



Original article

Reduction mammoplasty, self-esteem, and sexual desire: A pre-post intervention study

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ABSTRACT

Background/objective: Sexuality plays a significant role in social relationships and overall development. For women, the breasts hold considerable importance in sexual expression. Deviation from societal norms regarding breast size can lead to mental and sexual health issues. This study aimed to examine the impact of breast reduction surgery on self-esteem, body image, and sexual desire in women undergoing the procedure.

Methods: A descriptive correlational study was conducted, involving 50 women who underwent reduction mammoplasty.

Results: Regarding pre- and post-surgical measurements, breast reduction surgery was associated with improvements in body image perception, as indicated by the BREASTQ reduction module, and both dyadic and solitary sexual desire. However, self-esteem remained unaffected by the intervention. Correlational analysis demonstrated a positive relationship between psychosocial well-being and other dimensions of body image, as well as sexual desire. Sexual well-being also correlated with breast and nipple satisfaction, along with dyadic sexual desire. Notably, age and self-esteem did not exhibit significant correlations with the variables studied.

Conclusion: These findings suggest that breast reduction surgery can improve body image and sexual desire in women, but further research is needed to explore the long-term effects and the specific factors that contribute to these outcomes.

Introduction

The concept of female beauty, particularly in relation to breasts, is often associated with factors such as symmetry, appropriate projection, and a culturally accepted or "normal" size, which can vary based on ethnicity and evolve with changing cultural norms (Meza et al., 2019). To achieve this ideal, breast surgery is commonly employed, aiming not only to modify physical appearance but also to impact mental and health issues of the individuals undergoing the procedure (Crerand & Magee, 2013; Lapeira et al., 2016; Lapeira et al., 2016; Crerand & Magee, 2013).

Within the realm of reconstructive and aesthetic plastic surgery, reduction mammoplasty is a commonly performed procedure that aims to decrease the volume of the breasts by removing excess fat, breast tissue, and skin, often combined with a breast lift procedure (Plaza et al., 2018). According to Cogliandro et al. (2017), breast reduction surgery has gained popularity in recent years, particularly among women affected by macromastia. These women often experience physical discomfort such as back, neck, and shoulder pain, as well as a poor

posture (Cogliandro et al., 2017; Corbolan et al., 2018; Patel & Corcoran, 2023; Pérez-Panzano et al., 2017), and skin problems such as intertrigo, dermatitis, or scarring due to the continuous pressure of the bra straps (Bragina, 2022; Patel & Corcoran, 2023). They also face challenges in finding suitable clothing and engaging in physical activities (Corbolan et al., 2018; Patel & Corcoran, 2023; Pérez-Panzano et al., 2017). Moreover, emotional discomfort, including low self-esteem, poor sexual well-being, social embarrassment, and body dissatisfaction, further motivates these women to seek breast reduction surgery to enhance their quality of life (American Society of Plastic Surgeons, 2011; Bragina, 2022; Corbolan et al., 2018; Hudson et al., 2021; Patel & Corcoran, 2023; Pérez-Panzano et al., 2017).

Considering these factors, the impact of macromastia on body image, self-esteem, and social relationships, particularly concerning sexuality, is profound for affected women. Body image, as defined by Raich (2001), encompasses perception, feelings, and behaviours related to one's physical appearance. Dissatisfaction with specific body parts, like breasts, can lead to a decrease in self-esteem, as outlined by Durand et al.

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(2016). Self-esteem is described as the attitude toward oneself, comprising self-efficacy and self-respect, which can significantly influence emotional well-being and a sense of control (Rosenberg, 1965; Zavaleta, 2016). Thus, dissatisfaction with one's body and low self-esteem can give rise to distorted body image, fostering feelings of inferiority when comparing oneself to other women, and ultimately affecting sexual desire, potentially leading to relationship issues (Martínez et al., 2014). Sexual desire, defined by Moyano et al. (2016), is the motivation for sexual activity, often influenced by both internal and external cues. In women, breasts play a significant role in sexual attractiveness and desirability across different cultural contexts (Lapeira et al., 2016).

