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Prediction of body image dissatisfaction in university students by multivariate statistical methods

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ABSTRACT. Overweight and obesity are responsible for significant costs of the Brazil's public health system and can modify the self-perception of the body image, attitudes, cognitions and thoughts. This study intends to propose predictive models to evaluate factors related to body image dissatisfaction among university students. Undergraduate students, with a mean age of 22.4 years, were interviewed in Minas Gerais, Brazil, by means of a behavioral questionnaire and evaluated the body image by scale of figures of silhouettes according to the Brazilian biotype. Contingency analysis pointed out dissatisfaction in 67.1% of the students and the time dedicated to sedentary activities presented significant influence on body image. Female undergraduate students from health science courses with recent weight gain tended to wish smaller silhouettes, while male students wished larger body sizes. Multinomial and logistic regression analyses revealed a good predictive power, but the multinomial regression was more advantageous and effective in demonstrating a satisfactory predictive model comprised of a larger number of variables to explain the body image dissatisfaction.

Keywords: body image; college behavior; multinomial regression; logistic regression.

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Introduction

The current epidemiological scenario indicates that overweight and obesity are major health issues occurring at alarming rates among the worldwide youth population (Popkin, Adair & Ng, 2012). Previous studies have stated that such health problems are responsible for significant costs of the Brazil's public health system and many other services throughout the world. In this context, overweight and obesity have been a constant concern for the scientific community and health professionals (GBD, 2017; Domingos et al., 2018).

In addition to the physical consequences of obesity, psychosocial are also very frequent (Fonseca & Matos, 2005). Living habits adopted to conquest a body that meets the imposed 'ideal' beauty standard may negatively affect the perception of body image, especially in those individuals diagnosed with overweight and obesity (Appolinário & Claudino, 2000). Excessive concerns about body weight and appearance can trigger health problems, such as anxiety, depression and binge eating, thereby reducing life quality (Nicoli & Junior, 2011).

The increasing preference for an athletic body is evidenced by the growing emphasis on exercises, toning activities and muscularity, in addition to thinness (Grogan, 2008; Homan, McHugh, Wells, Watson & King, 2012). The ideal body trend has changed and produced an attractiveness pattern that has two dimensions now: unrealistically thin and toned body (Benton & Karazsia, 2015). Exercise interventions are effective in reducing the concerns on body image, and may be considered as an alternative and efficacious treatment for body image concern along with conventional therapies (e.g., psychoeducational, cognitive-behavioral) (Campbell & Hausenblas, 2009).

In studies with university students, more than half of population have distorted judgment of their body perception as compared to their real Body Mass Index (BMI) (55% of women and 63% of men), with men underestimating their weight and, among women, there are cases underestimating or overestimating their weight (Frederick et al., 2007; Miguez, De La Montana, Gonzalez, and Gonzalez, 2011).

It has been investigated the reasons by which occidental men became the subject of researches on body image perception, which have always been focused on women. Two possible explanations were suggested:

1) occidental men may cultivate unrealistic body ideas, and 2) occidental society is adding an increasing 'value' to the male body (Yang, Gray & Pope, 2005). However, relationships between living habits and body perception among male are still not clear.

In Brazil, there are only a few tools that are validated and used in researches on body image perception. Researchers validated the Body Shape Questionnaire (BSQ) as a tool for assessing the perceptions and attitudes related to body size among Brazilian adults (Di Pietro & Silveira, 2009), concurrent validity and discrimination of the Stunkard's silhouettes scale (Scagliusi et al., 2006) and a Silhouette Scale for Brazilian adults with age 18-59 years (Kakeshita, Silva, Zanatta & Almeida, 2009). This last one scale contain 15 images and overcame the limitations pointed out by some authors (Gardner, 1996; Gardner, Stark, Jackson, and Friedman, 1999) when working with silhouette scales, which are: insufficient number of figures (usually 5 to 12 images), sequential figures presentation method, which allow them to be easily memorized by the individual, thus disturbing the evaluation, and restricted number of figures that can be selected by the individual.

Limited scales such as those structured only by 9 images whose body shapes often do not truthfully represent the bodies of the individuals, have been widely used to study the Brazilian reality. Many researches have recently used these limited scales mostly due to the scarcity of effective tools for evaluating body image perception in Brazil and the time-consuming procedures necessary for validating silhouette scales.

