

The relationship between physical activity, eating attitudes, and body image dissatisfaction of Romanian students

Popescu Veronica¹, Musat George Cosmin², Petcu Damian², Georgescu Adrian², Octavian Barna^{3}*

¹Faculty of Physical Education and Sport, Alexandru Ioan Cuza University, Iasi, Romania; ²Faculty of Physical Education and Sport, Ovidius University, Constanta, Romania; ³Faculty of Food Science and Engineering, Dunarea de Jos University of Galati, Galati, Romania - *E-mail: octavian.barna@yahoo.com

Abstract. The purpose of this study was to evaluate the relationship between physical activity, eating attitudes, and body image dissatisfaction (BID) of Romanian students. The study was conducted with 934 students aged between 19 and 25 years. A self-administrative questionnaire was used for data collection on social demographic and physical activity and food habits, and a body dissatisfaction scale software assessment tool was used to measure the BID and body image perception (BIP). Anthropometric measurements were used to calculate the body mass index (BMI). A different subgroup of 97 subjects aged between 19 ± 25 years old was randomly selected to participate in an ancillary study, 2 weeks after the initiation of the main study. To determine the strength and direction of linear relationships between pairs of the analyzed data, we calculated Pearson's correlation coefficient (r) and the associated probability. The level of significance = 0.05 was used to check the hypothesis. The Kolmogorov–Smirnov test, t -test, and Levene's test were performed. BID ranged from 0.35 (SD = 0.94) to 1.35 (SD = 0.71) for the male subjects involved in the main study and from 0.74 (SD = 0.64) to 1.82 (SD = 0.78) for the female students. In the main study, the median values of physical activity (PA) ranged from 524.2 (±13.1) to 4,641.8 (±14.3) metabolic equivalent task (MET)·minute/week for male students and from 471.5 (±11.6) to 4,421.4 (±17.9) MET·minute/week for female students. Students who develop a regular practice of high PA and have a healthy diet have a lower BMI and a more favorable body structure and shape. There was a strong association between participation in sports and the BID and BIP. This study showed that BMI is negatively correlated with BID and BIP. There are no significant differences between the BID and BIP means between the main and ancillary studies. The gender differences in BID, BIP, BMI, and weight control practices as PA and diets exist among Romanian students. It is noted that, in the case of female students, there was a sharp increase in BID with the increase in BMI.

Key words: PA; food habits; physical activity; BMI; body image dissatisfaction; body image perception; students

Introduction

The field of body image has experienced a phenomenal growth in recent years. A large number of females and males in modern society are dissatisfied with some aspect of their bodies. Body weight perception is a strong determinant of nutritional habits and weight management practices among adolescents and young people. Maintaining a healthy weight crucially decreases the future risks of diabetes, cardiovascular disease, various types of cancer, and other chronic diseases (1, 2). The previous research has shown that successful weight control is strongly dependent on a person's own perception of body image (3). The body dissatisfaction represents a negative attitude toward the physical aspect and comes from a perceived discrepancy between self and ideal body size estimates (4). Body dissatisfaction, especially weight and shape concerns, has been identified as one of the key factors for dieting behavior, negative effect, and the causation and maintenance of eating disorders (5–8). Eating disorders are associated with significant increases in medical complications (9–11) and even mortality (12, 13). Body dissatisfaction is also correlated with depression and can have a negative impact on their daily lives, for example, students who do not attend school or work to avoid drawing attention to their appearance (14). The main ways to change the body mass index (BMI) and appearance of the body are physical activity and diet (15, 16). This research aims to explore the existence of body image dissatisfaction (BID) and body image perception (BIP) and to explore the correlation between physical activity, eating habits and BID or BIP among of Romanian students.

Materials and methods

Participants

Participants of the main study were a sample of 934 subjects of both male and female students recruited from faculties from Iasi and Constanta County, in Romania. Ages ranged from 18 to 25

years ($M \pm SD = 22.5 \pm 2.8$), and BMIs ranged from 18.84 to 26.88 kg/m^2 ($M \pm SD = 22.68 \pm 3.25$). In terms of ethnicity, all the participants were Caucasian descent. The survey included a written consent for the participants to participate in the study voluntarily. The permissions required for the data to be collected from students were obtained from the Ethics Council of University.