Hence, the presence of disproportionately large breasts, deviating from societal norms, can contribute to mental and sexual health issues in affected women (Lapeira et al., 2016). While some studies have focused on investigating changes in body perception (Corbolan et al., 2018; Hernanz et al., 2022) and self-esteem (Kececi et al., 2015; Mello et al., 2010) among women undergoing breast reduction, very few studies have explored the influence of this type of intervention on women's sexual desire. A few studies (Beraldo et al., 2016; Janik et al., 2019) have examined sexual function and observed some improvements following breast reduction. However, no study has aimed to investigate all these variables and how they may be interconnected. Consequently, studying the influence of breast reduction surgery on the self-esteem, body image, and sexual desire of women undergoing the procedure would be valuable.

Therefore, the aim of this study was to analyse the impact of breast reduction intervention on patient body image, sexual desire, and self-esteem. Specifically, the study sought to examine the association between body image, self-esteem, and sexual desire, along with socio-demographic variables such as age or relationship status of women, as well as the surgical procedure or reasons for reduction mammoplasty.

Methods

A single group pre-post design was used, and the study was carried out between January and May 2022.

Sample and data collection

A convenience sampling technique was used to recruit patients from local hospitals in [Hidden for blinding purposes] who were undergoing a breast reduction intervention. The inclusion criteria for participants were being over 18 years old, undergoing reduction mammoplasty and being Spanish speakers. Exclusion criteria consisted of being underage, having a diagnosis of breast cancer, were undergoing a different type of breast intervention, and not completing all the applied instruments.

Potential participants were approached and informed about the purpose of the study while they were at the hospital. They were requested to sign an informed consent to participate in the study, and, after that, they were given a link to an online questionnaire. The questionnaire encompassed several questions about sociodemographic characteristics, body image, self-esteem, and sexual desire. This form was applied before the subjects underwent surgery and one month after surgery. The participants did not receive any form of remuneration or compensation for their contribution in the study.

Measures

The sociodemographic data collected were age, relationship status, surgical procedure (with or without implants), surgical technique, and reasons why they underwent breast reduction surgery. To gather information on participants' relationship status and the reasons for undergoing surgery, open-ended questions such as 'What is your current relationship status?' and 'What is the main reason that led you to undergo breast reduction surgery?' were posed. Moreover, details regarding the

type of surgery and the technique employed were retrieved from participants' medical records.

Three dependent variables were evaluated:

Body image

Body image was assessed using the Spanish version of four scales from the Breast-Q-Reduction Module. The Spanish adaptation of these scales demonstrated good internal consistency in a Spanish population with Cronbach's alpha values ranging from 0.89 to 0.96 (Martínez et al., 2022).

Satisfaction with breasts. This scale consisted of 11 items that measure body image in terms of a woman's satisfaction with her breast appearance, for example: 'how your breasts look in clothes?'. The items were rated using a 4-point Likert scale ranging from 1 (very dissatisfied) to 4 (very satisfied).

Satisfaction with nipples. Composed of 5 items like 'How high or low your nipples are on your breasts?' that measure satisfaction with the appearance of the nipples and areola complexes. These items were rated using a 4-point Likert scale ranging from 1 (very dissatisfied) to 4 (very satisfied).

Psychosocial well-being. Consisted of 7 items that measure body image and confidence of a woman in social settings. An example item is, 'How often have you felt of equal worth to other women?'. The items were rated with a 5-point Likert scale ranging from 1 (never) to 5 (always).

Sexual well-being. Comprised of 5 items that measure body image issues related to feelings of sexual attractiveness with items like 'How often do you generally feel confident sexually?'. The items were rated with a 5-point Likert scale ranging from 1 (never) to 5 (always).

The scores of all the scales except 'Satisfaction with nipples' were transformed on a scale from 0 to 100 according to the BREAST-Q protocol, with a higher value representing greater satisfaction with body image.

Self-esteem

Self-esteem was conceptualized as one's positive or negative attitude toward oneself (Rosenberg, 1965). The Spanish version of the Rosenberg Self-Esteem Scale (Martín-Albo et al., 2007) was used to measure this variable. This scale comprised 10 items rated on a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree), with items like 'On the whole, I am satisfied with myself.' or 'At times I think I am no good at all'. The scale ranges from 0 to 30 with scores between 15 and 25 considered within normal range, while scores below 15 indicate low self-esteem. The Spanish version of this scale demonstrated good internal consistency in a Spanish population (Cronbach's alpha = 0.88) (Martín-Albo et al., 2007).

