



Body image distortion among Brazilian and Portuguese women with children: A comparative study between the ELSA-Brasil and Generation XXI cohorts

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ABSTRACT

Solid evidence indicates that body image distortion is associated with various physical and mental health problems in women (e.g. Lee and Lee, 2016; Mölbert et al., 2017; Raj and Ploriya, 2020; Sagar, 2005; Shin et al., 2015). Furthermore, body image has been shown to vary according to life context and stage, particularly after a woman has had children. This scenario justifies the comparison between different countries and cultures. The objective of the present study was to evaluate the prevalence and associated factors of body image distortion/accuracy in Brazilian and Portuguese women with children. The study assessed women selected from two epidemiological cohorts: ELSA-Brasil in Brazil ($n = 1468$) and Generation XXI in Portugal ($n = 3380$). The data analyzed were based on multidimensional questionnaires from which sociodemographic and family characteristics as well as data associated with lifestyle and health were obtained. The results show that most women in both cohorts had an accurate perception of their own body size. In cases of distorted self-perception, the likelihood of the Brazilian women perceiving themselves as being heavier was greater if they had had cancer, whereas the Portuguese women were less likely to perceive themselves as heavier when they had less schooling. Perceiving themselves as thinner than they actually are, was associated with poorer self-perception of their own state of health in the Brazilian women and with poorer schooling in both the Brazilian and Portuguese women. The present findings contribute towards improving understanding of the influence of body image distortion on the health and wellbeing of Brazilian and Portuguese women, possibly leading to the implementation of health-promoting policies in both countries.

1. Introduction

Body image is a complex and multidimensional construct (Cash and Deagle, 1997; Wade et al., 2003) that integrates perceptive and affective aspects (Uys and Wassenaar, 1996). Overall, perceptive component refers to the perception of body size, and the affective aspect is related to body satisfaction (Hamamoto et al., 2022; Uys and Wassenaar, 1996).

Body image distortion is the perceptual construct of body image and is defined as the self-perception of body status as being heavier or lighter than it really is (American Psychiatric Association, 2013; Hosseini and Padhy, 2021). Distorted body image has been associated with various physical and mental health issues such as obesity (Raj and Ploriya, 2018), suicidal ideation (Lee and Lee, 2016; Shin et al., 2015), depression/sadness (Lee and Lee, 2016), unhealthy behaviors related to weight

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loss such as extreme calorie restriction and nutritional imbalance (Lee and Lee, 2016; Sagar, 2005), and eating disorders such as anorexia nervosa and bulimia nervosa (Farrell et al., 2005; Gardner and Brown, 2014; Mölbart et al., 2017).

Several psychosocial and sociocultural factors have been associated with body image distortion, including gender (Ejike, 2015; Song et al., 2020), age (Song et al., 2020), socioeconomic status, mass media influence, parental influence, peer pressure (Musaiger, 2015), self-rated health status, health and lifestyle behaviors (Patrão et al., 2017; Song et al., 2020) and the use of medication and dietary supplements (Silva et al., 2018). The culture of each country or context also strongly influences several dimensions related to body image (Delavari et al., 2013; Toselli et al., 2016). With specific regard to gender, various studies have reported a greater tendency for women to perceive their body as larger than it really is (Ejike, 2015; Lee and Lee, 2016; Medeiros de Moraes et al., 2017).

In women, motherhood has been shown to be an event that has a major impact on body image (Hodgkinson et al., 2014). Nevertheless, the studies that are available have mostly focused on pregnancy, delivery, and the postpartum period (Hodgkinson et al., 2014; Rallis et al., 2007). In one of the rare studies that evaluated the effect of motherhood on body image over time, Yager et al. (2022) found that mothers (children 0–5 years) had significantly lower levels of body-related embarrassment, self-objectification (dependency on how others see them and judge them) and dietary restriction behaviors compared to women with no children. Mothers of school-aged children (6–10 years) had significantly less self-objectification compared to women with no children when controlled for age. Furthermore, the study conducted by Henriques et al. (2013) revealed that body image satisfaction prior to pregnancy, as well as realistic perceptions of one's own body, contributed to better weight control during the first four years following childbirth. In other words, the evidence suggests that the effect of motherhood on body image has a long-reaching effect. In addition, it is important to point out that these studies on motherhood focused mainly on the affective aspects of body image, which reinforces the need to study the perceptive dimension, which is less investigated at this level.

Understanding the relevance of rules and values in each cultural or social context is crucial to recognizing internalization and body comparison in individuals (Silva et al., 2019; Stojcic et al., 2020; Thompson et al., 1999; van den Berg et al., 2002), hence the pertinence of performing transcultural studies (Strahan et al., 2006). While several studies have reported higher proportions of body image distortion in women from Western societies compared to those from non-Western societies (Makino et al., 2004; Schaefer et al., 2019), others have highlighted regional differences in body image even between populations of Western countries (Schaefer et al., 2019).

