PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

Self-evaluation of appearance by female medicine students

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim Nowadays western culture promotes appearance-wise the ideal of a slim body. The purpose of the research was to study body composition of female medicine students and compare these results with their self-evaluation on the problem.

Material and Methods Ninety-nine Casimir Pulaski Radom University in Radom females students (22.0±2.1 years old) who studied at a medicine faculty have been involved in the research. The study was conducted in accordance with the basic bioethical norms of the Helsinki Declaration of the World Medical Association on Ethical Principles for Conducting Scientific and Medical Research. Written informed consent was obtained from each study participant. The study was approved in advance by Ethical Committee of the Casimir Pulaski Radom University in Radom. The studies included survey research: The International Physical Activity Questionnaires (IPAQ) - Short Form, The 5-item World Health Organization Well-Being Index (WHO-5), Questionnaire of self-evaluation of appearance, body mass and height. According to the Three Sigma Rule border values, research samples were selected regarding compacted values of corresponding parameters. Pearson correlation has been used with a purpose to study an interaction between anthropometric parameters of subjects. Two pair t-test for arithmetic means was applied to compare mean values of the anthropometric parameters of the subjects. Factor analysis has been used with a purpose to study body building of students. Calculations were done using Data Analysis from MS Excel Offices and computer package Statistica.

Results Shapiro – Wilk method was used to determine normality of distribution of quantity parameters studied in the research ($p>0.4$). Because Gauss distribution was noticed, parametric statistics were applied in mathematics elaboration of anthropometric parameters. According to the Method of Principal components, the Factor analysis has been done. A number of variables were reduced to twenty-three (11 – 33). Three Eigenvalues appeared greater than one (17.4; 3.3; 1.1). Number of factors extracted equals 3. Corresponding part of variation forms 94.7% of the total. The rest of variation (5.3%) presents other factors. The main factor (the first one) forms more than three quarters of variation – 75.7%.

Conclusions Accuracy of estimation of a body height among female subjects was determined as a difference between results of subject's answer and results of measurement. Two groups of subjects have been formed: 58 subjects presented their knowledge of values of body height and 38 subjects – estimated their own hypothetic values.

Keywords: physical fitness, BMI, body composition, physical activity, health.

Introduction

Human body viewed objectively and subjectively as a dynamic and multifaceted construct shaped by biological, social, psychological and cultural factors. Its representation is a reflection of current views and social norms on one hand, and one's own thoughts and emotions on the other. In the collective consciousness of people living in specific times and cultural circles, ideals of the human body are created and become objects of desire. Nowadays western culture promotes appearance-wise the ideal of a slim body [1, 2].

The dynamic development of traditional media (television, radio, newspapers, and magazines) and online media (Facebook, Instagram, Snapchat and Twitter) favors the rapid creation and spread of norms and patterns of behavior, but also, unfortunately, exerts pressure forcing certain, not always beneficial, health behaviors. The ideal of a slim body today occupies a central place in social media and is becoming an attractive and desirable value. Exposing this pattern is an everyday practice and every day it causes cognitive dissonance in a huge group of recipients - dissatisfaction with their body and great determination in striving for slimness, often at the expense of risky health behaviors [3, 4, 5].

Modern media excessively expose people to the ideal of thinness, starting from an early age. They point it as a necessary condition for success in life. This very often causes fears related to the inevitable evaluation by others, mainly based on physical appearance, which may negatively affect the individual's mental balance and satisfactory participation in social life [6, 7].

doi:10.15561/20755279.2024.0304

Body dissatisfaction and distorted appearance perception are common among university students (especially female students). Over 60% of students have inadequate self-esteem, which does not correspond to reality and causes them to incorrectly perceive their physical image [8, 9].

Studying involves living without the help and supervision from parents. Physical activity decreases and there are problems with regular and healthy eating. Greater autonomy comes with great academic pressure and the need to make independent lifestyle choices. This causes physical and mental health problems, which intensify the disturbed body image [10, 11].

A healthy body image not only impacts students' self-esteem and satisfaction, but also their overall mental health. Poor body image is associated with reduced quality of life and performance and requires appropriate interventions [12, 13].

You need to take care of your good appearance and proper body weight first of all to be healthy. Therefore, awareness of being overweight or underweight is very important not only for maintaining a healthy lifestyle, but also for the prevention of many lifestyle diseases [14].