Sexual desire

The Spanish version of the Sexual Desire Inventory (SDI) (Moyano et al., 2016) was used to assess interest or wish for sexual activity. This inventory measures sexual desire through 13 items, distinguishing three factors: partner-focused dyadic sexual desire (DSD-P) with items like 'How strong is your desire to engage in sexual activity with a partner?'; dyadic sexual desire for an attractive person (DSD-A), with items like 'When you first see an attractive person, how strong is your sexual desire?'; and solitary sexual desire (SSD), with items like 'How strong is your desire to engage in sexual behaviour by yourself?'. The internal consistency evaluated on a Spanish population was good for the three factors, with Cronbach's alpha values higher than 0.80 (Moyano et al., 2016).

Data analysis

Data analysis was conducted using IBM SPSS Statistics® for Windows, Version 27.0. A descriptive analysis of sociodemographic variables was performed, using frequency and percentage for qualitative variables and mean, standard deviation, minimum and maximum for quantitative variables. The normal distribution of the data was assessed using the Kolmogorov–Smirnov test. Between groups analyses were conducted using the Mann–Whitney and Kruskal–Wallis tests for variables that did not follow a normal distribution, and the *t*-Student and ANOVA tests for those that did. Intragroup analyses were conducted applying the Wilcoxon test for variables that did not follow a normal distribution and the *t*-student for variables that did. Moreover, the effect size was assessed using the rank-biserial correlation coefficient and Cohen’s *D*, respectively. Finally, to study the relationship between quantitative variables, a Spearman correlation test was performed. For all analyses, a *p*-value ≤ 0.05 was considered statistically significant.

Ethical considerations

The research was carried out according to the Declaration of Helsinki and the protocol was approved by the Ethics and Research Committee of the Department of Nursing, Physiotherapy and Medicine of the [Hidden for blinding purposes] (EFM 131/2021).

An informed consent document was prepared and signed by all participants, confirming the voluntary nature of their participation, as well as the freedom to withdraw from the study at any time without consequences. All data was processed in accordance with the European Data Protection Legislation.

Results

Sample characteristics

Table 1 shows the main sociodemographic characteristics of the sample. 50 women participated in the study. The mean age was 27.14 ± 6.39 years old, and 58.0 % (*n* = 29) had a partner. Regarding surgery, the same number of women underwent surgery with and without implants and the inverted T technique was used for all participants. Finally, among the reasons they decided to perform the surgery, back pain was the most frequent (*n* = 21; 42.0 %), followed by sagging breast, asymmetric or large breast (*n* = 17; 34.0 %).

More specifically, Tables 2 and 3 present the preoperative values of all the outcome variables according to the collected sociodemographic characteristics. The Mann Whitney test results revealed significant differences in self-esteem among the age groups (*p* = 0.038), indicating that the older age group exhibited lower levels of self-esteem. Similarly, a relationship was observed between this variable and the surgical procedure (*p* = 0.031), showing that women who later underwent

Table 1 Sociodemographic characteristics of the study sample.

Variable		<i>n</i>	%		
Relationship status	With partner	29	58.0		
	Single	21	42.0		
Surgical procedure	Implants	25	50.0		
	Without implants	25	50.0		
Reasons for reduction mammoplasty	Back pain	21	42.0		
	Uncertainty and low self-esteem	6	12.0		
	Sagging, asymmetric, and large size breast	17	34.0		
	Corporal image complex	6	12.0		
Variable	\bar{X}	SD	Range	Min	Max
Age	27.14	6.39	35	20	55

Max: maximum; Min: minimum.

surgery without implants had lower self-esteem values. However, neither relationship status nor the reasons for reduction mammoplasty were significantly associated with this variable. Likewise, no socio-demographic characteristic showed a significant association with the other outcome variables studied.

Intervention outcomes

Table 4 summarises the mean scores for body image and self-esteem before and after reduction mammoplasty. Wilcoxon’s test results showed that the body image measured through satisfaction with the breasts and psychosocial and sexual well-being improved significantly after the intervention (*p* < 0.05), showing a large effect size. In addition, the five items of the satisfaction with nipples scale showed high scores. However, no significant differences were found between pre- and post-surgery self-esteem scores (*p* = 0.94), and these scores showed a normal level of self-esteem, that is, a healthy level of self-esteem.