Within this study, 2 weeks after the initiation of the main study, a different subgroup of 97 subjects of both male and female students, aged between 19 ± 25 years old ($M \pm SD = 23.1 \pm 2.4$), was randomly selected to participate in an ancillary study with completing the International Physical Activity Questionnaire (IPAQ) and Diet History Questionnaire III (DHQIII) and self-perception body questionnaire and make anthropometric measurements.

2.2. Body image dissatisfaction (BID) and body image perception (BIP)

To determine body image dissatisfaction, all 934 participants were asked to complete a self-perception questionnaire of the body image was used using the Body Dissatisfaction Scale (BDS) Assessment tool created by Mutale et al. (17) using software DAZ Studio 4 (www.daz3d.com) and 3ds Max (www.autodesk.com). (Fig 1 and Table 1). The BDS consists of two gender-specific scales that contain nine virtual bodies of women and men. The scale of body figures ranged from 1 to 9, as follows: bodies 1–3 are underweight, bodies 4–6 are in the normal range, and bodies 7–9 are overweight/obese.

The BID score was calculated as the differences between the perceived current image and ideal image. Body image perception was calculated as the differences between perceived body image and actual BMI.

Physical activity (PA)

The students' PA was assessed based on the short version of the IPAQ questionnaire, translating into Romanian 18. The total weekly activity was expressed in metabolic equivalent task (MET) minute/week.

