BODY IMAGE AND FOOD CONSUMPTION IN ADULTS: A CROSS-SECTIONAL STUDY

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Débora Tavares Caixeta[a] iD, Filipe Pereira Oliveira[a] iD, Grassyara Pinho Tolentino[a] iD, Danielle Godinho de Araújo Perfeito[a] iD, Ana Paula Silva Siqueira[a] iD

[a] – Instituto Federal de Educação, Ciência e Tecnologia Goiano - Campus Urutaí. Rod. Geraldo Silva Nascimento, Km-2,5 - Zona Rural, 75790-000, Urutaí - GO, Brasil.

*Correspondente: filipe.pereira@estudante.ifgoiano.edu.br

Abstract

Objective: to evaluate self-perception of body image and its correlation with food consumption among individuals from Goiás. *Material and Methods:* A cross-sectional design was used, involving 67 participants aged 18 to 50 years. Data on self-reported body image, body mass index (BMI), and daily eating frequency were collected. Statistical analysis included t-tests for independent samples, ANOVA for multiple comparisons, Spearman and Pearson correlations, and chi-square tests for food frequency by sex, with a significance level of $p < 0.05$. *Results:* Significant differences were found between BMIs derived from the scale (Current BMI, Ideal BMI) and self-reported forms (Real BMI, Desired BMI). No significant difference was observed between BMI values for men alone, and no association was found between BMI and food consumption. *Conclusion:* These findings suggest that participants exhibit body image distortions, but BMI does not correlate with eating habits.

Keywords: Eating habits. Distorted body image. Weight perception

Resumo

Objetivo: avaliar a autopercepção da imagem corporal e sua correlação com o consumo alimentar em indivíduos goianos. *Material e Métodos:* Utilizou-se um delineamento transversal, envolvendo 67 participantes com idade entre 18 e 50 anos. Foram coletados dados sobre imagem corporal autorreferida, índice de massa corporal (IMC) e frequência alimentar diária. A análise estatística incluiu testes t para amostras independentes, ANOVA para comparações múltiplas, correlações de Spearman e Pearson e testes qui-quadrado para frequência alimentar por sexo, com nível de significância de $p < 0,05$. *Resultados:* Foram encontradas diferenças significativas entre os IMCs derivados da escala (IMC atual, IMC ideal) e as formas autorreferidas (IMC real, IMC desejado). Não foi observada diferença significativa entre os valores de IMC apenas para homens, e não foi encontrada associação entre IMC e consumo alimentar. *Conclusão:* Esses achados sugerem que os participantes apresentam distorções da imagem corporal, mas o IMC não se correlaciona com os hábitos alimentares.

Palavras-chave: Hábitos alimentares. Imagem corporal distorcida. Percepção de peso.

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Introduction

Body image is a multifactorial construct influenced by various individual and environmental factors, including gender, age, socioeconomic status, physiological aspects, and cultural elements (KOPS *et al.*, 2019; IRVINE *et al*., 2019; BONEV *et al*., 2021; ANJOS *et al.*, 2020; NÁJERA-LONGORIA *et al.*, 2021). The assessment of body image commonly employs tools such as questionnaires and silhouette scales, which provide insights into individuals' concerns and perceptions regarding their body shape (SILVA *et al.*, 2018; HOSSEINI *et al.*, 2024).

Studies utilizing silhouette scales and self-reported anthropometric data suggest that individuals with overweight or obesity tend to experience greater body dissatisfaction (KAKESHITA *et al.*, 2009; FREIRE *et al.*, 2017). Additionally, external factors exert a significant influence on body image, with women being particularly susceptible to these effects (PUJA *et al.*, 2021; GRUSZKA *et al.*, 2022; ALAHMARI *et al.*, 2019). Interviews employing the Body Shape Questionnaire (BSQ) have revealed image distortion, dissatisfaction, and a tendency to overestimate body weight, with associations observed between body image dissatisfaction, dietary habits, and lifestyle choices (STAGI *et al.*, 2021; DUARTE *et al.*, 2021; BOUTAHAR *et al*., 2019). Recent findings indicate that food consumption patterns play a crucial role in shaping body composition and overall health (ERDENEBILEG *et al*., 2018).