In this respect, Brazil and Portugal, in addition to sharing the same language, have sociocultural similarities resulting from the colonization process, particularly with regard to certain dietary habits (Martins and Baptista, 2010), a strong determinant of body image in each specific setting (Jansen, 2008; Soh et al., 2006). Nevertheless, studies comparing these two countries are sparse or non-existent. Both countries already developed research regarding women's body image (Henriques et al., 2013; Laus et al., 2014; Moreira et al., 2010; Teixeira et al., 2016) however, most of the studies conducted in Brazil and in Portugal have been with female patients (e.g. Moreira et al., 2010) or adolescent girls (e.g. Teixeira et al., 2016), without emphasizing the fact of having children or not. In addition, most Portuguese and Brazilian studies comprising the same cohorts of this study focused their work more in affective components of body image (satisfaction and dissatisfaction) (e.g. Albuquerque et al., 2021; Henriques et al., 2013) and not so much on perceptual ones. Therefore, the objective of the present study was to measure and compare the prevalence of body image distortion/accuracy and the associated sociodemographic and health-related factors with this construct in Brazilian and Portuguese women who have borne children.

2. Methods

2.1. Study design

This comparative study was conducted using information retrieved from women from two cohorts: the cohort involved in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil) in Brazil and the Generation XXI birth cohort in Portugal. Details of the design and methodology of both studies have already been published (ELSA-Brasil: Aquino et al., 2012; Schmidt et al., 2015; Generation XXI: Alves et al., 2012; Larsen et al., 2013).

At baseline (2008–2010), ELSA-Brasil included 15,105 active or retired civil servants aged 35 to 74 years from six research and higher education institutions located in the Brazilian cities of Salvador, Vitória, Belo Horizonte, Rio de Janeiro, São Paulo and Porto Alegre. Of these, 8218 were women. Long-term follow-up continues, with participants' state of health being monitored through interviews, anthropometric measurements, and face-to-face contact every four years, and by telephone contact annually. The present study evaluated data from the second follow-up visit (2012–2014), which involved 7657 participating women.

The Generation XXI birth cohort that has been following 8647 children and their families was assembled in 2005–2006, with the main aim of characterizing postnatal development and identifying its major determinants, in order to better understand health in childhood, adolescence and adulthood. Since that time, 8495 women who had given birth to the children from Generation XXI, were also enrolled and evaluated. The women were 18 to 52 years old at the time of recruitment, which took place after delivery at all five public maternity clinics that then covered the metropolitan area of Porto, Portugal. All mothers residing in the catchment area who had delivered a liveborn child (gestational age ≥ 24 weeks) in one of the five units were eligible for inclusion and were subsequently (at 24 to 72 h after delivery) invited to participate. At the time of their child's birth, 91.4% of the mothers agreed to participate in the study. Four years later, in 2009–2011, a follow-up evaluation was conducted, with 84.2% of the women being re-evaluated, 5729 (67.4%) attended a face-to-face interview and physical examination at the study site, while 1428 (16.8%) provided self-reported data during a telephone interview; 1338 (15.8%) were not reached or unable to participate. The women interviewed by telephone were excluded from the present study due to the lack of objective standardized anthropometric data.

Similar data collection procedures were used for both cohorts. During face-to-face interviews, trained interviewers used structured questionnaires to collect data on demographic, socioeconomic and lifestyle characteristics as well as the women's medical history, anthropometrics and body image perception.

2.2. Participants

Women of reproductive age (35 to 49 years old) with at least one liveborn child were selected for inclusion in this study, with the final sample consisting of 1468 women from the ELSA-Brasil cohort and 3380 women from the Generation XXI cohort.

2.3. Measures

All the selected variables of interest were available for both cohorts, thus enabling comparison. Sociodemographic characteristics include age (categorized as 35–39 years, 40–44 years and 45–49 years), marital status (married, separated/divorced, single, widowed) and education level (less than high school, high school or university/postgraduate education). Parity was defined as the number of live births. To assess individuals' perception of their state of health, the women were asked: "In general, compared to others of your age, how do you consider your state of health?" (very good, good, fair, poor or very poor). Regarding reports of cancer and diabetes, participants were asked whether they

had ever received a medical diagnosis of these pathologies (yes/no). Women from the Generation XXI cohort were asked if they had ever received a medical diagnosis of depression, while in the ELSA-Brasil cohort, symptoms of depression were evaluated using the Clinical Interview Schedule-Revised (CIS-R), duly adapted and validated for the Brazilian participants of the ELSA-Brasil cohort (Nunes et al., 2011). Smoking was evaluated from the question: “Do you currently smoke?” (yes/no). Participants were also asked whether they had ever drunk alcohol in their lifetime, even if occasionally (yes/no). In both the ELSA-Brasil and the Generation XXI cohorts, leisure-time physical activity was measured using the International Physical Activity Questionnaire, with respondents then being classified as physically active or not (Haskell et al., 2007; Pitanga et al., 2018).