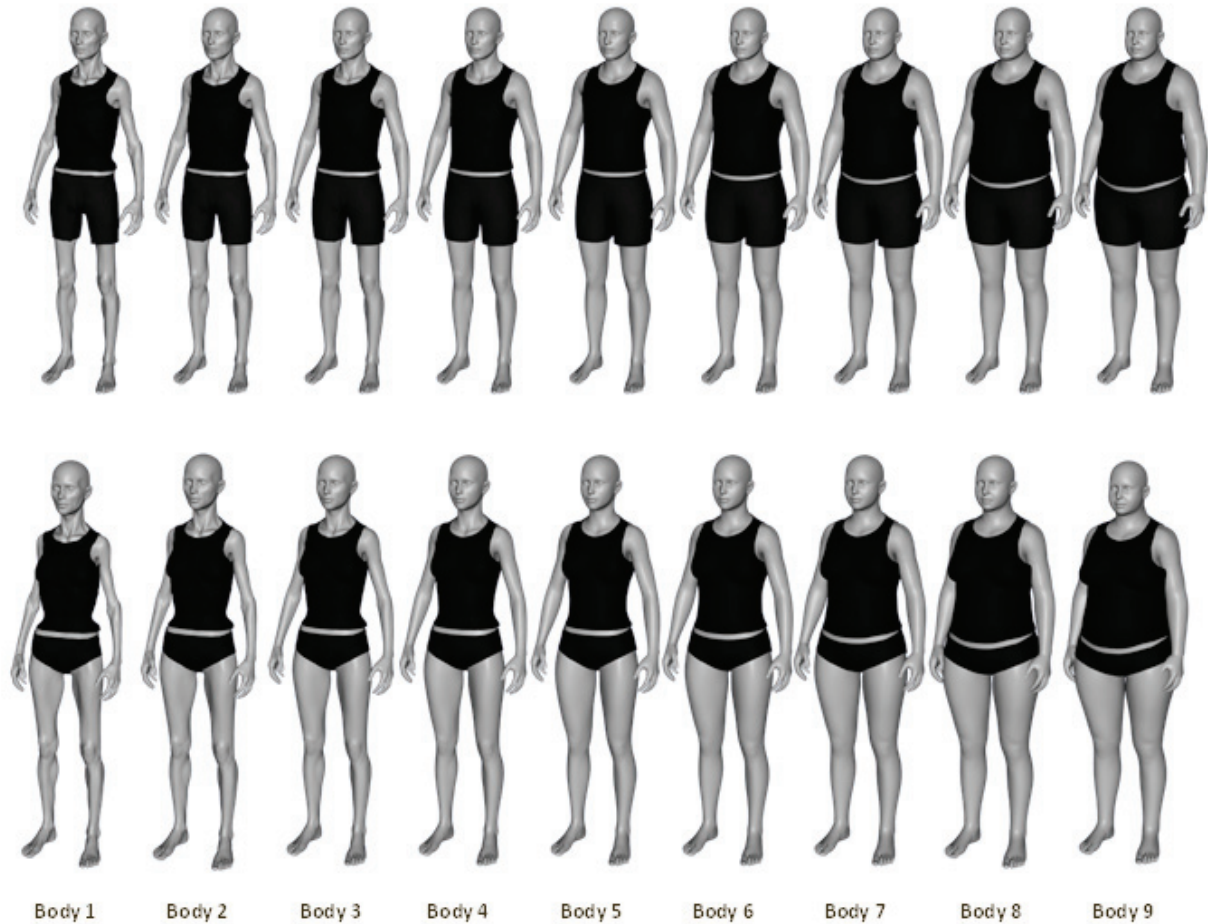


Figure 1 BDS tool for the assessment BID and BIP among the subjects. Adapted from Mutale et al. 17

Table 1. Correspondence between BDS tool and BMI for male and female students. Adapted from Mutale et al 2016(17).

BDS figure	1	2	3	4	5	6	7	8	9
BMI female	13.76	15.04	16.55	18.25	20.02	23.21	26.62	30.15	34.27
BMI male	14.54	15.93	17.49	19.15	20.97	24.32	27.25	31.61	35.92

One MET is equal to energy expenditure during rest and is approximately equal to $3.5 \text{ ml O}_2 \cdot \text{kg}^{-1} \text{ minute}^{-1}$ in adults. Students were classified into three main categories: low physical activity (nonathletic students; $<600 \text{ MET} \cdot \text{minute}/\text{week}$), moderate physical activity ($600\text{--}2,999 \text{ MET} \cdot \text{minute}/\text{week}$), and high physical activity (athletic students; $>2,999 \text{ MET} \cdot \text{minute}/\text{week}$) 19

Eating attitudes (EA)

The evaluation of the students' EA was made using the Healthy Eating Index (HEI) 2015 proposed by the US Department of Agriculture (20). The HEI 2015 score evaluates 13 food groups from the diet components, resulting in a score ranging from 1 to 100. The closer the score from the calculation is to 100, the more nutritionally appropriate

the diet. To calculate the HEI 2015 index, the subjects completed DHQIII self-reported questionnaires 21

BMI

BMI is used as an assessment tool in estimating a person's weight status 22BMI was calculated as weight ratio (kg)/permanent height (m²) and grouped into BMI categories as defined by the World Health Organization for sub weights (BMI: <18.5), normal weight (BMI: 18.5–24.9), overweight (BMI: 25.0–29.9), and obesity (BMI: ≥30)(23,24

The height was measured with an error of 0.1 cm using a Seca 213 (Seca, Germany) wall-mounted stadiometer. The weight was measured without shoes in light indoor clothing with an error of 0.1 kg with a 402LB Physician Beam Scale (Sunbeam, USA). The clothes were estimated to weigh 0.5 kg, and this weight was deducted from the total weight.

Statistical analysis

The analyses of data were performed using SPSS 23 (SPSS Inc., USA). To determine whether there is a statistical relationship between the analyzed data, we calculated Pearson's correlation coefficient (*r*) and the probability associated with it. The level of significance = 0.05 was used to check the hypothesis. As statistical indicators, the Skewness asymmetry coefficient and Kurtosis rollover coefficient were calculated. The Kolmogorov–Smirnov test, *t*-test, and Levene's test were performed. The *t*-test was used to test the difference between the BID index averages for the two independent samples consisting of the girls' group and the boys' group. The numeric type-dependent variable is given by the BID index, and the independent variable, nominal type, with two values (M/F), is the gender.

Results and Discussions

Physical Activity (PA)

Overall, 31.3% of the male students are involved in intense sport activities. This percentage is the highest with 2.5% than the percentage of female students who reported intense physical activity (28.8%) testing in the main study (Table 2). Similar results are also reported by Pinto et al. (25 and Savu et al. 26 In the ancillary study, 28.3% of boys and 25.5% of girls report engaging in intense sport activities.