The present study was focused on body image perception on college students because student dropout in higher education occurs worldwide and there may be a relationship between body image dissatisfaction and the context in which the university lives. Abandonment from classes, course changes and excessive reproaches are common situations in public universities. According to the National Institute for Educational Studies and Research 'Anísio Teixeira' (INEP), the number of entering freshmen in higher education courses raised by 16.8%. Yet the number of graduates decreased in 2013 for nearly all courses (except for engineering, manufacturing and civil construction) (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira [INEP], 2013).

In this context, this study aimed to demonstrate the efficacy of predictive models to estimate general body image dissatisfaction, being an alternative to the numerous studies that relate general self-esteem to body image dissatisfaction, making frequent use of univariate (Murphy, Dooley, Menton & Dolphin, 2016), little complex models to explain the data.

The following hypotheses were raised for this study:

H_1 = Students from Health Science courses present higher body image dissatisfaction.

H_2 = Individuals with recent weight gain present higher body image dissatisfaction when compared to individuals who have experienced recent weight loss.

H_3 = Multinomial regression is better at predicting body image dissatisfaction when comparing logistic regression.

Material and methods

This study was based on a cross-sectional analysis with quantitative and qualitative variables, which was based on a behavioral questionnaire among undergraduate students from the Universidade Federal de Viçosa (see Table 1). The practice of physical activity was determined from the time of physical activity spent throughout the week, while time dedicated to sedentary activities was calculated from the number of hours that the individual do not perform physical activity on week.

Weight and height measurements were self-reported and Nutritional status was assessed using BMI-body mass (kg) / height (m). The survey was carried out mainly focusing on evaluating the aspects related to physical activity, body dissatisfaction, body weight and health. In a second stage of this work, the anthropometric data of the participants (height and body weight) were collected in a laboratory of Nutrition and Health.

To evaluate body image dissatisfaction, it was requested that the participant indicated the figure that best described his current silhouette and the figure that represented the desired silhouette. The Scale of figures of silhouettes was based on drawings numbered from 1 (smallest silhouette; BMI: 17.5 kg m^{-2}) to 9 (biggest silhouette; BMI: 37.5 kg m^{-2}) according to the Brazilian biotype (Kakeshita et al., 2009). Despite the limitations considered for the scale of nine figures, it was chosen to use it considering that Brazil still has

few studies in the area and few scales validated for use. In addition, data was collected in the winter of 2009, when the scarcity of tools was even greater than today.

Table 1. Issues of the questionnaire.

Open-ended question	**Identification**
Self-reported weight and height	Gender Education Income Occupation Age Course
Closed-ended questions	
In your free time, how many hours do you spend on average sitting, watching radio, TV or video, using the computer, reading a book etc. (1) On a normal work day? (2) On a normal weekend or free day?	
You are currently: (1) Smoker (2) Ex-smoker (3) Non-Smoker	
In recent months you have: (1) Increased weight (2) Lost weight (3) Maintained weight	
Which factors most influence you in weight gain? (1) Genetics metabolism (6) Amount of physical activity practiced (2) Alcohol consumption (7) Total amount of food ingested (3) Smoking (8) Fat consumption (4) Sugar consumption (9) Usually not fattening (5) Other (please specify) (10) None / Do not know	

According to the survey period and courses involved in this study, the campus hosted approximately 7,109 students officially enrolled with the university (Universidade Federal de Viçosa [UFV], 2009). A convenience sample was chosen and the criteria for participating in the study were to be a student at the Federal University of Viçosa, aged over 18 years and able to participate in the study stages.

The survey was conducted with participation of 232 undergraduate students after approval of the Human Research Ethics Committee (n° 1.581.561) and carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. All students received a confidentiality agreement, which guaranteed that their identification would not be disclosed. Students found out the research from ads spread throughout of the university campus. Those who had gotten interested in participating went directly to the Department of Nutrition and Health and filled a recruitment questionnaire.

Statistical Analysis

The data of the participants were submitted to descriptive analysis in order to characterize the sampling under investigation. Subsequently, contingency analysis was applied to examine the relationship between weight change and body image dissatisfaction. The dissatisfaction is when a participant wants have any other silhouette different from the one he or she has and satisfaction just when two silhouettes coincide.

Finally, logistic regression was used to classify the dependent variables into two categories of body image (satisfaction and body image dissatisfaction), while the multinomial regression evaluated satisfaction into three categories (desiring larger silhouette measures, satisfied with his current silhouette, and desiring smaller silhouette measures). All analyses were performed using the Statistical Package for Social Sciences software (SPSS) version 20, licensed by Universidade Federal de Viçosa.

Results

The total participants consisted of 102 male (44%) and 130 female (56%) undergraduate students. The participants that did not provide information of their body image were excluded from this study, remaining only data from 228 students to be analyzed.