Trained and certified professionals obtained standardized anthropometric measurements from participants in the ELSA-Brasil and Generation XXI cohorts. In both, weight was measured following fasting, with the participant having an empty bladder and wearing standardized clothing and no personal objects or shoes. Electronic scales calibrated to a maximum capacity of 300 kg were used to measure weight to the nearest 0.1 kg. Height at vertex was measured to the nearest 0.1 cm, with the participant barefoot (Henriques et al., 2013; Schmidt et al., 2015). Body mass index (BMI) was calculated and classified into four different categories according to the standard World Health Organization definition: underweight ($<18.5 \text{ kg/m}^2$), normal weight ($18.5\text{--}24.9 \text{ kg/m}^2$), overweight ($25.0\text{--}29.9 \text{ kg/m}^2$) and obese ($\geq 30 \text{ kg/m}^2$) (NHLBI Obesity Education Initiative, 1998).

In both cohorts, body image perception was evaluated using the Stunkard Figure Rating Scale (Stunkard et al., 1983), a psychometric measure widely used in many countries to represent the body memory about measures of body size in lifetime (Bhuiyan et al., 2003; Nikniaz et al., 2016). This scale consists of 9 numbered silhouette figures that gradually increase in size from very thin to very obese (1–9, respectively). The validity of Stunkard’s Scale adapted into Portuguese was confirmed previously (correlation between current body shape and BMI of at least 0.70) (Scagliusi et al., 2006). The variable used in the present study consisted of the number of the Stunkard figure selected by the participant when asked the following: “Please choose the figure that reflects how you think you look”. The figure was classified according to Lynch et al. (2009): figs. 1–2 underweight, 3–4 normal, 5–6–7 overweight and 8–9 obese. Body image distortion was calculated as the difference between the real BMI categories and the categories used by Lynch et al. (2009) for the Stunkard figures. Then, they were categorized as same (difference = 0), heavier (difference > 0) and lighter (difference < 0).

2.4. Statistical analysis

For each cohort, simple frequencies were calculated for the categorical variables and measures of central tendency and dispersion for the continuous variables. The difference between proportions was compared using Pearson’s chi-square test, with p -values ≤ 0.05 being considered statistically significant. Odds ratios (OR) and their respective 95% confidence intervals (95%CI) were calculated as a measure of association.

Unconditional logistic regression models were constructed for each cohort independently, taking into consideration the dependent variables *accurate perception versus perceiving oneself as thinner* and *accurate perception versus perceiving oneself as heavier*. The co-variables were selected based on the literature. Those found to be associated with an accurate perception ($p \leq 0.10$) in the bivariate analysis, considering the differences between the cohorts, were included in the backward stepwise logistic regression models. To evaluate the goodness of fit of the models, the areas under the receiver operating characteristic (ROC) curve and the lift curve were calculated. The entire statistical analysis was conducted using Stata, version 17.0 (College Station, Texas, USA, 2017).

3. Results

3.1. Characteristics of the participants

The sociodemographic and health-related characteristics of the 1468 women from the ELSA-Brasil cohort and the 3380 women from the Generation XXI cohort are shown in Table 1. The Brazilian participants were older and more likely to be separated/divorced or single compared to the Portuguese women. The Portuguese participants had less schooling years and were more likely to refer to their state of health as poor or very poor, compared to the Brazilian women. At the time of evaluation, twice as many women from the Generation XXI cohort were smokers compared to the ELSA-Brasil cohort (21.7% versus 10.3%). The distribution of BMI was similar in both cohorts, with over one-fifth of the women in each cohort being classified as obese. Nevertheless, when asked to choose the figure that best represented their body at the time of the interview, only 4.9% of the women in the ELSA-Brasil cohort and 2.5% of those in the Generation XXI cohort selected images representative of obesity (figs 8 and 9). Around 33% of the Brazilian participants and 19.9% of the Portuguese women were physically active (Table 1).

Irrespective of age, the Stunkard silhouette most commonly selected by women in the ELSA-Brasil cohort was number 5, with mean BMI ranging from 26.5 to 27.4 kg/m^2 , representing overweight. The most common figure selected by the women from the Generation XXI cohort was number 4, with mean BMI ranging from 23.9 to 25.1 kg/m^2 , i.e. ranging from normal to overweight for women of 45 to 49 years of age (data not shown). Over 80% of the women in the two cohorts selected 8 and 9 Stunkard figures representative of overweight, although according to their BMI, calculated from their anthropometric measurements, they were actually obese (Fig. 1).

3.2. Psychosocial and lifestyle-related factors associated with body image distortion among Brazilian and Portuguese women

When the women were classified according to their body image, 56.2% of the women from the ELSA-Brasil cohort and 58.9% of those from the Generation XXI cohort had an accurate perception of their body, while the remainder perceived their body to be heavier or lighter than it really was (Table 2).

With respect to the Brazilian participants, body image distortion in the sense of perceiving themselves as lighter than they really were was more common among women with no more than nine years of schooling, among those who reported their state of health as poor or very poor, those who reported not having had cancer and those who were not physically active. Regarding the group of Portuguese women, body image distortion in the sense of perceiving themselves as lighter than they really were was more common among those aged between 45 and 49 years, those with no >9 years of schooling, those who described their state of health as fair or poor, and those with more children (Table 2).