It is worth noting that students consider those whose BMI values are within the norm to be attractive [15].

Therefore, it is important that during their studies they are equipped with basic, reliable knowledge and practical skills on how to assess their ideal body weight and how to take care of their health. This especially applies to students in the field of medical sciences, who in the future will be specialists responsible for promoting and improving public health. It is worth replacing the idea of a slim body with the idea of a healthy person in the physical and other dimensions: mental, social and spiritual.

Hypothesis. Female university students have a detailed knowledge about their body composition, especially regarding the body mass and body height and are able to self-evaluate these parameters.

The *purpose* of the research was to study body composition of female students and compare these results with their self-evaluation on the problem.

Materials and Methods

Participants

Ninety-nine Casimir Pulaski Radom University in Radom female's university students (22.0±2.1 years old) who studied at a medicine faculty has been involved in the research. The study was conducted in accordance with the basic bioethical norms of the Helsinki Declaration of the World Medical Association on Ethical Principles for Conducting Scientific and Medical Research as amended (2000, amended in 2008), the Universal Declaration on Bioethics and Human Rights (1997), the Council of Europe Convention on Human Rights and Biomedicine (1997) and do not contradict the norms of Ukrainian legislation and meets the requirements of the Law of Ukraine "On Scientific and Scientific Technical Activity" of dated November 26, 2015 No. 848-VIII. Written informed consent was obtained from each study participant. The study was approved in advance by Ethical Committee of the Casimir Pulaski Radom University in Radom.

Research Design

During the organizational meeting, females Casimir Pulaski Radom University in Radom students of the medicine faculty were informed about the aim and course of the study. The studies included survey research (The *International Physical Activity Questionnaires* (IPAQ) - Short Form, The 5-item World Health Organization Well-Being Index (WHO-5), Questionnaire of self-evaluation of appearance, body mass and height). Moreover, the participants were informed that they are free to withdraw from participation in the study at any stage. Next the persons interested were asked to give written informed consent to participate in the research. Then, the principles of preparing for a body composition test were discussed in detail. The participants of the study were informed in advance of the required conditions prior to measurement:

- no alcohol and coffee intake in the previous 24 h,
- no vigorous exercise in the previous 12 h,
- no food or drink intake in the previous 3 h,
- no urination immediately before measurement.

The studies were conducted in April and May 2023 in accordance with the previously agreed schedule with the participants. At the beginning of the study, students completed the above-mentioned questionnaires and provided information about whether they knew their body mass and height. Then, an experienced researcher conducting the study measured body height. Body height was measured upright, barefoot, rounded to 0.1 cm using a portable Harpenden anthropometry (Holtain Ltd, Crosswell, UK). The measurement was taken, with the participant stretching to the maximum height and the head positioned in the Frankfort plane. The body composition study was conducted according to the Tanita MC-980 PLUS MA guidelines. Participants were asked to remove footwear and socks and any metal objects. Measurements were made in underwear, standing in designated places on the platform. According to the Tanita MC-980 PLUS MA guidelines, accurate measurement requires the participants stood upright on the platform with their legs extended, placing their feet so that they touched the front and rear electrodes, ensuring that the weight was evenly distributed on both feet. The person examined held handles in their hands that were taken from the body at an angle of 35–40.

Apparatuses

Anthropometric measurements, body composition and body mass index have been used. Body composition was measured using the electrical bioimpedance method and a calibrated segment analyzer (Tanita MC-980 MA PLUS, Tokyo, Japan) with an accuracy of 0.1 kg/0.1%. Tanita MC 980 MA PLUS has approvals for medical use and meets the NAWI and CLASS III standards and the MDD 93/42/EEC directive, as well as the CE0122 EU certificate. The analyzer automatically measures body weight and then impedance. The Commuter software (a microprocessor) imbedded in the product uses the measured impedance, the participant's sex, body height, fitness, age, and the weight to determine body fat percentage based on equation formulas. The device gives general values of body composition such as fat mass, fat free mass, muscle mass, skeletal muscle mass, total body water, bone mass, protein mass, basal metabolic rate and their derivatives [16].