While the relationship between dietary intake and body composition is well established, less is known about how body image perception mediates this association, influencing dietary choices and nutritional behaviors. Therefore, this study aims to explore not only the relationship between self-perceived body image and food consumption but also how different body image perception profiles modulate dietary patterns in adults of both genders.

Material and Methods

This study adopts a cross-sectional design, employing an online questionnaire by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Sampling was conducted using convenience sampling methods. The study received approval from the Ethics Committee of the Instituto Federal Goiano, protocol number 39364320.4.0000.0036.

The recruitment was done via social media between August 2021 and April 2022. In total, 112 individuals were recruited. Inclusion criteria: (i) adults aged 18-50 years old, (ii) residents of the southern region of Goiás state, and (iii) individuals who self-reported having the cognitive and technological ability to complete the questionnaires. Participants were informed about the study procedures and were required to confirm their ability to understand and answer the online questionnaires before proceeding. Exclusion criteria: (i) failure to complete both questionnaire phases.

Nineteen individuals were non-inclusive for not meeting one of the inclusion criteria and 26 participants were excluded for not completing the two stages of the study. In this study, 67 individuals participated.

In the initial phase, on the first questionnaire, created by Forms of Google tools, participants provided sociodemographic data, including information on sex, age, height, and weight. Height and weight data were utilized to calculate the Real Body Mass Index (weight/height^2). Additionally, participants responded to the self-perception of body image using the 15-point Adult Silhouette Scale (ASS), validated for the Brazilian population (Kakeshita. *et al.*., 2009). Besides these quantitative data, we accessed qualitative information through the questionnaire by asking participants to cite 3 words that justified their chosen silhouette. Through frequency distribution, we illustrated the results using a word cloud (Free Word Cloud Generator). The bigger and more central words were the most cited.

Different types of BMI were calculated based on actual height, actual weight, intended weight, and silhouette results (FREIRE. *et al.*, 2017). The *Actual BMI* was calculated using the weight and height reported in the questionnaire. The *Real BMI* was estimated by the ASS, with individuals selecting the value that represents their own body at that moment, and for each value, there is a well-established equivalent BMI value. The *Intended BMI* was calculated using the weight and height that individuals reported wanting, using the same formula as the actual BMI. The *Ideal BMI* was estimated by the ASS, with individuals choosing the value that represents the body they intended, for each value there is a wellestablished equivalent BMI value.

Food consumption was assessed using the adapted test "How is your food consumption?" second phase/ second questionnaire (Brasil. 2008). Fifteen objective questions were answered regarding the usual dietary consumption of specific foods. The topics covered included daily consumption of fruits and vegetables, type and quantity of milk, consumption of

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visible fats in meat, intake of fish, frequency of consuming fries and deli items, consumption of sweets, pastry products, and sugary beverages, type of fat used in food preparation, salt addition, main meal of the day, water ingestion, alcoholic beverages, physical activity, and reading label information.

The measures adopted to mitigate potential biases associated with this study were: (i) To address selection bias, we employed a convenience sampling approach, ensuring adequate representation of the target population and employing a broad recruitment technique using the internet and social media (ii) To minimize information bias, we utilized validated and reliable data collection instruments (iii) Lastly, as the questionnaires were self-administered, we employed clear and simple questions and ensured the confidentiality of participant responses to promote the honesty and accuracy of the provided information.

The data were statistically analyzed. Categorical variables were assessed through frequency distribution and presented as percentages. Continuous variables, such as age and BMI, were analyzed using descriptive statistics and presented as mean and standard deviation. For comparisons between groups, the Student's T-test was used for independent samples. For multiple comparisons, Analysis of Variance and Tukey were employed as a post-hoc test. The correlation between categorical variables was analyzed using the Spearman test, and between continuous variables using the Pearson test; in both cases, a weak correlation was considered when r = until 0.3, moderate when 0.4-59, and strong when $r > 0.6$. Food frequency data by sex were analyzed using the Chi-square test. For all tests, $p < 0.05$ was considered significant.