In the multivariate models, body image distortion in which individuals perceive themselves as heavier than they actually are remained associated in a statistically significant manner with having been diagnosed with cancer (OR = 3.58; 95%CI: 1.28–10.02) in the Brazilian cohort and with having no >9 years of schooling (OR = 0.51; 95%CI: 0.35–0.73) in the Portuguese cohort (Table 3). In the multivariate models, body image distortion in which the individuals see themselves as thinner than they really are was significantly associated in the ELSA-Brasil cohort with: having 10–12 years of schooling (OR = 1.57; 95%CI: 1.23–1.99) and describing one’s state of health as poor or very poor (OR = 1.79; 95%CI: 1.28–1.49) and in the Generation XXI cohort with having fewer than 13 years of schooling (0–9 years: OR = 2.53, 95%CI: 2.04–3.14; 10–12 years - OR = 1.82, 95%CI: 1.43–2.32) (Table 4).

Table 1
Participants' sociodemographic and health-related characteristics according to the two cohorts evaluated: ELSA-Brasil and Generation XXI.

Characteristics	ELSA-Brasil			Generation XXI		
	n = 1468			n = 3380		
	Mean (SD)	n	%	Mean (SD)	n	%
Age (years)	47.8 (3.9)			38.5 (3.0)		
<i>Age group</i>						
• 35–39 years		74	5.0	2315	68.5	
• 40–44 years		417	28.4	900	26.6	
• 45–49 years		977	66.6	165	4.9	
<i>Marital status</i>						
• Married		1046	71.3	3022	91.1	
• Separated/divorced		282	19.2	231	7.0	
• Single		105	7.2	49	1.5	
• Widowed		34	2.3	13	0.4	
<i>Education (years of schooling)</i>						
• Elementary (0–9 years)		29	2.0	1416	41.9	
• High school (10–12 years)		532	36.2	771	22.8	
• College/university (13 or more years)		907	61.8	1193	35.3	
<i>Perceived state of health</i>						
• Poor/very poor – Fair/poor		18	1.2	1608	47.6	
• Fair – good		164	11.2	1085	32.1	
• Good/very good – Great/very good		1286	87.6	687	20.3	
<i>Smoker</i>						
• Never smoked		1071	73.0	2049	60.7	
• Former smoker		245	16.7	593	15.6	
• Current smoker		151	10.3	733	21.7	
<i>Alcohol consumption at some time</i>						
• No		311	21.2	867	32.3	
• Yes		1154	78.8	1819	67.7	
<i>Body mass index</i>						
• Underweight		4	0.3	16	0.6	
• Normal weight		540	37.0	1175	44.8	
• Overweight		521	35.7	874	33.3	
• Obese		385	27.0	558	21.3	
<i>Stunkard Silhouette classification^a</i>						
• Underweight (1 and 2)		64	4.4	124	4.7	
• Normal (3 and 4)		480	33.2	1106	42.0	
• Overweight (5, 6 and 7)		833	57.5	1340	50.8	
• Obese (8 and 9)		71	4.9	66	2.5	
<i>Parity</i>						
• 1		546	37.3	852	33.4	
• 2		696	47.5	1290	50.5	
• ≥3		222	15.2	412	16.1	
<i>Participant has had a medical diagnosis of:</i>						
Cancer						
• No		1444	98.4	3270	98.5	
• Yes		24	1.6	51	1.5	
Diabetes						
• No		1437	97.9	3291	99.0	
• Yes		31	2.1	34	1.0	
Depression						
• No		1202	88.2	2706	89.7	
• Yes		260	17.8	310	10.3	
<i>Physically active</i>						
• No		973	66.5	2156	80.2	
• Yes		490	33.5	531	19.8	

SD: standard deviation.

^a Classified according to the paper published by Lynch et al.: The relation between body size perception and change in body mass index over 13 years: The Coronary Artery Risk Development in Young Adults (CARDIA) study. *American Journal of Epidemiology*. v. 169. n. 7. p. 857–866, 2009.

4. Discussion

The present study compared the prevalence of distortion/accuracy with respect to the perception of body image in Brazilian and Portuguese women with children and identified the factors associated with distortion in which individuals perceive themselves as being thinner or heavier than they actually are. The majority of the women in both cohorts were found to have an accurate perception of their own body. When perception was distorted, the likelihood of the Brazilian women perceiving themselves as heavier than they really were was greater when they had cancer compared to the women who had never had cancer, while the likelihood of the Portuguese women perceiving themselves as heavier lower when they had less schooling compared to those with more schooling. On the other hand, perceiving one's body as thinner than it really is, was associated with a poor self-evaluation of the individual's state of health in the Brazilian cohort and with poorer schooling in the Brazilian and Portuguese cohorts.

The Brazilian women in the ELSA-Brasil cohort were older, less likely to be married or in a steady relationship, and had more schooling compared to the Portuguese women from the Generation XXI cohort. These sociodemographic differences are largely due to the nature of each cohort, with the Brazilian cohort being composed of civil servants and the Portuguese cohort of mothers from the general population. Although being older is a factor that would normally be associated with a more negative evaluation of a person's own state of health (Andersen et al., 2007), the Brazilian women were the most optimistic, a finding that could be associated with wider sociocultural issues. The greatest difference in lifestyle-related behaviors between the cohorts was seen for the smoking variable, with significantly fewer smokers in the Brazilian cohort. This could be attributed to the well-known and successful antismoking policy in place in Brazil over recent decades (Portes et al., 2018). In addition, the fact that Brazilian women are older (an average age difference of 10 years), can also influence this behavior, given that age favors a healthier lifestyle (Patrão et al., 2017).