The body weight and height of the participants were measured using the standard protocol and equipment that was calibrated before and during the data collection period. Body height was measured upright, barefoot, to the nearest 0.1 cm using a portable Harpenden anthropometer (Holtain Ltd, Crosswell, UK) [17]. The measurement was taken, with the participant stretching to the maximum height and the head positioned in the Frankfort plane [18]. Body mass was assessed with an accuracy of 0.1 kg using a body composition analyzer (Tanita MC-980 MA PLUS). Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2).

Survey questionnaires

The *International Physical Activity Questionnaires* (IPAQ) - Short Form. For physical activity rating of the short IPAQ questionnaire approved by the IPAQ Study Group was used (polish version). The questionnaire contained 7 questions pertaining to all kinds of physical activity related to the job, everyday life and leisure and, specifically, to the time spent on vigorous and moderate activities, on walking and sitting [19]. The 5-item World Health Organization Well-Being Index (WHO-5). It is a short and generic global rating scale measuring subjective well-being through a questionnaire consisting of 5 simple and non-invasive statements stated below, which tap into the subjective well-being of the respondents:

- (1) "I have felt cheerful and in good spirits";
- (2) "I have felt calm and relaxed";
- (3) "I have felt active and vigorous";
- (4) "I woke up feeling fresh and rested";
- (5) "My daily life has been filled with things that interest me".

The respondent is asked to rate how well each of the 5 statements applies to him or her when considering the last 14 days. The above statements were scored by the respondents from 0 (none of the time) to 5 (all of the time) each and summarized at the end on the scale from 0 (absence of well-being) to 25 (maximal well-being) [20].

Questionnaire of self-evaluation of appearance, body mass and height

Self-evaluation of appearance, body mass and height were by assessed by administering a self-report questionnaire prepared by the Department of Axiology of the Jan Kochanowski University in Kielce. The questions covered leisure-time physical activity as well as commuting activity. Construct validity of the questionnaire for cross-sectional analysis was confirmed with a Cronbach alpha of 0.81 [21].

The possibilities among which the respondents could choose were as follows:

- self-evaluation of appearance: "excellent", "good", "indifferently", "bad";
- self-evaluation of body mass: "too slim, " "just right", "too fat";
- self-assessment of body height: "too small", "just right", "too tall".

Statistical Analysis

Shapiro – Wilk method was used to determine normality of distribution of quantity parameters studied in the research (p>0.4). Because Gauss distribution was noticed, parametric statistics were applied in mathematics elaboration of anthropometric parameters. According to the Three Sigma Rule border values, research samples were selected regarding compacted values of corresponding parameters. Pearson correlation has been used with a purpose to study an interaction between anthropometric parameters of subjects. Two pare t-test for arithmetic means was applied to compare mean values of the anthropometric parameters of the subjects. Factor analysis has been used with a purpose to study body building of students. Calculations were done using Data Analysis from MS Excel Offices and computer package Statistica (StatSoft Inc.).

Results

Body height and body mass among females' students

The studied group has been statistically elaborated according to the BMI values. Using the Three Sigma Rule border values were calculated by formula as follows:

$$BMI = M \pm 3 * SD, \quad (1)$$

where M=22.0 is arithmetic mean; SD=4.2 is standard deviation. Lower and upper values have been determined: BMImin=9.5; BMImax=34.4. Two subjects (8K and 95K) showed BMI values bigger than upper border (35.4 and 44.0) were eliminated from the studying group. A total number of subjects with valid result appeared 9.

Accuracy of estimation of a body height among female subjects was determined as a difference between results of subject's answer and results of measurement. Two groups of subjects have been formed: 58 subjects presented their knowledge (I know my body height it is …) of values of body height and 38 subjects – estimated their own hypothetic values (I suppose my body height is …).

Two paired t-test for means have been used to compare subject's estimations with results of measurements (Table 1).

Mean values of difference in the first and second tests were -0.2 (on knowledge) and 0.4 cm (supposition) correspondingly. This is that in average subjects had images regarding their body height smaller than it is in reality. Contrary, the subjects who did not know their body height estimated this parameter greater. Means of absolute values of the differences appeared the same:

$$\frac{\sum |x_K - x_M|}{n} = 1.0 \text{ cm},$$

where x_K is subject's knowledge or evaluation regarding a body height; x_M is results of measurements; n are samples' numbers.