Furthermore, the results of the *t*-student test showed that the three factors from the SDI also improved significantly between pre- and post-surgery (*p* < 0.005), showing a moderate-large size effect (see Table 5).

Comparison of groups

Given that initial analysis revealed differences in the self-esteem variable related to age and type of surgery, a pre-post comparative analysis was conducted using the Wilcoxon test, revealing no significant differences. Additionally, Mann–Whitney test results demonstrated no significant differences in post-surgery scores between age groups or between groups defined by the surgical procedure (see Table 6).

Correlation analysis

Table 7 shows the correlation analysis between the main variables studied. Regarding age, neither body image, self-esteem, nor any factor of sexual desire were significantly correlated (*p* > 0.05). The same results were obtained for the self-esteem score, which was not significantly related to any of the variables studied (*p* > 0.05).

Regarding body image, the satisfaction with breasts showed a correlation with the other scores related to body image. More specifically, the satisfaction with breasts was very strongly related to the psychosocial well-being score (*r* = 0.74; *p* < 0.05), and the sexual well-being score (*r* = 0.73; *p* < 0.05). Moreover, it was moderately related to the 5 items from the satisfaction with nipples scale. The psychosocial well-being score also showed a very strong relationship with the sexual well-being score (*r* = 0.83; *p* < 0.05) and a strong relationship with all the items of the satisfaction with nipples scale. Lastly, the sexual well-being score and the five items of satisfaction with the nipples scale were also moderately correlated.

In terms of sexual desire, the DSD-P score was moderately correlated with the psychosocial well-being score (*r* = 0.38; *p* < 0.05), breast satisfaction score (*r* = 0.28; *p* < 0.05) and the item about height from the satisfaction with the nipples scale (*r* = 0.28; *p* < 0.5). On the other hand, the DSD-A was moderately related to the satisfaction with psychosocial well-being (*r* = 0.28; *p* < 0.05), and the item about height from the satisfaction with nipples scale (*r* = 0.28; *p* < 0.005). However, the SSD score was not significantly correlated with any of the variables studied (*p* > 0.05).

Discussion

The aim of this study was to analyse the influence of breast reduction intervention on body image, sexual desire, and self-esteem in women undergoing reduction mammoplasty. To the best of our knowledge, this is the first study that focuses on analysing these variables among women within this population. The findings reflect that this surgery leads to improvements in both body image and sexual desire, as evidenced by the

Table 2
Sociodemographic characteristics in relation to the pre-surgery values for the outcome variables.

Variable	Self-esteem		Psychosocial well-being		Sexual well-being		Satisfaction with breasts	
	M (IQR)	<i>p</i> *	M (IQR)	<i>p</i> *	M (IQR)	<i>p</i> *	M (IQR)	<i>p</i> *
Age (years)								
18–25	22.0(4.8)	0.038	41.0(11.5)	0.899	42.0(23.5)	0.681	35.5(16.3)	0.652
26–60	20.5(3.0)		41.0(25.5)		50.0(27.3)		38.0(10.8)	
Relationship status								
With partner	21.0(2.5)	0.272	41.0(14.5)	0.890	47.0(24.5)	0.430	38.0(15.0)	0.581
Single	22.0(5.5)		41.0(33.0)		39.0(28.5)		35.0(16.5)	
Surgical procedure								
Implants	22.0(4.0)	0.031	42.0(13.0)	0.547	44.0(22.0)	0.490	36.0(16.5)	0.382
No implants	20.0(3.0)		39.0(26.0)		42.0(26.5)		40.0(13.5)	
Reasons								
Back pain	22.0(3.5)	0.345	38.0(12.0)	0.292	44.0(22.0)	0.517	38.0(13.0)	0.243
Uncertainty	21.5(4.3)		34.5(10.3)		40.5(31.0)		32.0(10.3)	
Breast size	21.0(4.0)		42.0(32.5)		42.0(34.0)		38.0(16.5)	
Image Complex	23.5(4.3)		44.5(44.5)		51.5(25.5)		45.5(20.5)	

* *p* values from Mann Whitney or Kruskal–Wallis test. IQR: interquartile range; M: median; *p* ≤ 0.05.