An interesting finding was the association between education level and a distorted perception of body image both towards perceiving oneself as thinner and as heavier in the Portuguese cohort and towards perceiving oneself as thinner in the Brazilian cohort. Indeed, higher education levels appear to favor body image distortion towards perceiving oneself as heavier, while less schooling is associated with perceptions of being thinner, a finding that corroborates the conclusions of other studies conducted with women (e.g. Kim et al., 2004). This association could be related to body dissatisfaction issues, which are more common among higher-educated women (McLaren and Kuh, 2004). In Western culture, which encompasses both the Brazilian and Portuguese cohorts, and in which thinness is considered ideal (Pines, 2012), dissatisfaction (which was not the subject of the present study) is often associated with a desire to be thinner or have less weight (Haddad et al., 2019; Hamamoto et al., 2022), possibly influencing the perception of better-educated women towards believing that they are heavier than they really are, as shown in the present results. Conversely, lower levels of education, a factor that is associated with poorer socioeconomic status and poverty (Botha, 2010; DeNavas-Walt and Proctor, 2015), would make women less concerned with their bodies due to more urgent priorities in their lives. These women would therefore perceive themselves as thinner than they actually are, placing them at a greater risk of cardiovascular disease. The present study did not have information about satisfaction/dissatisfaction with body image, however, future studies should evaluate the association between education level and dissatisfaction and distortion simultaneously (the perceptual and affective components of body image).

The association between a history of cancer and distorted body image has been frequently reported, particularly with regard to breast cancer (Oers and Schlebush, 2020; Rezaei et al., 2016). Studies have suggested that body image is closely correlated with physical symptoms and psychological issues, including identity, self-esteem, perceptions of

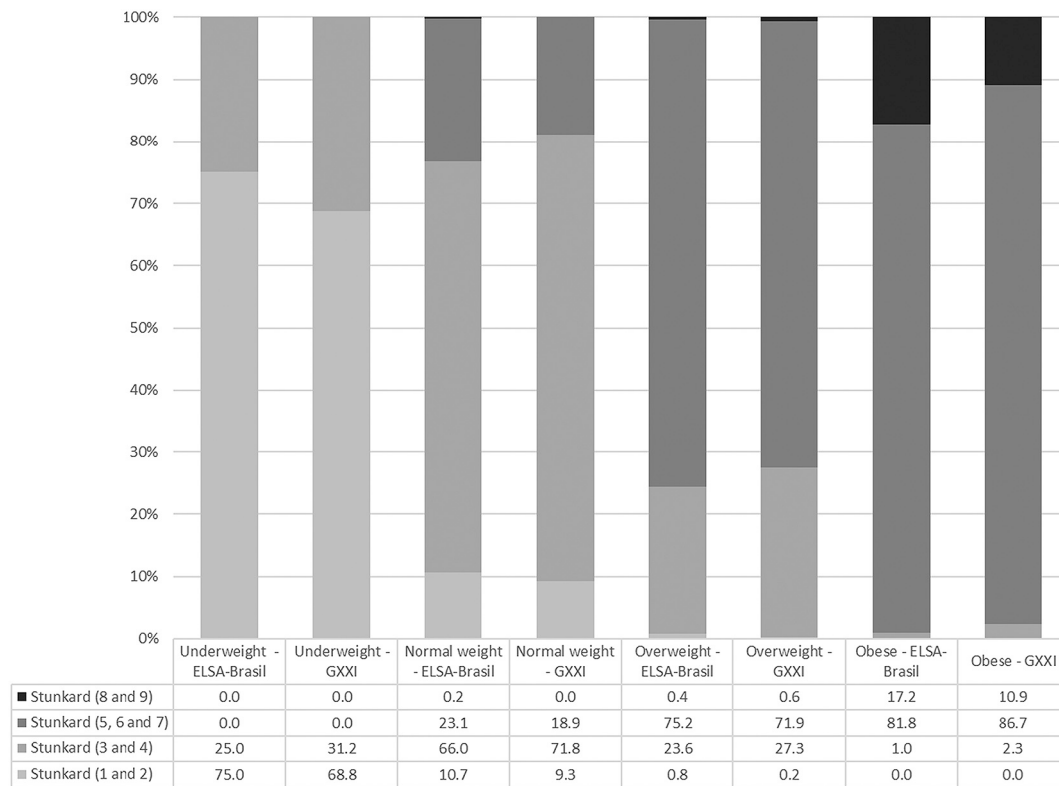


Fig. 1. Distribution of the women according to body mass index and Stunkard Figure Rating Scale*: ELSA-Brasil and Generation XXI.
 * Classified according to the paper published by Lynch et al.: The relation between body size perception and change in body mass index over 13 years: The Coronary Artery Risk Development in Young Adults (CARDIA) study. *American Journal of Epidemiology*. v. 169. n. 7. p. 857–866, 2009.

attractiveness and social interactions (Oers and Schlebusch, 2020; Paterson et al., 2016). Therefore, body image distortion during an experience of cancer could be part of a more complex and wide-reaching psychological and emotional process. Nonetheless, this finding with respect to cancer should be interpreted with caution, since the number of women in the present study with cancer diagnosis was not high; therefore, future studies will be required to investigate this association.