Statistical hypothesis about a common general set of the subject's results and results of measurements have been accepted on the levels of significance as follows: p=0.383 – for the first subjects' sample ("I know …) and p=0.094 – for the second ("I suppose …).

The same calculations regarding body mass values have been done; corresponding results are presented bellow (Table 2).

Statistical hypothesis about a common general set of the subject's results and results of measurements have been accepted on the levels of significance as follows: p=0.226 – for the first subjects' sample ("I know …) and p=0.232 – for the second ("I suppose …). Mean value of difference in the first and second tests were -0.3 and -0.4 cm correspondingly. Significant validity of both studied tests has been determined as excellent (r_1=0.988, r_2=0.974; p<0.01).

In average subjects have images regarding their body height smaller than it is in reality. Contrary, the subjects who do not know their body height estimate this parameter greater. Means of absolute values of the differences appeared smaller 1 cm in both tests.

Factor analysis of body building composition

Because a lot of parameters described body compositions of studied patients, Factor analysis

Table 1. Two pair t-test for means of female body height (cm)

Statistics	Knowledge	Measurement	Supposition	Measurement
Arithmetic means	165.7	165.9	165.4	165.0
Variance	44.5	46.6	34.2	34.1
Sample number	58		38	
Pearson correlation	0.981		0.976	
Degree of freedom	57		37	
t-statistics	-0.879		1.719	
P(T<=t) one tail	0.192		0.047	
t one tail boarder	1.672		1.687	
P(T<=t) two tail	0.383		0.094	
t- two tail boarder	2.002		2.026	

Table 2. Two pair t-test for means of female body mass (kg)

Statistics	Knowledge	Measurement	Supposition	Measurement
Arithmetic means	54.8	55.1	60.2	60.6
Variance	51.9	43.0	90.7	110.9
Sample number	22		74	
Pearson correlation	0.988		0.974	
Degree of freedom	21		73	
t-statistics	-1.248		-1.207	
P(T<=t) one tail	0.113		0.116	
t one tail boarder	1.721		1.666	
P(T<=t) two tail	0.226		0.232	
t- two tail boarder	2.080		1.993	

has been used with a purpose to reduce a number of corresponding variables. Forty parameters related to the problem have been collected among others (Table 3).

Table 3. Mass parameters presented a body mass composition

No	Measurements
1	Fat free mass (kg)
2	Bone mineral mass (kg)
3	Protein mass(kg)
4	Muscle mass (kg)
5	Skeletal muscle mass (kg)
6	Skeletal muscle percentage (%)
7	Body fat mass (kg)
8	Body fat percentage (%)
9	Visceral fat (level)
10	Total body water (kg)
11	Extra-cellular water (kg)
12	Intra-cellular water (kg)
13	Extra-cellular water / Total body water (%)
14	Basal metabolic rate (kJ)
15	Basal metabolic rate (kcal)
16	Impedance (ohm)
17	Trunk fat percentage (%)
18	Trunk fat mass (kg)
19	Trunk fat free mass (kg)
20	Trunk muscle mass (kg)
21	Right arm impedance (ohm)
22	Right arm fat percentage (%)
23	Right arm fat mass (kg)
24	Right arm fat free mass (kg)
25	Right arm muscle mass (kg)
26	Left arm impedance (ohm)
27	Left arm fat percentage (%)
28	Left arm fat mass (%)
29	Left arm fat free mass (kg)
30	Left arm muscle mass (kg)
31	Right leg impedance (ohm)
32	Right leg fat percentage (%)
33	Right leg fat mass (%)
34	Right leg fat free mass (kg)
35	Right leg muscle mass (kg)
36	Left leg impedance (ohm)
37	Left leg fat percentage (%)
38	Left leg fat mass (%)
39	Left leg fat free mass (kg)
40	Left leg muscle mass (kg)

Correlation matrix as a first step of the Factor analysis has been constructed for these 40 parameters (Table 3). Significance of correlation was evaluated using the critical absolute values of correlation coefficients by formula as follows:

$$|r| = \frac{t}{\sqrt{t^2 + \nu}},$$

where r is Pearson correlation, t is Student statistics, $\nu = n - 2$ is degree of freedom, n=40.