Table 3
Sociodemographic characteristics in relation to the pre-surgery values for sexual desire inventory.

Variable	Dyadic sexual desire (partner)		Dyadic sexual desire (attractive person)		Solitary sexual desire	
	$\bar{X} \pm SD$	<i>p</i> *	$\bar{X} \pm SD$	<i>p</i> *	$\bar{X} \pm SD$	<i>p</i> *
Age (years)						
18–25	29.36 ± 9.88	0.317	8.82 ± 3.60	0.360	13.93 ± 6.62	0.330
26–60	30.77 ± 10.99		8.45 ± 3.54		14.86 ± 8.32	
Relationship status						
With partner	30.41 ± 10.80	0.365	8.34 ± 3.59	0.233	14.07 ± 6.82	0.381
Single	29.38 ± 9.79		9.10 ± 3.52		14.71 ± 8.19	
Surgical procedure						
Implants	30.12 ± 10.14	0.462	8.32 ± 3.54	0.252	14.52 ± 7.32	0.432
No implants	29.84 ± 10.66		9.00 ± 3.58		14.16 ± 7.53	
Reasons						
Back pain	29.48 ± 10.71	0.248	8.38 ± 3.25	0.709	13.76 ± 7.56	0.376
Uncertainty	23.67 ± 6.25		7.50 ± 3.21		11.50 ± 5.99	
Breast size	30.88 ± 11.10		9.35 ± 4.36		16.71 ± 7.58	
Image complex	35.50 ± 7.66		8.83 ± 2.48		12.50 ± 6.86	

* *p* values from *t* Student or ANOVA test. SD: Standard Deviation; \bar{X} = Mean; *p* ≤ 0.05.

comparison of pre-intervention and one-month post-surgery scores. However, it is noteworthy that self-esteem did not exhibit any significant changes following the surgical intervention. Furthermore, the correlation analysis revealed that self-esteem was not significantly correlated with any of the studied variables, whereas sexual desire demonstrated associations with certain aspects of body image.

The literature has documented multiple reasons that lead women to undergo breast reduction interventions. On the one hand, physical issues such as back pain or skin issues like intertrigo are frequently highlighted. On the other hand, several studies emphasize the significance of psychosocial issues such as limitations in physical activities; decreased self-esteem and self-confidence; worsened body image perception; relationship problems; and sexual concerns (American Society of Plastic Surgeons, 2011; Bragina, 2022; Corbolan et al., 2018; Hudson et al.,

Table 4
Outcome differences between BREAST-Q before and after surgery and self-esteem scores expressed in the median and interquartile range.

Variable	Pre-surgery M (IQR)	Post-surgery M (IQR)	<i>U</i>	<i>p</i>	<i>r</i> _b
Psychosocial well-being	41.0 (15.5)	73.5 (29)	-5.59	<0.001	0.93
Sexual well-being	43.0 (26)	76.0 (28.8)	-5.23	<0.001	0.95
Satisfaction with breasts	37.0 (14.8)	82.0 (32)	-5.91	<0.001	0.97
Satisfaction with nipples					
Location		4 (1)			
Symmetry		4 (1)			
Shape		4 (1)			
Appearance		4 (1)			
Sensitivity		4 (2)			
Self-Esteem	22.0 (3)	21.0 (5.3)	-0.08	0.94	0.01

IQR: interquartile range; M: median; *r*_b: Rank-biserial correlation coefficient; *U*: Wilcoxon test; *p* ≤ 0.05.

Table 5
Outcome differences between pre- and post-surgery sexual desire scores expressed in mean and standard deviation.

Variable	Pre-surgery $\bar{X} \pm SD$	Post-surgery $\bar{X} \pm SD$	<i>t</i>	<i>p</i>	<i>d</i>
Dyadic sexual desire (partner)	29.98 ± 10.29	38.48 ± 8.88	-4.97	<0.001	0.70
Dyadic sexual desire (attractive person)	8.66 ± 3.54	11.82 ± 3.31	-5.20	<0.001	0.74
Solitary Sexual Desire	14.34 ± 7.35	19.92 ± 6.39	-6.19	<0.001	0.88

d: Cohen's *D*; SD: Standard Deviation; *t*: *t*-Student test; \bar{X} = Mean; *p* ≤ 0.05.