In the main study, median values (SD) of PA ranged from 524.2 (±13.1) to 4,641.8 (±14.3) MET·minute/week for male students (Fig. 2) and from 471.5 (±11.6) to 4,421.4 (±17.9) MET·minute/week for female students (Fig. 4).

In the ancillary study, MET index ranged from 512.51 (±15.5) to 5,435.37 (±16.45) for male students (Fig. 3) and from 472.52 (±12.6) to 4,653.48 (±17.3) for female students (Fig. 5).

The mean body dissatisfaction score ranged from 0.35 (SD = 0.94) to 1.35 (SD = 0.71) for the male subjects involved in main study (Fig. 2) and from 0.74 (SD = 0.64) to 1.82 (SD = 0.78) for the female students (Fig. 4). In the ancillary study, BID ranged from 1.46 (SD = 0.71) to 0.41 (SD = 0.76) for male and from 1.76 (SD = 0.68) to 0.62 (SD = 0.96) for female students (Fig. 3).

The studies show that, in many cases, male students due to BID are tempted to use muscle building substances such as steroids or fat burners to lose weight in a short time 27–29

Median value for HEI score ranged from 49.8 (±3.2) to 54.8 (±2.5) for male students (Fig. 2) and from 50.2 (±2.9) to 55.1 (±2.8) for female students surveyed in the main study (Fig. 4). Similar results were reported by Hiza and Gerrior (30) and Gheorghiu et

Table 2. Demographic data and PA level of students participating in the main and ancillary studies.

Study		Main study			Ancillary study		
Gender		Male students	Female students	Total	Male students	Female students	Total
Subjects number (%)		451 (48.3%)	483 (51.7%)	934	46 (47.4)	51 (52.6)	97
PA level number (%)	Low	106 (23.5%)	134 (27.7%)	240 (25.7%)	12 (26.1%)	16 (31.4%)	28 (28.9%)
	Moderate	204 (45.2%)	210 (43.5%)	414 (44.4%)	21 (45.6%)	22 (43.1%)	43 (44.3%)
	Intense	141 (31.3%)	139 (28.8%)	280 (29.9%)	13 (28.3%)	13 (25.5%)	26 (24.8%)

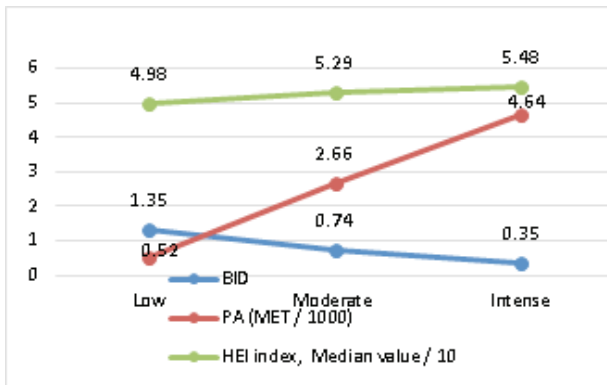


Figure 2 Relationship between BID, HEI index, and PA (MET) for different PA levels of male student participants at the main study.

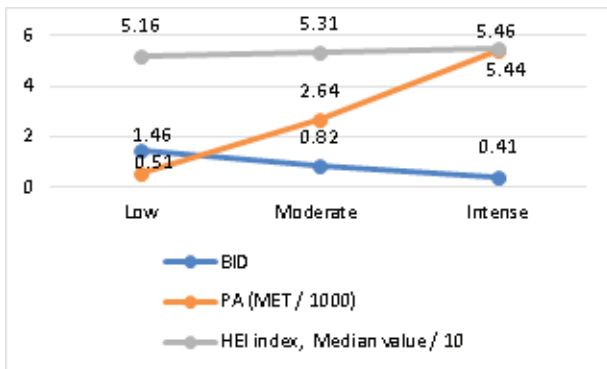


Figure 3 Relationship between BID, HEI index, and PA (MET) for different PA levels of male student participants at the ancillary study.

al.2019 (31). In the ancillary study, HEI index ranged from 51.3 (± 3.6) to 54.6 (± 2.9) for male students (Fig. 3) and from 51.4 (± 3.2) to 55.6 (± 2.6) for female students (Fig. 5).