According to the Method of Principal components, the Factor analysis has been done (Table 4). A number of variables were reduced to twenty-three (11 – 33). Three Eigenvalues appeared greater than one (17.4; 3.3; 1.1). Number of factors extracted equals 3. Corresponding part of variation forms 94.7% of the total. The rest of variation (5.3%) presents other factors. The main factor (the first one) forms more than three quarters of variation – 75.7%.

Table 4. Results of the Factor analysis

Variables	Factor 1	Factor 2	Factor3
11	-0.876	-0.451	-0.059
12	-0.924	0.240	0.265
13	-0.926	0.239	0.261
14	0.631	-0.604	0.334
15	-0.776	-0.572	-0.179
16	-0.923	-0.317	-0.088
17	-0.943	0.199	0.195
18	-0.940	0.202	0.199
19	0.646	-0.564	0.353
20	-0.776	-0.573	-0.169
21	-0.925	-0.315	-0.083
22	-0.946	0.198	0.169
23	-0.943	0.200	0.172
24	0.671	-0.505	0.419
25	-0.795	-0.512	-0.134
26	-0.945	-0.287	-0.054
27	-0.956	0.171	0.164
28	-0.955	0.171	0.168
29	0.679	-0.475	0.439
30	-0.803	-0.499	-0.130
31	-0.947	-0.281	-0.051
32	-0.960	0.146	0.160
33	-0.959	0.149	0.164
Eigenvalues	17.4	3.3	1.1
Prp.Totl.%	75.7	14.2	4.8

Factor 1 – fat factor. Loadings (Unrotated) Extraction: Principal components (|r|>0.939): left arm fat percentage (%); left arm fat mass (kg); right leg fat percentage (%); right leg fat percentage (kg); trunk fat percentage (%); trunk fat mass (kg); right arm fat percentage (%); right arm fat mass (kg); left arm impedance (ohm); right leg impedance (ohm).

Factor 2 – fat-free factor. Loadings (Unrotated) Extraction: Principal components (|*r*|>0.504): basal metabolic rate (kJ); basal metabolic rate (kcal); trunk fat free mass (kg); trunk muscle mass (kg); right arm fat free mass (kg) right arm muscle mass (kg).

Factor 3 – combined factor. Loadings (Unrotated) Extraction: Principal components (|*r*|>0.333): basal metabolic rate (kJ); trunk fat free mass (kg); right arm fat free mass (kg); left arm fat free mass (kg).

Principal components were extracted as fat factor (75.7%) and no fat factor (14.2%). The third, combine, factor (4.8%) could not be presented as a sum of homogenous principal components. Therefore, only two factors – the first and the second one – should be taking into consideration in solving theoretical problems. Other variations could be eliminated because their negligible income to the total account.

Fitness parameters correlation

Four fitness parameters have been selected with a purpose to study the validity of self-evaluation of well-known methods with BMI, WHO-5 and others. Test results were collected at columns of the Excel file as follows:

- (AJ) Intense physical exertion (minutes per week),
- (AU) How many minutes per day did a student spends sitting or lying down on average?
- (BA) WHO - 5 sum of points,
- (BI) Body-Mass Index (kg/m^2).

Results of Pearson correlation are presented in Table 5: coefficients of correlation are situated left–down of the correlation matrix diagonal and t-Student statistics – right–top. Only two from six pares showed practically significant correlation: |*r*|=0.250. "Intense physical exertion" (AJ) was correlated with results of the "Sum of points WHO – 5" and "Body-Mass Index" (BI).

The self-evaluation study based on "Intense physical exertion" is valid relatively WHO 5 as well as and BMI tests (p<0.05).

Body mass self-evaluation vs. appearance

Interdependence between attributive features regarding self-evaluation of body mass and appearance was studied using χ^2 Pearson statistics; and Cramer coefficient of conjugation. The results of evaluation were collected in Table 6. The attributive values were situated in the rows and columns according to ranged marks in the questionnaire form.

Because there were empty cells (i.e. sells with zero frequencies) in three cells of the Table 6 (lean-bad, lean-excellent, and exactly-bad), this table has been reorganized with a purpose to avoid the empty cells. Two rows (lean and fat) as well as two columns (indifferently and bad) have been united so that the table has been transformed into the table with three columns and two rows (Table 7).

