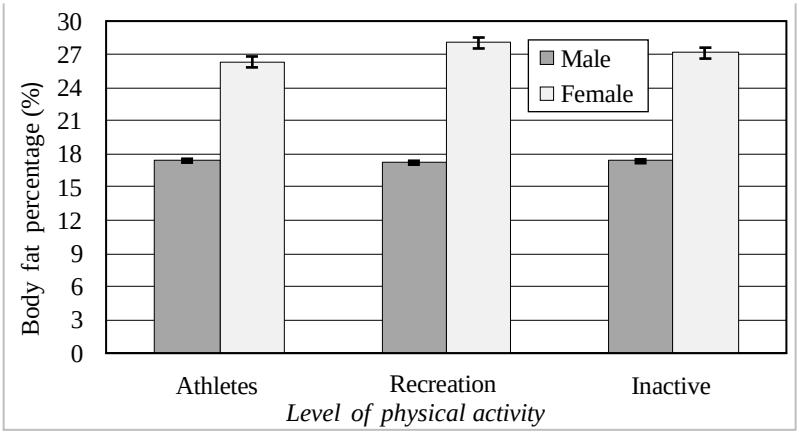

Figure 2. **BODY FAT PERCENTAGE OF DIFFERENT SUB-GROUPS**

Factorial validity of the questionnaire

The factor analysis of the Principle Component Analyses (PCA) was conducted with the data collected by the initial 24-item questionnaire. An assessment of the data 's suitability for factorisation preceded the explanation of the components. Many coefficient values of 0.3 or higher have been recorded by reviewing the correlation matrix. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was 0.85, which is higher than the recommended minimum theoretical value of 0.6 (Kaiser, 1974). The sphericity test (Bartlett, 1954) also indicated the statistical significance of the obtained factor model (chi-square=2688.596; $p<0.001$). These statistics proved good factorability of the correlation matrix.

The PCA obtained after Oblimin rotation revealed four components with Eiegenvalues over 1. The initial scree plot shows that the scree point was right after the third component. Based on the Kattel criterion (1966), it was decided to retain only two components that were above the scree point. This decision was supported by the results of a parallel analysis (Horn, 1965) that used the matrix with 24 variables, 600 subjects and 100 replications (Watkins, 2000).

The same PCA procedure was repeated with the two-component solution. Four items (item numbers 1, 5, 10 and 18) had commonality values of <0.3 and were eliminated from the system. Cronbach's alpha increased to 0.815 after excluding these four variables. The PCA was repeated once again with the retained 20 variables. The newly obtained solution was rather stable and confirmed that the basic statistical assumptions of the factor analysis were met

(KMO=0.854; chi-square=2850.603; p<0.001). The scree plot obtained (Figure 3) confirmed that the two-component system was an effective solution. It explained a satisfactory 46.52% of the total variance (the contribution of the first component was 28.38%, and the second 18.1 4%). All 20 communalities were >0.3 and met the recommended statistical criterion (Thurstone, 1947). Each of the 20 retained items gave the significant factor loadings only to one of the two principal components (Table 6). A low inter-factor correlation (r=0.196) confirmed additionally validity of the two-factor model.

Table 6. **FACTORIAL STRUCTURE OBTAINED BY PCA WITH OBLIMIN ROTATION**

Statement number	Loading on (pattern matrix)		Communalities
	Factor 1	Factor 2	
19	**0.731**	0.015	0.539
15	**0.718**	0.024	0.523
13	**0.697**	0.065	0.509
12	**0.696**	–0.015	0.480
14	**0.594**	0.033	0.362
22	**0.578**	–0.141	0.319
17	**0.562**	0.124	0.362
21	**0.520**	–0.052	0.301
6	**0.517**	0.032	0.306
4	**0.486**	0.031	0.304
9	–0.005	**0.660**	0.434
24	0.080	**0.660**	0.464
3	–0.175	**0.596**	0.341
23	0.108	**0.595**	0.393
7	–0.138	**0.576**	0.316
20	–0.036	**0.568**	0.315
2	0.060	**0.506**	0.303
8	–0.013	**0.504**	0.301
16	0.188	**0.503**	0.329
11	0.185	**0.488**	0.311