The association between a negative self-evaluation of health status and body image has been widely documented insofar as body dissatisfaction and anxieties are concerned (e.g. De Oliveira Da et al., 2018; Meland et al., 2021). The results of the few studies conducted to investigate the factors associated with distortion (Kim et al., 2008; Song et al., 2020) are in agreement with the results found for the women in the Brazilian cohort: poorer self-evaluation of state of health is associated with body image distortion or distortion from actual weight. Several studies have reported an association between a negative evaluation of one’s own state of health and poorer health behaviors and outcomes (Bombak, 2013), with body image distortion being one of the elements in this repertoire.

The results of our study contribute to a field of research that is still underexplored, which is the study of body image distortion in women with children. Other studies have shed light on issues related to body objection among women with and without children (Yager et al., 2022) and satisfaction with body image in mothers (Henriques et al., 2013). However, our study contributes to the study of body image distortion, a less studied dimension in this field. Although our study was not able to make comparisons between women with or without children, compared to other studies with women where the focus was not on having children or not (Ejike, 2015; Lee and Lee, 2016; Medeiros de Morais et al., 2017), we consider that our results show that social factors such as education play a central role in body image distortion. Thus, we consider that this study shed light on the role of variables that influence the perceptual component of body image (distortion); which in turn may influence

affective components (satisfaction, objectification, etc.). Thus, we recommend that future studies explore these components and their associated factors simultaneously.

The present findings have implications within the realm of health promotion and in the prevention of chronic diseases and disorders, since they increase understanding of the factors associated with distorted self-perception of body weight in the sense that the woman perceives herself to be thinner than she actually is. This has implications with respect to weight loss and the prevention and treatment of the main chronic diseases (e.g. Raj and Ploriya, 2018). In addition, distorted self-perception of body image towards perceiving oneself as heavier than one actually is a condition often associated with restrictive diets and eating disorders (e.g. Mölbert et al., 2017). Moreover, we believe that the transcultural comparison greatly enriches this discussion, showing that, depending on the country, the factors associated with women’s body image distortion can differ under certain circumstances and be similar in others.

4.1. Strengths and limitations

To the best of our knowledge, this study is the first to compare Brazilian and Portuguese women with respect to their body image distortion, providing new information on the factors associated with body image distortion. The strengths of the study lie in using direct anthropometric measurements and applying the same scale for measuring body image distortion in both cohorts of women, all of comparable age and all mothers. Despite the existence of several measures of body image distortion, including optical distortion techniques and others more recently implemented (Mölbert et al., 2017), the Stunkard silhouettes continues to be widely adopted in large observational studies. Although there are differences between the two cohorts, both involving a large number of participants, allowing to test different sociodemographic, health and lifestyle factors related with body image distortion.

Table 2
Body image perception according to the characteristics of the women of reproductive age who had already given birth: ELSA-Brasil and Generation XXI.

Characteristics	Perception (Stunkard – Body mass index)									
	ELSA-Brasil %					Generation XXI %				
	n	Same ^a	Heavier ^a	Lighter ^a	p-value	n	Same ^a	Heavier ^a	Lighter ^a	p-value
General	1442	56.2	8.8	35.0		2621	58.9	8.8	32.3	
<i>Age group</i>					0.602					0.032
• 35–39 years	73	58.9	8.2	32.9		1812	60.3	9.1	30.6	
• 40–44 years	410	59.3	8.3	32.4		687	56.2	8.7	35.1	
• 45–49 years	959	54.6	9.1	36.3		122	52.5	5.7	41.8	
<i>Marital status</i>					0.537					0.457
• Married	1026	56.3	9.4	34.3		2414	58.8	9.1	32.1	
• Separated/divorced	278	56.8	7.9	35.3		154	63.0	5.2	31.8	
• Single	104	50.0	7.7	42.3		39	56.4	10.3	33.3	
• Widowed	34	64.7	2.9	32.4		11	36.4	9.1	54.5	
<i>Education (years of schooling)</i>					0.000					0.000
• Elementary (0–9 years)	28	50.0	3.6	46.4		1061	51.5	5.7	42.8	
• High school (10–12 years)	520	51.5	6.2	42.3		608	59.4	8.1	32.5	
• College/university (13 or more years)	894	59.1	10.5	30.4		952	66.7	12.9	20.4	
<i>Perceived state of health</i>					0.000					0.000
• Poor/very poor – Fair/poor	16	56.3	–	43.7		904	54.7	6.5	38.8	
• Fair – good	163	44.2	4.3	51.5		1062	60.3	10.1	29.6	
• Good/very good – Great/very good	1263	57.7	9.5	32.8		655	62.4	10.1	27.5	
<i>Smoker</i>					0.438					0.975
• Never smoked	1052	55.6	9.4	35.0		1587	58.5	9.0	32.5	
• Former smoker	240	58.7	8.3	32.9		481	60.1	8.3	31.6	
• Current smoker	150	56.0	5.3	38.7		551	59.2	8.9	31.9	
<i>Alcohol consumption at some time</i>					0.545					0.138
• No	300	54.0	8.3	37.7		844	59.0	10.3	30.7	
• Yes	1141	56.8	8.9	34.3		1776	58.8	8.2	33.0	
<i>Parity</i>					0.100					0.003
• 1	539	53.6	9.5	36.9		815	62.5	9.2	28.3	
• 2	682	59.1	9.1	31.8		1266	59.0	9.1	31.9	
• ≥3	217	53.5	6.4	40.1		408	53.7	6.9	39.4	
<i>Cancer</i>					0.019					0.755
• No	1418	56.4	8.5	35.1		2572	59.0	8.9	32.1	
• Yes	24	45.8	25.0	29.2		43	53.5	9.3	37.2	
<i>Diabetes</i>					0.532					0.135
• No	1412	56.2	8.9	34.9		2592	59.0	8.9	32.1	
• Yes	30	56.7	3.3	40.0		26	53.8	–	46.2	
<i>Physically active</i>					0.014					0.104
• No	962	54.8	7.8	37.4		2096	58.3	8.5	33.2	
• Yes	478	59.0	10.7	30.3		525	60.9	10.3	28.8	