The post hoc statistical power was calculated to determine the study's ability to detect a statistically significant effect given the sample size and expected effect size. A two-sample independent t-test was used, considering a significance level of 0.05. The sample size was 67 participants. The effect size was assumed to be medium, with a typical Cohen's d value of 0.5. The population standard deviation was estimated as 4 kg/m², based on Body Mass Index (BMI) data from adult residents in Goiás. After calculating the tvalue and consulting a t-table to find the associated probability, the probability of committing a Type II error (β) was determined. The post hoc statistical power was then calculated as the complement of β, representing the probability of detecting a statistically significant effect if a true effect exists.

Results and Discussion

Sample Carachetization

The study sample comprised 67 individuals, characterized (Table 1) by the predominance of females. Residing mainly in urban areas, the families earn around R$ 3,300 to R$ 6,600 reais monthly and have completed high school. On average, participants were overweight (Table 1) according to the World Health Organization (WHO).

Table 1. Sample caractherization.

Variables	Frequency (%)
Sex	
Female (n=51)	76
Male (n=16)	24
Area	
Urban	88
Rural	12
Monthly Income (R$)	
≤1320	8
3960 to 7920	64
7921 to 15840	20
<15840	8
Formal Education	
Incomplete High School	6
Complete High School	51
Graduate	8
Postgraduate	35
Average ± Standard Deviation	
Age (years old)	
Female	29.59 ± 9.84
Male	29.59 ± 9.84
Total	29.15 ± 9.57
BMI Real (Kg/m²)	
Female	25.35 ± 5.83
Male	24. 89 ± 3.51
Total	25.24 ± 5.35

Differences in Body Mass Index Measurements: Actual, Intended, Ideal, and Real BMI

Different types of BMI were calculated based on actual height, actual weight, intended weight, and silhouette results (FREIRE *et al.*, 2017). The Actual BMI refers to the body mass

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index calculated based on the participants' self-reported weight and height. The Real BMI is the value estimated by the Adult Silhouette Scale (ASS), based on the individual's perceived physical appearance. The Intended BMI represents the weight and body shape the participants wish to achieve, based on their self-reported. The Ideal BMI corresponds to the body shape the participants perceive as ideal, selected from the silhouettes in the ASS, with each silhouette having a well-established corresponding BMI value.

Evaluating BMI through both scales and self-reports, a significant difference was observed and should be noted (Figure 1) ($p < 0.0001$). The post-hoc test specifically identified a difference between the actual BMI and the intended BMI (<0.0001). The actual BMI reported by the participants (28.99 ± 8.10 Kg/m²) was greater than the intended BMI (22.76 ± 2.54 kg/m²). Furthermore, a difference ($p > 0.0002$) was noted between the Real BMI and the Ideal BMI (25.00 ± 4.05 Kg/m²), both reported by the participants, with the ideal being lower than the real.
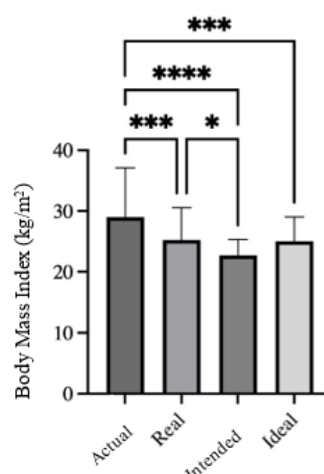

Figure 1. Body Mass Index Actual, Real, Inteded and Ideal.
*Significantly difference ($p<0.05$) between groups

Additionally, a difference between the Real BMI reported by the participants and the BMI derived from the questions on the form was observed ($p = 0.0005$). Furthermore, a difference ($p = 0.042$) between the Actual and Intended BMI, both informed on the form, was noted, with the intended BMI being lower than the actual. No significant differences were found between ideal and real ($p = 0.994$) or between intended and ideal ($p = 0.081$).