PCA = Principle Component Analysis

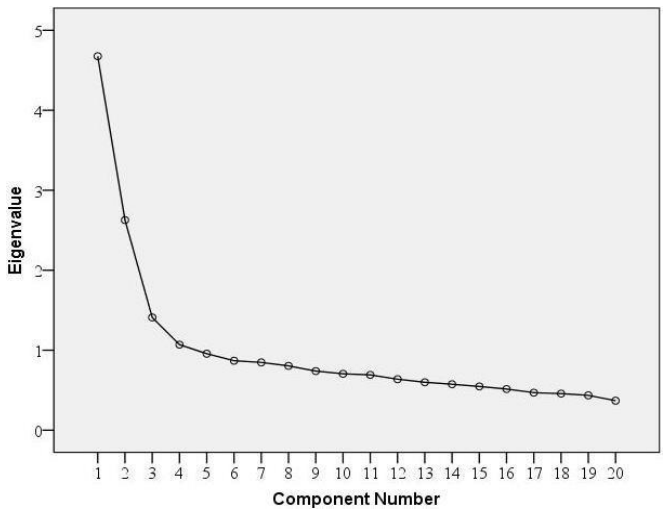

Figure 3. **SCREE PLOT FOR 20-ITEM QUESTIONNAIRE RESULTS**

The pattern matrix (Table 6) shows clearly the 10 variables that saturate the first component (item numbers 4, 6, 10, 12, 13, 14, 15, 17, 19, 21 and 22, from Table 2) and 10 which saturate the second (variables No 2, 3, 7, 8, 9, 11, 16, 20, 23 and 24). The first component items content indicates negative attitude towards exercise (labelled with the acronym NATE). The remaining 10 statements indicate positive attitude towards exercise (PATE).

Attitudes towards exercise

The factor analysis results showed that the questionnaire consists of two separate scales. Descriptive parameters (mean and standard deviation) were calculated separately for each scale (NATE and PATE), as well as for Total score (Table 7). The ANOVA results (Table 8) revealed that gender and PA level individually and interactively did not significantly influence differences between sub-groups. Significant differences were found only for the variables PATE and Total score. Levene's test shows that the variances of these three dependent variables were not homogeneous in different sub-groups (for NATE: $F=4.49$, $p=0.001$; for PATE: $F=2.571$, $p=0.026$; for Total score: $F=4.038$, $p=0.001$). As the assumption was not fulfilled, the ANOVA results could not be applied to the entire population and should only be interpreted for the present sample.

Table 7. **DESCRIPTIVE PARAMETERS OF ATTITUDE TOWARDS EXERCISE FOR DIFFERENT SUB-GROUPS**

			NATE		PATE		Total score	
Group	Gender	N	Mean	SD	Mean	SD	Mean	SD
Athletes	Male	38	40.29	5.96	42.74	5.92	83.03	9.73
	Female	22	38.27	5.26	41.41	5.72	79.68	7.15
	Total	60	39.55	5.75	42.25	5.83	81.80	8.95
Recreation	Male	191	38.72	8.15	43.10	5.13	81.82	10.70
	Female	90	39.80	6.10	41.49	5.06	81.29	9.03
	Total	281	39.07	7.56	42.58	5.16	81.65	10.18
Inactive	Male	71	37.79	7.81	40.75	5.47	78.54	10.39
	Female	188	38.56	5.96	40.60	4.19	79.16	8.32
	Total	259	38.35	6.51	40.64	4.57	78.99	8.92

NATE = Factor of negative attitude towards exercise; PATE = factor of positive attitude towards exercise.

Table 8. **STATISTICS OF ANOVA FOR ATTITUDE TOWARDS PHYSICAL ACTIVITY**

Variable	Impact	df	F	**p**	η^2	Achieved power
PATE	PA level*Gender	2	1.256	0.286	0.004	0.273
	PA level	2	6.231	0.002	0.021	0.894
	Gender	1	3.588	0.059	0.006	0.473
NATE	PA level*Gender	2	1.145	0.319	0.004	0.252
	PA level	2	1.505	0.223	0.005	0.321
	Gender	1	0.006	0.941	0.000	0.051
Total score	PA level*Gender	2	0.966	0.381	0.003	0.218
	PA level	2	4.800	0.009	0.016	0.796
	Gender	1	1.081	0.299	0.002	0.180

PA = Physical activity; η^2 = partial eta squared; PATE = factor of positive attitude towards exercise; NATE = factor of negative attitude towards exercise.