The data in Figure 1 show that the distribution of current silhouette values is similar to a Gauss curve, thus it may be considered as a leptokurtic distribution, since the kurtosis coefficient is positive and equal to 1.623. The asymmetry is positive and moderate at right. The data are well distributed and concentrated around the body sizes from 1 to 6. On the other hand, the distribution of desired silhouette values reveals a high concentration of data around the body size 3, which corresponds to a smaller body size silhouette.

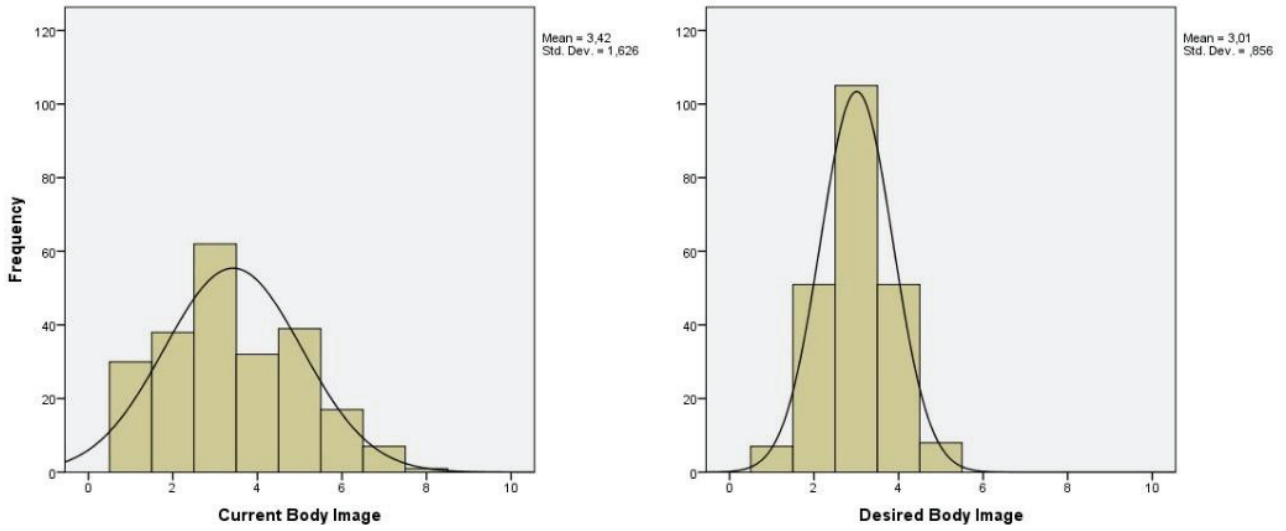

Figure 1. Distributions of current silhouette and desired silhouette values of undergraduate students (n = 228).

The desired silhouette distribution is even more leptokurtic, with a positive kurtosis coefficient higher than that of the current body image distribution, 13.693. Its asymmetry is also positive, but larger and more evident at right. This suggests lower frequencies of high values for desired silhouette, that is, the individuals not satisfied with their body silhouette desired to possess smaller body sizes, which decreased the values and concentrated them at the left part of the histogram, with asymmetry most at right.

Figure 2 shows the total percentage of individual responses in relation to factors that motivated them to lose weight. Table 2 shows the Chi-square ($\chi 2$) test of association that was applied to examine the relationships of weight change that presented a significant value on body dissatisfaction ($\chi 2 = 37.450$, $p < 0.001$).