The results reveal several significant differences in BMI values across different measurement methods. Overall, the findings indicate that participants desire a body weight considerably lower than their current weight, with the perception that the ideal body is thinner than the body they perceive as their own. This discrepancy may be a result of aesthetic standards imposed by the media and society, which value slimmer bodies, leading to an idealization of a body image that does not correspond to reality (DA SILVA *et al.*, 2021; JIOTSA *et al.*, 2021).

These discrepancies suggest that, in addition to interventions aimed at promoting physical health, it is crucial to consider mental health, as dissatisfaction with body image can contribute to issues such as low self-esteem and eating disorders (OLIVEIRA *et al.*, 2020; ROUNSEFEL *et al.*, 2020; MARTINEZ *et al.*, 2019). The evaluation of BMI through multiple approaches provides a broader understanding of individuals' perceptions and expectations regarding their bodies, helping to inform more effective and personalized intervention strategies.

Differences in Body Mass Index Measurements: Comparisons by Gender

There was no difference between the types of BMI to males. The descriptive characterization of BMI by gender can be seen in Table 2.

Table 2. Descriptive characterization of BMIs by gender

BMI (kg/m^2)	Female	Male
Actual BMI	29,71 ± 8,61	26,72 ±5,89
Real BMI	25,35 ± 5,84	24,89 ± 3,5
Desired BMI	24,11 ± 2,97	22, 34 ± 2,26
Ideal BMI	24,38 ± 2,66	25,20 ± 4,11

There was a difference between some types of BMI for women, as the Actual BMI was different from the Real BMI($p=0.0010$), the Intended BMI ($p<0.0001$), and the Ideal BMI ($P=0.0006$). The Real BMI was different from the Intended BMI ($p=0.044$). There was no difference between BMI Ideal to Real ($p=0.9992$) and Ideal to Intended ($p=0.0623$).
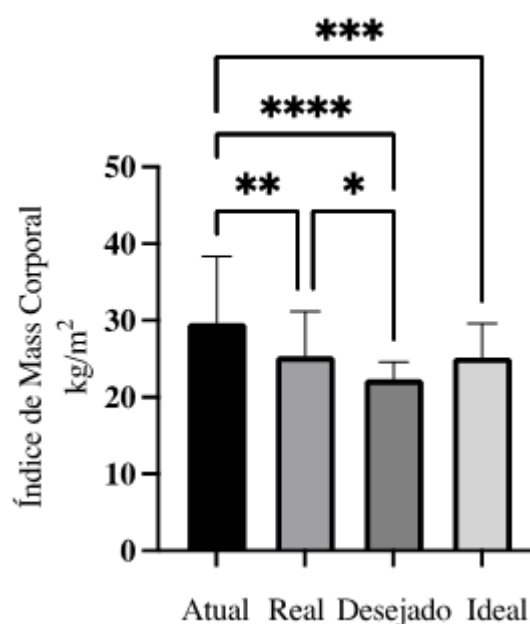
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Figure 2. Differente types of Body Mass Index of the womem.

*Significantly difference (p<0.05).

In summary, the results reveal a complex relationship between self-perception, idealization, and body weight goals, particularly among women. While both men and women may experience body image distortions, the data suggest that women often hold unrealistic perceptions of their body weight, desiring a thinner physique, influenced by widely promoted societal beauty standards (KAZIGA *et al.*, 2021; MALLOY *et al.*, 2024).

The minimal differences observed between Ideal BMI and Real BMI, as well as between Ideal BMI and Intended BMI, indicate a shared understanding of what is considered "ideal." This "ideal" is largely a social construct shaped by cultural, media, and advertising influences, which promote thinness as a standard of beauty and health. This understanding is internalized by individuals, leading them to pursue a body that often does not align with their physical reality or personal aspirations, but rather with the model imposed by society (RISADA *et al.*, 2023).