The Bonferroni post hoc tests revealed the source of variability in both cases was the difference between recreational and inactive males. At the same time, not a single difference was found in the sub-sample of females. In addition, the effect size (η^2) in both cases was significantly lower than the theoretical low limit of 0.06 (Cohen, 1988) and showed that the real influence of PA level on attitude towards exercise was rather small. This means that all groups of participants (athletes, recreational and inactive students, as well as students of both genders) had the same moderately positive attitude towards exercise (Figure 4).

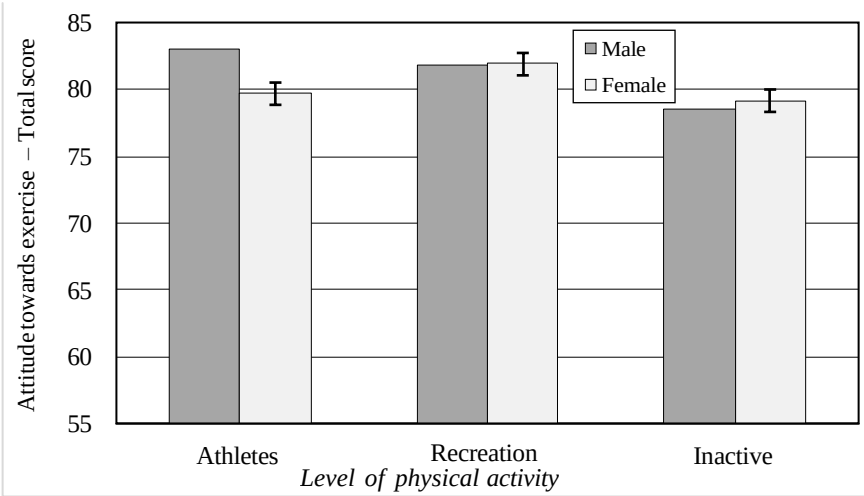

Figure 4. **ATTITUDES TOWARDS EXERCISE**

DISCUSSION

This cross-sectional study addressed the relationship between CS body composition, level of PA, and their attitudes towards exercise. The PA levels and body composition of CS in Kosovo was similar to that of other students in other countries reported in previous studies (CDC, 2019; De Vahl *et al.*, 2005; Romanov *et al.*, 2014; Sullum *et al.*, 2010; WHO, 2018a, 2018b). Many CS declared that they never exercise, especially females (24% of males and 63% of fema les were inactive). However, although male students reported much higher PA, there was significantly more overweight and obesity among them than among their female colleagues.

A significant association between PA level and body composition variables (BMI and BFP) was not demonstrated. The level of PA did not impact significantly on the body status of the participants of either gender. Groups with different PA level (athletes, recreationals and inactive) had almost the same body composition. There was also no correlation between the body composition variables and attitudes towards exercise (total score of SATE), as revealed by Pearson coefficients (for BMI: r=0.036 p=0.373; for BFP: r=–0.033 p=0.424).

All the sub-groups, regardless of gender and PA level, ha d a moderately positive attitude towards exercise. Their attitudes towards exercise were not significantly different according to their self-reported PA levels. This finding was somewhat unexpected given the results of previous studies that indicated a significant association between attitudes towards exercise and PA levels (Bailey, 2006; Hagger *et al.*, 2003; Kretschmann, 2015, Portman, 2003; Prochaska *et al.*, 2003; Subramaniam & Silverman, 2000). The researchers have reported that persons with a more favourable attitude exercise more regularly than those who value exercise less. Our finding is probably due to the use of an instrument (questionnaire) that, from a cognitive perspective, is not fully adapted to the characteristics of the chosen population. This indicates the need to improve the SATE in future research.

Another possible explanation for this finding is insufficient item precision for PA level. Just three levels describing the amount of daily, weekly and monthly PA is probably not sufficient for discriminatory responses. This problem was more apparent with CS who exercise recreationally. Whereas some exercise regularly, others exercise very rarely. Thus, those considered strong recreationists and those closer to the inactive group were included in the same group. This can be considered as another limitation of the study. In future research, it would be appropriate to use standardised tools to assess PA level, for example, the GPAQ (WHO, 2021), and apply it to a probabilistic sample.