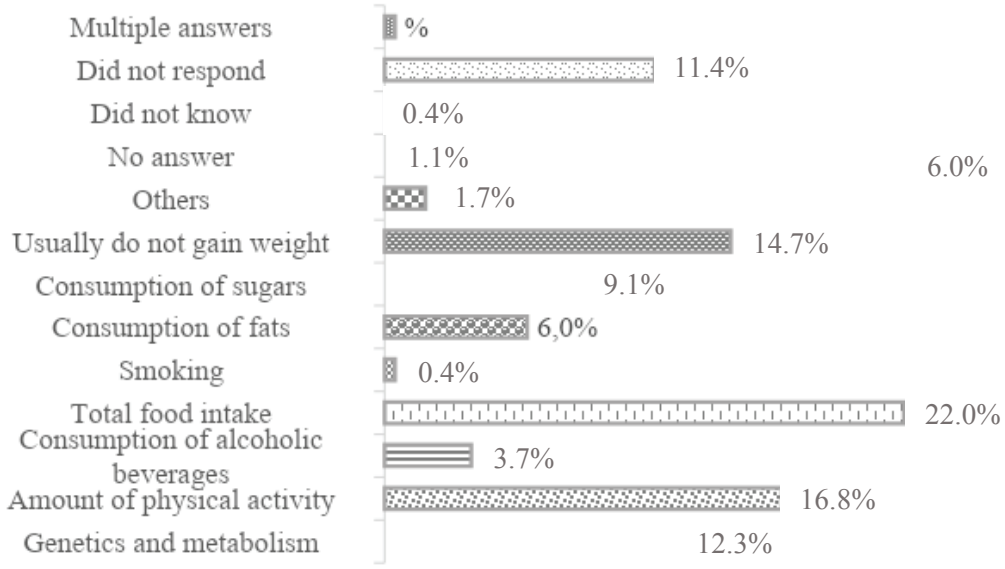

Figure 2. Factors cited as motivators of weight gain.

Among 27.2% of students gained weight recently, 12.7 and 57.5% were able to lose and maintain weight, respectively. The number of students who experienced weight change and wanted smaller silhouette corresponds to 43.7% for those who gained weight and 11.7% for those who lost weight. Likewise, the number of students who experienced weight changes and wished a larger weight is similar for both situations (16.0 and 20.0%). There are also a large number of students who maintained their body weight, however wished larger silhouette measures (62.0%).

Table 2. Contingency analysis between recent gain weight and satisfaction with body image.

Body image satisfaction		Weight change (χ^2 = 37.450, p < .05)				
		Gained	Lost	Maintained	$N_{S/R}$	Total
Desiring larger silhouette	Count	8	10	31	1	50
	Expected value	13.6	6.4	28.7	1.3	50
	% (Satisfaction)	16.0	20.0	62.0	2.0	100
	% (Change)	12.9	34.5	23.7	16.7	21.9
	Residual deviation	-1.5	1.4	0.4	-0.3	
	Adjusted residue	-2.0	1.7	0.7	-0.3	
Desiring smaller silhouette	Count	45	12	41	5	103
	Expected value	28.0	13.1	59.2	2.7	103
	% (Satisfaction)	43.7	11.7	39.8	4.9	100
	% (Change)	72.6	41.4	31.3	83.3	45.2
	Residual deviation	3.2	-.3	-2.4	1.4	
	Adjusted residue	5.1	-.4	-4.9	1.9	
Satisfied with current silhouette	Count	9	7	59	0	75
	Expected value	20.4	9.5	43.1	2.0	75
	% (Satisfaction)	12.0	9.3	78.7	0.0	100
	% (Change)	14.5	24.1	45.0	0.0	32.9
	Residual deviation	-2.5	-.8	2.4	-1.4	
	Adjusted residue	-3.6	-1.1	4.5	-1.7	
Total	Count	62.0	29.0	131.0	6.0	228.0
	Expected value	27.2%	12.7%	57.5%	2.6%	100%

Note. NS/R: Do not know/Did not respond.

The largest residue (5.1) corresponds to the students who experienced weight gain and wished a lower weight, meaning that among the 62 respondents who gained weight, 28.0 or 45.2% of them were expected to wish lower weights. Nevertheless, it is observed that 45 or 72.6% of the students, which report a recent weight gain, wanted smaller silhouette measures. These values are higher than those expected, which justifies the high standardized and adjusted residue.

For those who desire a larger silhouette, it is found more students who lost weight (adjusted residue of 1.7) and fewer students (adjusted residue of 2.0) who gained weight. However, for the smaller silhouette, an opposite trend is observed. This supports the contrast among students who are dissatisfied with their body image: students who gained weight want to lose it, whereas those who lost weight want to gain it.

Among the satisfied students, there are more individuals who maintained their weight (78.7%), followed by those who gained weight (12.0%), and finally by those who lost weight (9.3%). Overall, the results show a percentage of 67.1% of undergraduate students dissatisfied with their body image.

In logistic regression, among the 228 observations were excluded the answers from 2 participants (1 woman and 1 man) for not containing information on body image and time dedicated to sedentary activities time. Therefore, the logistic regression model took into account only 226 observations.

Statistical methods allowed identifying the most significant variables on body image distortion among all variables examined in this study. The analysis of multicollinearity suggested the exclusion of the variable 'height' because its VIF (Variance Inflation Factor) value was greater than 5. The quantitative variables were standardized using the Z-score in order to avoid possible scale errors. The estimations of the probability model are presented in Table 3.

Table 3. Previsions of the probability model for body image dissatisfaction.