The significant difference between Real BMI and Intended BMI (p<0.0001) suggests addtionally a widespread dissatisfaction with the current body. Body dissatisfaction refers to the discrepancy between the perceived body image and the idealized body image, leading to feelings of inadequacy and discomfort with one's own body (PANDOLF *et al.*, 2020; VAZ e FERNANDES, 2022).

The reason why this phenomenon predominantly affects women may be linked to the social and cultural pressure to conform to these aesthetic standards. Women are constantly exposed to representations of idealized bodies in films, magazines, social media, and advertising campaigns, which can directly influence their self-perception (ROUNSEFELL *et al.*, 2020; VAZ e FERNANDES, 2022; SELENSKY, CARELS, 2021). These pressures can lead to a cycle of dissatisfaction and an incessant pursuit of a physical appearance that aligns with what is considered "acceptable" or "beautiful" by societal standards (PUJA *et al.*, 2021; ALAHMARI *et al.*, 2017; GRUSZKA *et al.* 2022). This body image distortion is closely related to self-esteem and may contribute to eating disorders and mental health issues such as anxiety and depression, underscoring the importance of considering not only physical well-being but also psychological health in health interventions (ONG, SUNDERMANN, 2022; LINARDON *et al.*, 2021; BABBOTT, CONSEDINE, ROBERTS, 2023).

Analysis of Body Image Perceptions: Word Cloud Representation

The word cloud (Figure 3) was structured by words that represent people's feelings regarding their body image. The central and largest words were chosen more frequently by individuals. The five most cited words were Health, Self-esteem; Wellbeing; Beauty; and Esthetics, respectively.

Figure 3. Word cloud associated with selections made on the silhouette scale.

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The word cloud, symbolizes not only external aesthetic standards but also the way these standards are internalized, influencing psychological and emotional well-being, particularly among women.

"Self-esteem" is closely linked to an individual's perception of their body, as low self-esteem can amplify body image distortion, leading to a negative self-view. The relentless pursuit of an ideal body, often associated with "Health," can result in harmful behaviors such as restrictive diets and excessive exercise, in an attempt to conform to an aesthetic standard that does not align with actual health needs, contributing to body dissatisfaction. The term "Beauty" emphasizes the societal pressure to shape the body according to media standards, often promoting thinness as synonymous with attraction and value, which distorts individuals' perceptions of their bodies, leading to frustration for not meeting the ideal. Finally, "Well-being" is affected by these pressures, as the constant striving for an idealized body can undermine mental and emotional health, leading to eating disorders and psychological health issues. These terms, therefore, illustrate how body image distortion is intertwined with social and psychological factors, directly impacting individuals' well-being and self-esteem, particularly among women (MALLARAM *et al.*, 2023; LINARDON *et al.*, 2022; WU, BERRY, 2018; PUJA *et al.*, 2021; ALAHMARI *et al.*., 2017; GRUSZKA *et al.*., 2022).

Food Consumption

There was no difference between men and women regarding food consumption, as shown in Table 3. Fruit consumption outweighed vegetable consumption, with higher intake observed in this group for full-fat dairy products, fats, and meats (Table 3). Breakfast and lunch emerged as the primary meals for these individuals.

Table 3. Description of individuals' lifestyle habits through questions involving 187 daily frequency of food groups, by gender.