Schools and mass media periodically point out the importance of PA for general health, trying to project positive attitudes towards exercise. However, a positive attitude is obviously not sufficient for objectively regular participation in PA. It must be supported by education and encouraging sports and recreational activities during studies. Kosovo is among the poorest European countries, which is why universities have a rather poor infrastructure for supporting PA. There is no obligatory PE in the curricula of any faculty. Students are left to the influence of public opinion, which in underdeveloped societies is often based on insufficiently verified information. It is crucial to gain an understanding of what healthy PA is.

The most represented PA among the surveyed students were soccer and fitness (gym, HIT, workout, etc.). They are activities of high intensity, based on glycolytic processes. Fats are little used as an energy substrate during these activities. Most uninformed people try to regulate their BW only by resistance training and are not aware that long time moderate-intensity activities (walking, cycling, hiking, jogging, swimming, etc.) are equally beneficial. Students can obtain important information on proper exercising (for example, about BW regulation) if they are provided with continuing education during their studies. It would be useful if, in addition to attitudes towards exercise, student knowledge in this realm was assessed. The lack of this data is another limitation of our study and suggests that testing knowledge in future research may offer clearer conclusions regarding the relationships between PA level, body composition and attitude towards exercise in CS.

Some previous studies support the assumption about the importance of education related to PA (Digelidis *et al.*, 2003; Kelso *et al.*, 2020; Pacala *et al.*, 2017; Quinn *et al.*, 2008). The findings of all the mentioned studies prove that education had the greatest effect on increasing motivation for PA. Students who took part in educational interventions, compared with other students, had more positive attitudes towards exercise and healthy diet, lower ego and higher task orientation.

A potentially valuable outcome of this study is the brief questionnaire to assess CS attitudes towards exercise (SATE). It was obtained using a statistically large sample where the number of respondents was as much as 25 times higher than the number of variables in the initial questionnaire. In this way a fundamental assumption for analysing the factorial validity and internal reliability was fulfilled. The SATE contains two stable independent scales (negative NATE and positive PATE) that can be interpreted both separately and jointly (SATE = NATE + PATE). The maximum score on the SATE is 100 points and enables scale division into five symmetrical intervals – from a very negative to a very positive attitude towards exercise. Completing the questionnaire and the scoring method are simple and it is recommended that the SATE is used in research practice.

The non-probability sampling combined convenience and quota methods to collect data. This approach reduced the possibility of generalising the results and thus represents the main limitation of the study. The reasons behind opting for convenience sampling is that the present study is a pilot and is exploratory in nature as no similar studies have been conducted previously in the Kosovo region. This in turn posed some challenges in conducting the fieldwork, particularly in terms of temporal and financial constraints. The quota method was applied following official university data that showed that there are approximately equal numbers of male and female students at most faculties considered in this study.

CONCLUSION

The results of the study showed that students at Kosovo universities have a similar level of PA and a similar prevalence of obesity as students worldwide. We confirmed that the surveyed students do not exercise enough, especially females. Overweight was represented by 20% and obesity by 3% of the overall sample. Practically, almost one quarter of students ha d an issue with BW; however, the results indicated that there were more males who were obese. Students of all sub-groups (male and female, athletes, recreational and inactive) expressed a favourable attitude towards PA. These data were obtained using a reliable brief questionnaire that was standardised for the purpose of this study. A significant association between body composition, PA levels, and attitudes towards PA was not established. The authors believe that in future research testing students' knowledge of PA would be useful, as this insight would provide more reliable information about the problem in question.

Practical application

The study's results indicate that solely promoting regular PA in a positive manner is insufficient in practice. To effectively encourage proper exercise, it is crucial to incorporate instruction about PA into formal education. Additionally, the questionnaire used to assess attitudes towards PA has practical value due to its brevity and ease of scoring.

Conflicts of interest

We did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors for this research. The authors declare that there is no conflict of interest with any financial organisation regarding the material discussed in the manuscript

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Corresponding author: Dr. *Dušan B. Perić*; **Email:** *dusan.preic@tims.edu.rs*