Experimental	Prevision		Correct Percentage
	Dissatisfaction	Satisfaction	
Dissatisfaction	126	19	86.9%
Satisfaction	37	38	50.7%
Total			74.5%

The variables of the proposed model are able to predict 86.9% of the students who felt body image dissatisfaction and 50.7% of those satisfied with their body image. The overall prediction power of the model is 74.5%, which means that the variables performed a correct prediction of 164 respondents among the 226 participants. Additionally, it is possible to observe that the best model prediction power relates to

the level of body dissatisfaction, which is the main goal of this study.

The prediction of the model containing only a constant term presents an overall percentage 65.9% lower than that of the full model presented in Table 4, which includes the selected predictors of the analysis.

Table 4. Variables of the prediction model for body image dissatisfaction (n = 226).

Variables	B	SE	X^2Wald	p-value	e^B	95% CI for e^B
Weight	1.145	.309	13.725	.001	3.143	1.715; 5.760
BMI	-0.933	.343	7.398	.007	0.393	0.201; 0.770
CCB	-1.506	.569	6.995	.008	0.222	0.073; 0.677
CCE	-1.077	.541	3.955	.047	0.341	0.118; 0.985
Lack of physical activity	-1.440	.700	4.229	.040	0.237	0.060; 0.935
F	0.417	.182	5.231	.022	1.517	1.061; 2.169
Recent weight gain	-1.487	.460	10.427	.001	0.226	0.092; 0.557
Recent weight loss	-1.077	.531	4.115	.042	0.341	0.120; 0.964
Constant	0.993	.691	2.063	.151	2.699	.

Note. CCB: students from the Biological and Health Science courses*; CCE:* students from the Earth Sciences and Technology courses*; F:* Time spent sitting on week*; SE:* Standard error. Significant values p < .05, two-tailed.

This suggests that the inclusion of explanatory variables, which were selected from the questionnaire, increases the body image dissatisfaction prediction by 13.05%:

$$I_{cmc} = \frac{P_{mc} - P_{mr}}{P_{mr}} = \frac{74.5 - 65.9}{65.9} = 13.05\,\%$$

where:

Icmc is the indicator of contribution of the full model; Pmc is the prevision of the full model; and Pmr is the prevision of the reduced model.

Based on the X^2Wald values, it was possible to exclude the variables not significant on body satisfaction at a probability of 5%. The fit is made manually, and the variables with lower explanatory power are eliminated step-by-step, until building a model comprised of significant variables and with satisfactory results (Ferreira & Ferreira, 2014).

Accordingly, the variables 'gender', 'tobacco smoking', 'time spent sitting on working days' (T), and the variables related to the physical activity were excluded. Thus, the mathematical form of the proposed model becomes:

$$Y = 0.993 + 1.145X[?][?][?] - 0.933X[?][?][?] - 1.506X[?][?][?] - 1.077X[?][?][?] - 1.440X[?][?][?] + 0.417X[?][?][?] - 1.487X[?][?][?] - 1.077X[?][?][?]$$

where:

Y is the dependent variable (satisfaction of body image), X_1 is the variable 'weight', X_2 is the variable "BMI", X_3 is the variable related to students from the Life and Health Science courses, X_4 is the variable representing the students from the Earth Science courses, X_5 is the variable representing the time dedicated to sedentary activities, X_6 is the time (h) spent sitting on week, and X_7 and X_8 are the recent weight gain and weight loss, respectively.

The omnibus test of model coefficients, a global test of significance that evaluates the predictive power of models, presented a significant chi-square model at less than 1% of probability, meaning that the null hypothesis can be rejected. Thus, it is possible to affirm that the model makes accurate predictions, because the estimated coefficients improve the quality of the predictions (Ferreira & Ferreira, 2014).

Yet the Hosmer-Lemeshow test presents a significance of 0.75, however, as supposed by the equality between the predicted and the experimental frequencies, it is found that there is no difference between the model and the observed results. This indicates that the variables incorporated into the model have considerable power to explain a phenomenon under study (Ferreira & Ferreira, 2014).

In addition to the variable BMI, which is significant (p = .007), the variable weight also presents a significant influence on body satisfaction, as expected (p < .05). Concerning the time spent sitting, the variable time spent sitting on week is found to be significant. Among the 226 observations, 152 (66.7%) respondents present longest times of time dedicated to sedentary activities on weekends, which suggests that there is higher time dedicated to sedentary activities on these days.