Variables	Male N=16	Female N=51
Fruits consumption[1] n(%)		P* 0.11
Not consumption	2 (12.5)	10 (19.6)
1 portion	3 (18.8)	6 (11.8)

2 or more servings	6 (37.5)	18 (35.3)
3 or more servings	5 (31.2)	17 (33.3)
Consumption of vegetables[1] n(%)		0.31
Not consumption	8 (50)	34 (66.7)
4 a 5 tablespoons	4 (25)	13 (25.5)
6 a 7 tablespoons	3 (18.8)	3 (5.9)
8 or more tablespoons	1 (6.3)	1 (2)
Consumption of fat and visible skin from red and white meat n(%)		0.65
Yes	9 (56.3)	28 (54.9)
Not	6 (37.5)	22 (43.1)
Do not consume red and/or white meat	1 (6.3)	1 (2)
Fish consumption n(%)		0.88
Not consumption	2 (12.5)	7 (13.7)
Only a few times a year	9 (56.3)	31 (60.8)
2 or more times a year	0 (0)	1 (2)
1 a 4 times a month	5 (31.3)	12 (23.5)
Consumption of milk and dairy products [1] n(%)		0.70
Not consumption	0 (0)	3 (5.9)
3 or more servings	2 (12.5)	5 (9.8)
2 portion	4 (25)	16 (31.4)
1 or fewer portions	10 (62.5)	27 (52.9)
Type of milk and derivatives n(%)		0.94
Full	12 (75)	35 (68.5)
Low in fat [2]	4 (25)	15 (29.4)
Consumption of fried foods and sausages n(%)		0.05
Rarely or never	2 (12.5)	6 (11.8)
Every day	0 (0)	3 (5.9)

2 a 3 times a week	9 (56.3)	10 (19.6)
4 a 5 times a week	1 (6.3)	3 (5.9)
Less than 2 times a week	4 (25)	29 (56.9)
Consumption of sweets, baked goods and sugary drinks n(%)		0.25
Rarely or never	1 (6.3)	5 (9.8)
Every day	3 (18.8)	15 (29.4)
2 a 3 times a week	6 (37.5)	12 (23.5)
4 a 5 times a week	6 (37.5)	11 (21.6)
Less Than 2 times a week	0 (0)	8 (15.7)
Type of fat used for cooking n(%)		**0.02**
Lard	2 (12.5)	25 (49)
Vegetable oil[3]	11 (68.8)	20 (39.2)
Margarine or shortening	2 (12.5)	1 (2)
Oil	1 (6.3)	5 (9.8)
Adding salt to food n(%)		0.44
Yes	0 (0)	5 (9.8)
Not	16 (100)	46 (90.2)
Most eaten meal of the day n(%)		0.71
Breakfast	3 (18.8)	14 (27.5)
Morning collation	0 (0)	0 (0)
Lunch	13 (81.3)	33 (64.7)
Afternoon snack	0 (0)	1 (2)
Dinner	0 (0)	2 (3.9)
Supper	0 (0)	1 (2)
Water consumption [1] n(%)		0.75
Less than 4 glasses	0 (0)	3 (5.9)

4 a 5 glasses	5 (31.3)	14 (27.5)
6 a 8 glasses	6 (37.5)	21 (41.2)
8 cups or more	5 (31.3)	13 (25.5)
Consumption of alcoholic beverages [4] n(%)		0.67
Daily	0 (0)	0 (0)
1 a 6 times a week	3 (18.8)	9 (17.6)
Occasionally or rarely	8 (50)	20 (39.2)
Not consumption	5 (31.3)	22 (43.1)
Practice of Physical Activity[5] n(%)		0.48
Yes	9 (56.3)	29 (56.9)
Not	4 (25)	7 (13.7)
2 a 4 times a week	3 (18.8)	15 (29.4)
Customary reading of food labels n(%)		0.82
Never	1 (6.3)	7 (13.7)
Almost never	5 (31.3)	12 (23.5)
Sometimes	7 (43.8)	21 (41.2)
Always or almost always	3 (18.8)	11 (21.6)

[1]Consumo diário; [2]Semidesnatado, desnatado, light ou diet; [3]soja, girassol, milho, algodão ou canola; [4]uísque, cachaça, vinho, cerveja, conhaque, entre outros; [5] Prática de atividade física regular por pelo menos 30 minutos por dia; [6] Teste Qui-Quadrado; * p < 0,05 foi considerado significativo.