Table 5. Correlation matrix of self-evaluation and two international indexes

Tests	AJ	AU	BA	BI
AJ	1	0.004	2.720	2.540
AU	0.000	1	1.244	0.500
BA	**0.266**	0.125	1	1.072
BI	**0.250**	0.051	0.108	1

*Note: |*r*|=0.312 (p=0.05); |*r*|=0.403 (p=0.01); |*r*|=0.501; (p=0.001).

Table 6. Self-evaluation results of body mass and appearance

Self-evaluation of body mass	Self-evaluation of appearance				Total
	excellent	good	indifferently	bad	
Lean	0	7	1	0	8
Exactly	16	31	19	0	66
Fat	2	12	6	5	25
Total	18	50	26	5	99

Table 7. Reorganized results of self-evaluation

Body mass \ appearance	Excellent	Good	Indifferently & bad	Total
Exactly	16	31	19	66
Lean + Fat	2	19	12	33
Total	18	50	31	99

The research hypothesis assumed functional interdependence between body mass and appearance. Hypothesis criterion (χ^2 – statistics) was calculated using the formula bellow:

$$\chi^2 = \sum_i \sum_j \frac{(f_{ij} - F_{ij})^2}{F_{ij}} \quad (2)$$

where f_{ij} are empirical frequencies of evaluation; $F_{ij}=f_{i0}f_{0j}/n$ are theoretical frequencies proportional to the total; x and y are attributive features; total number of frequencies.

Empirical value of the Pearson statistics was calculated using the simplified formula (2) as follows:

$$\chi^2 = 99\left(\frac{16^2}{18\times 66} + \frac{2^2}{18\times 33} + \frac{31^2}{66\times 50} + \frac{19^2}{33\times 50} + \frac{19^2}{31\times 66} + \frac{19^2}{31\times 66} + \frac{12^2}{33\times 31} - 1\right) = 4.89 \quad (3)$$

According the degree of freedom $k=(m_x-1)(m_y-1)=2$, significance of consistency of variation of attributive features x and y was determined as follows: $p=0.043$, where $m_x=2$ and $m_y=3$ are numbers of groups x (rows) and y (columns) correspondingly. As relative measure of density of this stochastic correlation a reciprocal conjugation coefficient was determined as follows:

$$C = \sqrt{\frac{\chi^2}{n(m_{\min} - 1)}} \quad (4)$$

where $m_{min}=2$ is a smaller value of groups' numbers (m_x or m_y); $C=0.222$ that shows a weak density of stochastic interdependence.

Self-evaluation of body mass vs. body height

All the three tests' evaluation has been done using the same form of the attributive features into three columns and two rows (Table 8). Significance of interdependence appeared at the statistical level $p=0.05$. A conjugation coefficient ($C=0.208$ – 0.222) showed a weak mean density of stochastic interdependence.

A stochastic interdependence between body mass and body height was studied comparing an empirical distribution with the theoretical distribution common for the body mass and body length. The empirical variances were borrowed from results of body mass and body height evaluation. The theoretical variances were calculated as an arithmetic mean of the corresponding empirical variances (Table 9).

An empirical value of the Pearson statistics was calculated as follows:

$$\chi^2 = \frac{(16-16)^2}{16} + \frac{(31-36.5)^2}{36.5} + \frac{(19-20)^2}{20} + \frac{(2-2)^2}{2} + \frac{(19-13.5)^2}{13.5} + \frac{(12-11)^2}{11} + \frac{(16-16)^2}{16} + \frac{(42-36.5)^2}{36.5} + \frac{(21-20)^2}{20} + \frac{(2-2)^2}{2} + \frac{(8-13.5)^2}{13.5} + \frac{(10-11)^2}{11} = 6.42 \quad 5)$$

A conjugation coefficient ($C=0.255$) showed a weak mean density of stochastic interdependence (see Table 8). Significance of acceptation of zero hypotheses regarding equal distribution of body mass and body height evaluation has been shown with $p=0.844$.

Discussion

People with an attractive physical appearance are happy, healthy, watch their diet and are physically active [22]. A review of the literature regarding self-assessment of appearance by female students shows that over 50% of respondents declare dissatisfaction with their appearance [23].