The second regression model was used with the purpose of analyzing the dependent variable (body image dissatisfaction) regarding more than two classes ('desiring larger silhouette measures', 'desiring smaller silhouette measures' and 'satisfied with current silhouette') by multinomial regression.

Among the variables listed in the survey, the influence of factors on weight gain was chosen to investigate the behaviors of consumption and life quality of the participants, from the variable 'motivators of weight gain'. The most frequent answer given by the participants was the total amount of food intake (22%). In this way, the following categories were considered: genetics and metabolism, amount of physical activity, alcohol consumption, amount of food intake, and others.

The not significant variables of the construct 'physical activities', 'tobacco smoking', 'motivators of weight gain' and 'time spent sitting on working days' were excluded. Thus, it was possible to build a model composed of significant variables. The likelihood ratio test between the null model (containing only a constant) and the full model (containing all independent variables) presented a difference value between the two models referred to as G^2. The G^2 value (212.432) was found to be significant ($p < .001$), excluding, therefore, the null hypothesis that the model is not significant at usual levels. It may be concluded that there is at least one independent variable that significantly influences on body image satisfaction.

The 'Pseudo R-Square' presented an estimation of the pseudo-R^2 values, being that the Cox & Snell (R^2 = .619) and Nagelkerke (R^2 = .704) values showed a good fit. Table 5 reports the estimation of the model's parameters, and the Wald tests and odds ratios (Exp (B)) of the 'desired larger weight' and 'desired lower weight' in relation to the category 'satisfied'.

Table 5. Variables of multinomial model for body image dissatisfaction (n = 226).

Variables		B	SE	X^2Wald	p-value	e^B	95% CI for e^B
Desiring larger silhouette measures	Intercept	-3.945	1.161	11.54	.001	.	.
	BMI	-2.511	.793	10.03	.002	0.081	]0.02; 0.38[
	[Gender=Male]	2.355	.798	8.72	.003	10.54	]2.21; 50.3[
	[Gender=Female]	0b	.	.	.	.	.
	GM	1.987	.998	3.96	.046	7.29	]1.03; 51.5[
Desiring smaller silhouette measures	Intercept	1.115	1.008	1.22	.269	1.11	
	BMI	2.919	.626	21.72	.001	18.53	]5.43; 63.2[
	Weight	-1.675	.566	8.75	.003	0.18	]0.06; 0.57[
	[Gender=Male]	-1.935	.805	5.78	.016	0.14	]0.03; 0.70[
	[Gender=Female]	0b	.	.	.	.	.
	F	-0.479	.246	3.79	.052	0.619	]0.38; 1.00[
	[Weight gain]	1.756	.539	10.61	.001	5.79	]2.01;16.6[
	[kept weight]	0b	.	.	.	.	.
	[Course=CCB]	-1.619	.651	6.18	.013	0.19	]0.05; 0.71[
	[Course=CCH]	0b	.	.	.	.	.

Note. GM: genetics and metabolism; CCB: students from the Biological and Health Science courses; CCH: students from the Human Science courses; F: Time spent sitting on weekends; SE: Standard error. Reference category: Satisfied with current silhouette measures. Significant values $p < 0.05$, two-tailed.

One of the clearest differences between the multinomial regression and the logistic regression was the significance of the variable 'gender'. When the body perception was classified into 'dissatisfaction' and 'satisfaction', i.e., analyzed in a dichotomous way, there was no significant difference between male and female students. However, when the body perception was separated according to the wish for modifying the silhouette (larger or smaller silhouette measures), the Wald test revealed significance ($p < 0.05$) not only for the class that wishes a higher weight, but also to the class that wishes a lower weight. Figure 3 shows the percentage values of satisfaction with body image.

In the case of male students, the probability of wishing a lower weight to become satisfied, compared with the female students is .144. This means that when the student is from the male gender, the probability of wishing a lower weight is reduced by 85.6%. Hence, this study suggests that the female students from the Universidade Federal de Viçosa are more dissatisfied than the male students when it comes to wish a silhouette smaller than the current one.

The odds ratio corresponding to the probability of male students desiring smaller silhouette measures relative to the probability of desiring larger silhouette measures is $\text{Exp}(B_{\text{smallersilhouette}})/\text{Exp}(B_{\text{largersilhouette}}) = 0.014$. Thus, the probability of wishing a smaller silhouette in relation to wishing a larger silhouette decreases by 98.6%. In other words, the male students predominantly wish to possess a larger silhouette, while the female students tend to distort their body image due to wanting a smaller silhouette; women overestimate their body size while the men slightly underestimate it (Silva & Nunes, 2014).