For the main study, for the male subjects, we observe a strong direct correlation not only between the BID values and the BMI values ($r = 0.732, p = 0.032$) but also between the BID and BIP values ($r = 0.759, p = 0.016$) (Table 3). Strong, but negative, correlations were observed between BID and PA ($r = -0.702, p = 0.036$) or between BID and HEI ($r = -0.724, p = 0.007$), indicating that the values of these variables are inversely proportional (Fig. 2).

In the case of boys, we obtained the same conclusions for the ancillary study as for the main study. The IDB index is in a direct correlation relation with BMI ($r = 0.728, p = 0.022$) and with and BIP ($r = 0.746,$

Table 3 BMI and BIP for male and female students in the main study.

PA levels	BMI, SD		BIP, SD	
	Male students	Female students	Male students	Female students
Low	25.32 (1.56)	24.27 (1.31)	1.21 (0.67)	1.54 (0.95)
Medium	22.45 (1.31)	22.78 (1.49)	0.61 (0.78)	1.09 (0.63)
High	21.03 (1.55)	20.32 (1.48)	0.26 (0.63)	0.49 (0.86)

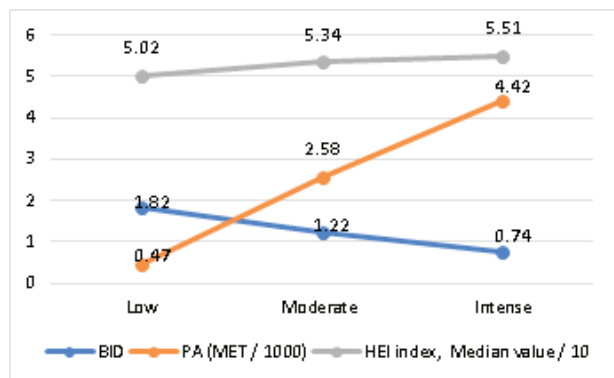


Figure 4 Relationship between BID, HEI index, and PA (MET) for different PA levels of female student participants at the main study.

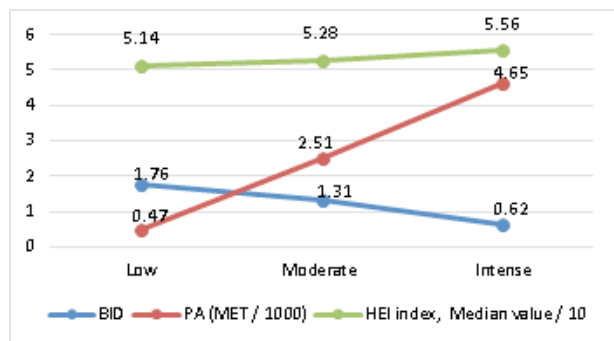


Figure 5. Relationship between BID, HEI index, and PA (MET) for different PA levels of female student participants at the ancillary study.

$p = 0.010$) and in an inverse correlation relation with PA ($r = -0.694, p = 0.028$) and with HEI ($r = -0.705, p = 0.013$). The correlations are strong also in the case of the ancillary study.

Female students reported dissatisfaction with their body weight more frequently than male students.

Significant higher adjusted prevalence ratios for body dissatisfaction were observed in students, those with overweight/obesity, those who were physically low active, and those with a low score for HEI index. The same results were reported by Moehlecke et al. 32 and Yager and O’Dea 33

The conclusions of the Pearson correlation test of female students show that there is a strong direct correlation between BID and BMI ($r = 0.718, p = 0.031$) and between BID and BIP ($r = 0.787, p = 0.023$) and a strong opposite sense correlation between BID and PA ($r = -0.764, p = 0.016$) and between IDB and HEI ($r = -0.725, p = 0.037$) (Fig. 3).

The values of the Pearson correlation coefficient and the probabilities associated with these coefficients in the ancillary case study for the female group indicate a strong direct correlations between IDB and BMI ($r = 0.743, p = 0.028$) and between IDB and BIP ($r = 0.716, p = 0.041$) and a strong correlation negative between IDB and PA ($r = -0.743, p = 0.041$) and between IDB and HEI ($r = -0.735, p = 0.044$).