In this study, 68.7% of surveyed medical students chose "good" or "excellent", 26.3% chose "differently" in relation to their appearance, and only 5.1% chose "bad". At the same time, the last

Table 8. Statistics of self-evaluation results with appearance

Anthropometric parameters	χ^2	*k*	*C*	*p*
Body mass	4.89	2	0.222	0.043
Body height	4.27	2	0.208	0.059
BMI	4.50	2	0.213	0.053
x / y	6.42	11	0.255	0.844

Table 9. Empirical (*f*) and theoretical (*F*) variances of body mass (*x*) and height (*y*)

f	x	16	31	19	2	19	12
	y	16	42	21	2	8	10
F	x / y	16	36.5	20	2	13.5	11
		16	36.5	20	2	13.5	11

mentioned group qualified themselves as "fat" in their self-assessment of body weight, thus indicating that being overweight is a problem in their perception of their appearance.

On the other hand in relation to self-assessment of body weight, 67% of respondents assigned themselves to the "exactly" category, 25.3% to the "fat" category and 8% to the "lean" category. It is noteworthy that as many as seven out of eight students from the "fat" category associated their slimness with their "good" appearance, and only one with the "indifferently" category. This may indicate that they adhere to the ideal of a slim appearance.

The above thesis is confirmed by the BMI results based on objective measurements, where as many as 71.7% of the surveyed students were classified in the "normal" group, 13.1% in the "underweight" group, and 15.2% in the "overweight" group. After self-assessment, overweight was stated in 25 cases, and after assessment only in 15. Therefore, as many as 10 students showed too critical self-assessment.

The results of this study do not correspond to reports that higher BMI was associated with perceptions of less personal control and responsibility [24].

A literature review shows that women usually underestimated their body weight in their self-esteem, which was explained by the desire to adapt to the cultural ideal of a slim body promoted by the media [25].

The results of this study confirm that female students care about the attractiveness of their appearance and associate it with a slim body, but they do not underestimate their body weight. This may prove their high awareness, which is the basis for effective action in taking care of their appearance and maintaining the appropriate body weight.

Body height, like body weight, can affect how people perceive themselves and others [26].

Typically, men overestimate body height in order to emphasize the need to be big and in line with the cultural gender pattern and women do not show such a tendency [27].

In our study, average body height was most often indicated as attractive, similarly to another new large Polish study [22].

The examined medical students who declared that they knew their body height made an underestimation error of an average of 0.2 cm (p=0.383), and those who did not know their body height and declared only an assumption made an overestimation error of an average of 0.4 cm (p=0.383). 0.094). These results, similarly to the self-assessment of weight, indicate high body awareness.

Our study, unlike other recent studies on medical students, shows a high percentage of students with distorted self-perception and dissatisfied with their appearance [28, 29] shows a favorable trend in this field. Awareness of one's body and adequate self-assessment of one's appearance are very positive factors in the context of personal development and future work as a doctor [30].

A limitation of this study is the narrow sample of medical students at the university, so one should be careful in generalizing the obtained results.

This research has been done among female medicine students. Young females are rather interested about their appearance. It will be an important research regarding the self-evaluation of appearance by male medical students as well as among students of other specialties [31].

Conclusions

In average, female students have images regarding their body height smaller than it is in reality. Contrary, the students' who do not know their body height estimate this parameter greater. Statistical hypothesis about a common general set of the subject's results and results of measurements have been accepted on the bigger level of significance (p=0.383) – for the subjects' sample who know their parameters than for another sample who suppose these parameters (p=0.094).

Highlights

During Factor analysis of a body composition, three factors included anthropometric parameters regarding body mass and body height have been derived. The main factor forms more than three quarters of variation – 75.7%. It was named as body fat factor because fat related parameters were correlated with this factor. The second significant factor included 14.2% of variation and was named as non-fat factor which correlates with parameters related to the no fat body mass.

The self-evaluation study based on "Intense physical exertion" is valid relatively WHO 5 as well as and BMI tests (p<0.05).

Significance of interdependence appeared at the statistical level p=0.05. A conjugation coefficient (C=0.208 – 0.222) showed a weak mean density of stochastic interdependence.

Acknowledgement

Authors thank the students participated in the research for their valuable contribution.

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Cite this article as:
Nowak SB, Zanevskyy IP. Self-evaluation of appearance by female medicine students. *Physical Education of Students,* 2024;28(3):158–167.
https://doi.org/10.15561/20755279.2024.0304

Received: 26.12.2023

Accepted: 03.03.2024; **Published**: 30.06.2024