^a Same = body image perception corresponds to actual BMI; heavier = body image perception with higher BMI than real; lighter = body image perception with lower BMI than real.

For methodological reasons and the different origin of the women participating in the two cohorts, we chose not to combine the databases and analyze them independently. Our conclusions were based on the association measure derived from two independent regression analyses, that intended to highlight similarities and differences between women’s body image distortion in Portugal and in Brazil regarding the factors related to body image distortion.

Certain limitations need to be taken into consideration when interpreting the results of this study. The women from the ELSA-Brasil cohort are civil servants whose education level and income are higher than those of the general population; therefore, caution is required with respect to the external validation of the results. On the other hand, the women from the Generation XXI cohort were recruited in public maternity hospitals in the metropolitan region of Porto, Portugal. Although the women in the two cohorts are of the same age range, their socio-economic profile is expected to be different. In addition, it is important to note that the variable on alcohol consumption does not allow access to a pattern of consumption for each woman, since it only asks if they have ever drunk alcohol. However, this is the only way to capture some type of consumption in both cohorts, and we think it is an important variable to present when evaluating body image distortion. In future studies, it would be important to characterize these patterns in depth. Due to the observational nature of this study, it is possible that there is some residual confounding due to the unavailability of some important co-variables in one of the cohorts such as race/skin color, use of leisure

time, and opportunities for personal care and for leisure time physical activity.

5. Conclusion

The present results contribute towards identifying factors associated with body image distortion in Brazilian and Portuguese women with children. There are historical and cultural links between these two countries despite different economic and political settings reflected in historical social injustices and different situations of health in their populations. It is clear that, in the Brazilian women, distorted body weight perception in which one perceives oneself as heavier is associated more with health issues (cancer), while in the Portuguese women social factors such as schooling are associated. With respect to distorted body weight perception in the sense of perceiving oneself as thinner, the common denominator between the two populations was schooling, i.e. despite some differences, it is possible that in both countries public health interventions focused on social factors such as schooling, which is malleable and changeable, could affect health behaviors (e.g. weight control) and the perception of body image. Distorted body image could represent an important barrier to the treatment of various health issues such as, for example, chronic diseases (diabetes, hypertension, etc.) and eating disorders.

Table 3

Association between body image distortion (perceiving oneself as heavier) and selected characteristics of the women of reproductive age who had already given birth - ELSA-Brasil and Generation XXI.

Characteristics	ELSA-Brasil				Generation XXI			
	Accurate versus heavier				Accurate versus heavier			
	Crude OR	95%CI	Adjusted OR ^a	95%CI	Crude OR	95%CI	Adjusted OR ^a	95%CI
<i>Age group^b</i>								
• 35–39 years	–	–	–	–	1.00		1.00	
• 40–44 years	–	–	–	–	1.03	0.75–1.41	1.03	0.73–1.44
• 45–49 years	–	–	–	–	0.72	0.33–1.61	0.84	0.37–1.90
<i>Education (years of schooling)</i>								
• Elementary (0–9 years)	0.40	0.05–3.09	0.70	0.45–1.08	0.57	0.41–0.79	0.51	0.35–0.73
• High school (10–12 years)	0.67	0.44–1.03	0.45	0.06–3.53	0.70	0.49–1.00	0.70	0.49–1.01
• College/university (13 or more years)	1.00		1.00		1.00		1.00	
<i>Perceived state of health</i>								
• Poor/very poor – Fair/poor fair – Good	0.52	0.24–1.16	0.55	0.25–1.24	0.91	0.67–1.23	1.02	0.74–1.41
• Good/very good – Great/very good	1.00		1.00		1.00		1.00	
<i>Parity</i>								
• 1	1.00		1.00		1.00		1.00	–
• 2	0.87	0.58–1.30	0.91	0.60–1.36	1.04	0.76–1.43	1.07	0.78–1.47
• ≥3	0.68	0.36–1.28	0.81	0.42–1.53	0.87	0.55–1.38	1.03	0.63–1.67
<i>Participant has a medical diagnosis of cancer^c</i>								
• Yes	3.60	1.31–9.92	3.58	1.28–10.02	–	–	–	–
• No	1.00		1.00		–	–	–	–
<i>Physically active^c</i>								
• Yes	1.00		1.00		–	–	–	–
• No	0.79	0.53–1.15	0.89	0.60–1.32	–	–	–	–

^a Model adjusted simultaneously.