The values of the correlation coefficient for the whole group, main study, indicate the same conclusions as for the analysis done separately by genders. There is a strong direct correlation between IDB and BMI ($r = 0.689, p = 0.025$) and between IDB and BIP ($r = 0.766, p < 0.001$) and inverse between IDB and PA ($r = -0.698, p = 0.015$) and between IDB and HEI ($r = -0.704, p = 0$). For the ancillary study, the whole group has strong direct correlations between IDB and BMI ($r = 0.709, p = 0.012$) and between IDB and BIP ($r = 0.747, p < 0.001$) and inverse between IDB and PA ($r = -0.723, p = 0.005$) and between IDB and HEI ($r = -0.708, p = 0.013$).

Table 4 BMI and BIP for male and female students in the ancillary study.

PA levels	BMI, SD		BIP, SD	
	Male students	Female students	Male students	Female students
Low	24.73 (2.46)	24.59 (2.65)	1.32 (0.83)	1.62 (0.84)
Medium	23.28 (2.54)	23.14 (2.38)	0.79 (0.96)	1.12 (0.77)
High	21.27 (2.48)	21.12 (2.21)	0.47 (0.81)	0.63 (0.93)

Table 5. Descriptive statistics.

	Main study		Ancillary study	
	Statistic	Std. Error	Statistic	Std. Error
Mean	1.0367	0.21548	1.0633	0.21495
95% Confidence interval for mean	Lower bound	0.4828	0.5108	
	Upper bound	1.5906	1.6159	
5% Trimmed mean	1.0313		1.0609	
Median	0.9730		1.0650	
Variance	0.279		0.274	
Std. deviation	0.52781		0.52552	
Minimum	0.29		0.31	
Maximum	1.92		1.89	
Range	1.47		1.35	
Interquartile Range	0.83		0.97	
Skewness	0.289	0.845	0.172	0.853
Kurtosis	-0.612	1.741	-1.802	1.792

The Kolmogorov–Smirnov test shows that the data have a normal distribution for both the main study ($p = 0.203 > = 0.05$) and the ancillary study ($p = 0.176 > = 0.05$).

For the main study, the Levene’s test confirms the equality of variances of the two groups: $F = 0.012$ and $p = 0.920 > = 0.05$. This test helps us to interpret the t -test. Since $p = 0.447 > = 0.05$, considering that the confidence interval limits 95% CI for the mean difference: (1.58503, 0.91836) contain the zero value, there are no significant differences between IDB average values between the girls’ group and the boys’ group.

For ancillary study, $F = 0.026$ and $p = 0.910 > = 0.05$ shows, according to the Levene’s test, the equality of variances. As $p = 0.525 > = 0.05$ and because the confidence interval limits 95% CI for the mean difference: (-1.31366, 0.78700) contain the zero value, according to the t -test, there are no significant differences between the BID means between the group girls’ and boys’ group not even in the case of an ancillary study. The results obtained in the

ancillary study confirm and reinforce the results from the main study.

Conclusions

Students who develop a regular practice of high physical activity and have a healthy diet have a lower body image dissatisfaction level. There was a strong negative association between participation in sports and the body image dissatisfaction. There was a strong association between participation in sports and the BID and BIP. This study showed that BMI is negatively correlated with BID and BIP. There are no significant differences between the BID and BIP means between the main and ancillary studies. The gender differences in BID, BIP, BMI, and weight control practices as PA and diets exist among Romanian students. It is noted that, in the case of female students, there was a sharp increase in BID with the increase in BMI. Given the high prevalence of body dissatisfaction, which causes eating disorders among students, many universities have implemented programs to promote PA and proper eating behavior (33).

The conclusions of this study will improve the understanding relations between physical activity, nutritional habits and BDI and provides information on guiding the effective development and development of obesity prevention and control programs among students.

Limitations

The survey was limited to samples of 19- to 25-year-old Romanian students. Larger samples in each age and country group are essential for establishing age and sex-specific indexes and correlations.

Conflict of interest

No potential conflict of interest relevant to this article was reported by the authors.

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Authors' contributions

All authors contributed equally to this manuscript. All authors read and approved the final manuscript.

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Correspondence:

Octavian Barna,

Faculty of Food Science and Engineering, Dunarea de Jos

University of Galati, Galati, Romania.

E-mail: octavian.barna@yahoo.com