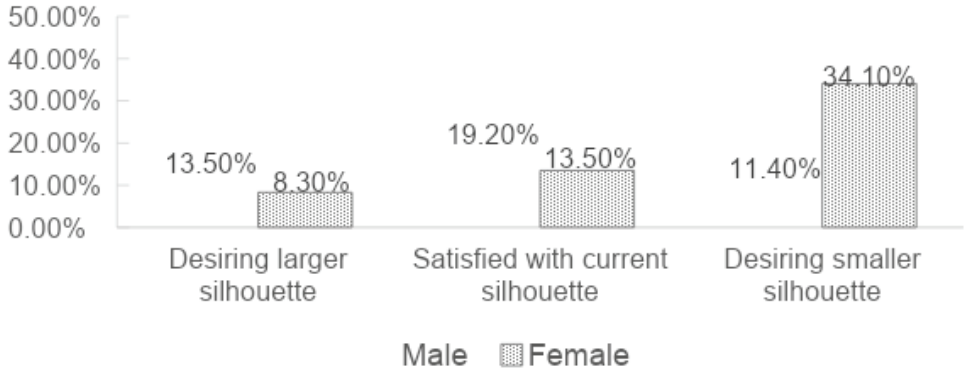

Figure 3. Percentage of undergraduate students satisfied and dissatisfied with their silhouette.

These findings corroborate with those reported by studies in which significant differences between genders was found only after classifying the dichotomous body satisfaction into three categories ($p < .05$) (Paap & Gardner, 2011). The variable 'weight gain' was significant on the class 'desiring smaller silhouette measures' ($p < .05$), and not significant on the class 'desiring larger silhouette measures'. Thus, the students who gained weight tend to be more dissatisfied and wish smaller body sizes. The value of 5.79 confirms that there is a probability of 479.2% of student that wants a smaller silhouette in relation to be satisfied, when he knows that he has gained weight recently.

BMI was found to be significant and the odds ratio of this variable was $Exp(B_{smallersilhouette})/Exp(B_{largersilhouette}) = 18.529/0.081$. This indicates that the probability of wishing smaller silhouttes is much high, and this probably happens to undergraduate students with BMI above the ideal value.

The variable 'motivators of weight gain' is significant on the variable 'genetics and metabolism' ($p = 0.046$), suggesting that one of the reasons of body dissatisfaction among students is the difficulty to gain weight due to heredity and/or physiological behavior.

The variable 'time spent sitting on week' exhibited a p-value close to 5% ($p = 0.052$). If a p-value of 0.10 is taken into account, this variable has significant power on body dissatisfaction. This variable was kept in the model due to its importance revealed by the logistic regression model. In this case, the undergraduate students more physically inactive on weekends may show a tendency to be dissatisfied with their body.

The recent weight gain is also a significant factor, as earlier observed by logistic regression. However, the multinomial analysis reveals that the weight gains are associated with dissatisfaction for smaller silhouettes ($p = 0.001$). It is worth pointing out that the multinomial regression indicates that weight gain presents higher influence on body image dissatisfaction rather than the weight loss. This can be confirmed by the lack of significance of the variable 'weight loss' in the multinomial analysis, as well as in the logistic regression, which revealed higher significance of the variable 'weight gain' ($p = 0.001$) compared with the variable 'weight loss' ($p = 0.042$).

In Table 6, the number of correct classifications is given by the main diagonal values, and the number of wrongly classified observations is the values outside. For the class 'desiring smaller silhouette measures', there are 19 badly classified students, corresponding to a correct classification percentage of 83.5%. In general, the adjusted model classifies 74.5% of the students correctly, thus being a good predictive model for body image dissatisfaction.

Table 6. Predictive model and percentage validity.

Experimental	Predictive model			
	Desiring larger silhouette measures	Satisfied with current silhouette	Desiring smaller silhouette measures	Correct percentage
Desiring larger silhouette measures	29	14	5	60.4%
Satisfied with current silhouette	7	54	14	72.0%
Desiring smaller silhouette measures	4	12	81	83.5%
Total percentage	18.2%	45.5%	36.4%	74.5%

Discussion

This is the first study that compares the predictive power of regression models to explain a set of variables on categories of body image dissatisfaction. Following previous occidental and oriental studies (Gillen & Lefkowitz, 2012; Ji-Young, Hyun-Jung, Hyung-Chul & In-Sil, 2015; Sai et al., 2018; Lee, Chiang & Chu, 2019), the results showed that BID of Brazilian college students depends on the university environment (e.g. social influence around health aspects, group living, cultural aspects of clothing, etc.) and anthropometric factors associated. For example, for African American women, being well-groomed, having a unique personal style, and exuding confidence is attractive and determines their particularly body image (Gillen & Lefkowitz, 2012). BID may be lower in oriental people, probably because costumes doesn't expose or reveal the body and differences in oriental traditional thought and philosophy (Ji-Young et al., 2015).