^b Only used in the adjusted model of the generation XXI cohort.

^c Only used in the adjusted model of the ELSA-Brasil cohort.

Table 4

Association between body image distortion (perceiving oneself as thinner) and selected characteristics of the women of reproductive age who had already given birth - ELSA-Brasil and Generation XXI.

Characteristics ^{b and c}	ELSA-Brasil				Generation XXI			
	Accurate versus lighter				Accurate versus lighter			
	Crude OR	95%CI	Adjusted OR ^a	95%CI	Crude OR	95%CI	Adjusted OR ^a	95%CI
<i>Age group^b</i>								
• 35–39 years	–	–	–	–	1.00		1.00	
• 40–44 years	–	–	–	–	1.23	1.02–1.49	1.09	0.88–1.33
• 45–49 years	–	–	–	–	1.57	1.07–2.03	1.41	0.94–2.12
<i>Education (years of schooling)</i>								
• Elementary (0–9 years)	1.80	0.83–3.89	1.60	0.73–3.53	2.72	2.22–3.33	2.53	2.04–3.14
• High school (10–12 years)	1.59	1.27–2.01	1.57	1.23–1.99	1.79	1.42–2.27	1.82	1.43–2.32
• College/university (13 or more years)	1.00		1.00		1.00		1.00	
<i>Perceived state of health</i>								
• Poor/very poor – Fair/poor fair – Good	1.98	1.43–2.73	1.79	1.28–2.49	1.33	1.09–1.63	1.16	0.94–1.44
• Good/very good – Great/very good	1.00		1.00		1.00		1.00	
<i>Parity</i>								
• 1	1.00		1.00	–	1.00		1.00	–
• 2	0.78	0.61–1.00	0.77	0.60–0.99	1.19	0.98–1.45	1.11	0.91–1.36
• ≥3	1.09	0.78–1.52	0.94	0.67–1.32	1.62	1.25–2.09	1.26	0.95–1.65
<i>Medical diagnosis of cancer^c</i>								
• Yes	1.02	0.39–2.65	1.13	0.43–2.97	–	–	–	–
• No	1.00		1.00		–	–	–	–
<i>Physically active^c</i>								
• Yes	1.00		1.00	–	–	–	–	–
• No	1.33	1.04–1.69	1.21	0.94–1.55	–	–	–	–

^a Model adjusted simultaneously.

^b Only used in the adjusted model of the generation XXI cohort.

^c Only used in the adjusted model of the ELSA-Brasil cohort.

Ethical approval and consent to participate

The ELSA-Brasil study protocol was submitted to and approved by the internal review boards of the six participating centers. The Generation XXI study protocol was approved by the internal review board of the São João Hospital and by the Portuguese Data Protection Authority on April 27, 2005 and was conducted in accordance with the principles of the 1964 Declaration of Helsinki. Written informed consent was

obtained from all participants at baseline and at follow-up evaluations in both cohorts. All potential participants who declined the invitation or otherwise did not participate were not disadvantaged in any way by not participating in the study.

Availability of data and materials

Regarding ELSA-Brasil, due to ethical restrictions approved by the

ethics committee of each institution (Universidade Federal de Minas Gerais, Universidade de São Paulo, Universidade Federal do Espírito Santo, Universidade Federal do Rio Grande do Sul, Universidade Federal da Bahia e Fundação Oswaldo Cruz) and by the Publications Committee of ELSA-Brasil (publiELSA), the data used in this study can be made available for research proposals by a request to ELSA's Datacenter (estatisticaelsa@ufrgs.br) and to the ELSA's Publications Committee. Additional information can be obtained from the ELSA Coordinator from the Research Center of Bahia (elsaufba@ufba.br).

The data from Generation XXI are not publicly available due to privacy or ethical restrictions. The data can be made available for research proposals on request to the Generation XXI Executive Committee (generationxxi@ispup.up.pt). Further information about Generation XXI can be obtained via the Generation XXI website [www.geracao21.com] or by emailing generationxxi@ispup.up.pt.

Consent for publication

All participants provided informed consent and local ethical committees approved the study protocols.

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CRediT authorship contribution statement

Ana Luísa Patrão: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **Maria da Conceição Almeida:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **Ana Henriques:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Sheila M. Alvim Matos:** Conceptualization, Methodology, Writing - review & editing. **Henrique Barros:** Funding acquisition, Project administration, Writing - review & editing. **Rosane Harter Griep:** Writing - review & editing. **Estela M.L. Aquino:** Conceptualization, Methodology, Funding acquisition, Investigation, Project administration, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no conflict of interest to declare.

Data availability

Data will be made available on request.

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