Eating behavior in this study did not exhibit statistically significant differences between the sexes when assessing the eating habits of the studied population. While some authors have found associations between negative body image and eating disorders (SOUZA *et al.*, 2021; ROUNSEFELL *et al.*, 2020), this study did not find such an association with BMI.

Analyzing the dietary patterns of these individuals revealed low consumption of fruits and vegetables in both sexes, falling short of the recommended 5 servings per day for the Australian population by both local guidelines and the World Health Organization (Brasil, 2014). A diet characterized by low consumption of fresh produce and high intake of processed

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foods is considered low quality, necessitating attention to facilitate dietary habit changes (BRASIL, 2014).

Furthermore, daily consumption of sweets, baked goods, and sugary drinks indicates a low-quality diet in both sexes, considering the level of food processing and its impact on weight and body composition (BRASIL, 2014; BORTOLINI *et al.*, 2019). The practice of physical exercise, cited in studies as a factor influencing body shape, underscores the need to integrate body image considerations into physical exercise interventions (HAN *et al.*, 2023; D'Anna. *et al.*, 2023). While reports of exercise exist in this study, its frequency is not regular, falling short of the WHO recommendation of at least 150 to 300 minutes of moderate to vigorous aerobic activity for adults (JACKSON *et al.*, 2022). Consequently, sedentary behaviors may be associated with adverse outcomes on individuals' physical and mental health, potentially contributing to a distorted self-image.

The connection between body image distortion and eating habits in this study can be elucidated by the notion that distorted perceptions of one's image and dissatisfaction with one's body may contribute to unhealthy eating habits. Similarly, poor-quality food choices can impact an individual's body size, fostering an unfavorable self-perception (ZAKHOUR *et al.*, 2021).

Influence of Socioeconomic and Demographic Factors on Different BMI Types

The different types of BMI assessed cannot be associated with the individuals' income (real income vs. income r= -0.09 p= 0.46; real income vs. income r= -0.09 p=0.42; income intended vs. income r=-0.03 p= 0.78 and Ideal vs. income r=-0.08 p= 0.50). And not be associated with formal education (Real vs. education r= 0.05 p= 0.7; Real vs. education r= 0.13p=0.26; Real vs. education r=0.18 p=0, 14 and Ideal vs. education r=0.02 p = 0.85). There was no difference between the different types of BMI and area of residence (Actual vs. area r= -0.06p= 0.58; Actual vs. area r= -0.11 p=0.37; Intended vs. area r =0.007 p=0.95 and Ideal vs. area r=0.03 p= 0.77).

The retrospective statistical power of the study is approximately 0.159, indicating that there is a probability of about 15.9% of not detecting a statistically significant effect if a true effect exists.

Limitation and Strength

Among the limitations of this study, the most notable are the inability to establish causal relationships and potential selection bias. The small sample size limits the generalizability of the results to the broader population of the southern Goiás region. Additionally, recruitment via social media may have introduced a bias by excluding participants with limited internet access, further narrowing the representativeness of certain demographic groups.

However, despite these limitations, the study offers valuable insights into the body image and eating habits, particularly in a socioeconomically diverse sample. The exploratory nature of the research allowed us to investigate these issues in depth, providing a foundation for future studies on the topic. The inclusion of a broad range of participants, considering factors such as socioeconomic background and regional diversity, adds to the study's robustness. Moreover, the variability in body image and dietary habits among participants was carefully considered, offering a nuanced understanding of the complexities involved. By acknowledging both the limitations and strengths, this study contributes to the growing body of knowledge on body image and eating behaviors and serves as a stepping stone for future research in this area.

Conclusion

The observed statistical differences between actual and intended, as well as ideal and actual BMI, indicate the presence of individuals harboring distorted body image, with significant variations discernible between genders. The pronounced difference between the actual and intended BMI underscores the dissatisfaction prevalent in the study sample regarding their body measurements, specifically the reported (actual) weight. This study did not reveal significant correlations between BMI and food consumption. Consequently, there is a compelling recommendation for further research to delve more extensively into these intricate associations.

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