The findings of this research also provide a comprehensive overview and builds on the increased interest in the relationship between body image concern and extrinsic factors associated (e.g. social media, personal style, health consciousness), which goes beyond anthropometric factors, by indicating external factors trends to consumer. In an environment of coexistence among yoga practitioners, participants indicated that mirrors can help with body alignment, but also allows for more comparisons with others, which in turn leads to harmful self-talk; however, a sense of relief comes when someone physically 'bigger' is in the same environment (Neumark-Sztainer, Watts & Rydell, 2018).

Currently, despite cultural particularities, body image satisfaction seems to has a high correlation with the use of social networks and this universal trend is imminent on body image in university studies, because social influence is a key determinant of health behaviors (Aparicio-Martínez, Perea-Moreno, Martinez-Jimenez, Suarez-Varela, Varo, and Vaquero-Abellán, 2017; Perry & Ciciurkaite, 2019). According to Aparicio-Martínez et al. (2017, p. 1685) "[...] women's degree of satisfaction is highly correlated with the frequency of their connections to social networks, with the body image those women present and with the effect of advertising [...]", but this finding does not apply to men, which mean there are many differences between men and women in the perception of their self-images, each composed by different values.

It is known that body weight plays an important role on body self-image, and it is directly associated with BMI. A particularity of the present study was to consider the recent weight change as a good predictor of body self-image. The variable BMI was significant at levels of 1% and time spent sitting on week at levels of 5%. This corroborates with the study who identified the longest times spent in front of TV on weekend among the male students between 15-17 years old and with overweight and obesity (Klouck & Farias, 2015). In a study with undergraduate students found a high prevalence of body dissatisfaction from the physical education course, being the highest frequencies for those who have informed time dedicated to sedentary activities (Silva & Nunes, 2014). The time dedicated to sedentary activities increases predisposition to dissatisfaction. Nevertheless, further studies are necessary to confirm the relevance of the time spent sitting on week.

The predictive models were able to estimate the results evidenced in the literature. Female students wished to reduce their body size, while male students intended to increase it. It is important to emphasize the men's behavior, who have been increasingly concerned about becoming more muscular, due to the culture and seeking for increased body sizes (McCreary & Sasse, 2000; Coqueiro, Petroski, Pelegrini & Barbosa, 2007). Regarding differences between male and female students, it was found the prevalence of body image dissatisfaction among male students, whose majority wished to achieve larger silhouettes. In contrast, women presented an opposite behavior, with higher dissatisfaction and desire for smaller silhouettes.

The differences among undergraduate students from distinct courses showed that students from the biological and health science courses are more concerned about their body condition, and pursue silhouettes that appear to be healthier. A particular result of this study was to find body self-image dissatisfaction among students from the earth science courses, which included food science courses. Researchers emphasize that an important concerning in intervention studies referring to fact the demand for apparently healthy products is linked more to the pursuit of a desirable silhouette rather than health or well-being concerns (Fiszman, Carrillo & Varela, 2015). Health-related advertisements sometimes perpetuate the so-called 'healthy weight' stereotype that being beautiful and healthy is only achieved by reducing body fat (Rodgers, 2016). However, greater concerns about weight do not necessarily lead to healthy habits or health consciousness (McCabe, Connaughton, Tatangelo, Mellor & Busija, 2017; Yiu,

Murray, Arlt, Eneva & Chen, 2017). Therefore, healthy behaviors should be stimulated to facilitate positive self-image of university students.

Conclusion

Logistic regression and multinomial regression were satisfactory in determining the body image dissatisfaction among undergraduate students. However, the multinomial regression was more advantageous and effective in demonstrating a satisfactory predictive model comprised of a larger number of variables to explain the dependent variables, since it promoted greater segmentation of individuals regarding body image dissatisfaction. In addition, the use of regression models for evaluating categorical variables, such as those evaluated in this work, is not common in body image studies. This approach could contribute to enrich further studies on this subject matter in addition to the use of descriptive statistics, frequency observations and central tendency measurements. However, it would be of relevance to include other parameters on the evaluation of body image dissatisfaction, for instance, percentages of lean body mass and body fat, as well environment factors.

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