2021; Patel & Corcoran, 2023; Pérez-Panzano et al., 2017). While physical issues primarily drive women to undergo these interventions, some studies also discuss the pressure of beauty standards on younger women and increased body awareness in this age group, indicating that reasons related to body image seem to be expanding to other age groups (Mello et al., 2010; Wirthmann et al., 2018). In the present study, the main reasons reported by women for undergoing breast reduction surgery were physical problems such as back pain or having excessively large breasts. However, a small number of women in the sample mentioned emotional reasons such as self-esteem issues or body image

Table 6

Outcome differences between before and after surgery self-esteem scores according to age and surgical procedure.

Variable	Pre-surgery M (IQR)	Post-surgery M (IQR)	Z	p (within groups)	U	p (between groups)
Age (years)						
18–25	22.0 (4.8)	21.0 (6.0)	–0.567	0.571	273.500	0.498
26–60	20.5 (3.0)	21.0 (4.5)	–0.735	0.462		
Surgical procedure						
Implants	22.0 (4.0)	21.0 (6.5)	–0.358	0.720	250.00	0.223
No implants	20.0 (3.0)	21.0 (4.0)	–0.502	0.616		

IQR: interquartile range; M: median; U: Mann–Whitney test; Z: Wilcoxon signed-rank test; $p \leq 0.05$.

concerns. It is important to acknowledge that these findings may be influenced by the limited sample size and potential social desirability bias in responding to the questionnaire.

Although our participants were selected using a convenience sampling, the age distribution reflected that most of women in this study were between 18 and 30 years old, with a mean age of 27.14 ± 6.39 years old. These results are consistent with data from other countries such as Brazil, where the vast majority of patients undergoing breast reduction mammoplasty were young women aged 19–35 (Corbolan et al., 2018; Mello et al., 2010). However, most studies examining breast reduction involve women in a slightly broader age range, typically between 18 and 60 years old (Beraldo et al., 2016; Corbolan et al., 2018; Correa et al., 2018; Hernanz et al., 2022; Jørgensen et al., 2021). These findings suggest that this type of surgery is becoming more common among women of various age groups. Nevertheless, although it seems that the age range is expanding, the underlying reasons for this trend remain unclear, as both physical and psychosocial issues appear to affect individuals across different age groups (Mello et al., 2010; Wirthmann et al., 2018).

In terms of analysing the influence of breast reduction surgery in body image, significant improvements were observed in the BREAST-Q scores following the surgery. Specifically, post-surgery scores showed significantly higher levels of psychosocial well-being, sexual well-being, and satisfaction with breasts. Moreover, high scores were observed for items related to satisfaction with nipples, indicating that women were satisfied with this aspect of their breast. Several studies (Correa et al., 2018; Crittenden et al., 2019; Hernanz et al., 2022; Wampler et al., 2021) examining pre- and post-surgery differences using the reduction module of the BREAST-Q have reported similar findings. For instance, Hernanz et al. (2022) conducted a study with 34 women with breast hypertrophy in Spain and found higher scores in all domains of the BREAST-Q after the surgery, approaching those of reference populations. Similarly, Wampler et al. (2021), carried out a study with the largest number of subjects to date and obtained comparable results. These studies support that pain relief, improved posture, and enhanced physical capacity contribute to these outcomes. Additionally, women reported feeling more self-confident and receiving positive feedback in social interactions, leading to positive changes in self-image (Cogliandro et al., 2017; Corbolan et al., 2018; Correa et al., 2018; Esmalian & Nodargahfard, 2020). It is worth noting that our study demonstrated a significant improvement in sexual well-being after the mammoplasty, although some studies (Davis et al., 2022; Garcia et al., 2015) did not find these outcomes. Garcia et al. (2015) reported a decrease in nipple-areola complex sensitivity after the surgery, which they associated with sexual dysfunction. Davis et al. (2022) also found lower scores on sexual well-being. However, their study focused on teenagers, who generally have less sexual experience, which could influence their assessments. Furthermore, these differences may be attributed, first and foremost, to the limited sample size of our study, which hinders the generalizability of the results. Secondly, since sensitivity issues are suggested as one of the reasons for sexual dysfunction, our results showing favourable data in this variable may explain the observed improvement in sexual well-being.

Regarding of self-esteem, no significant differences were found

between pre- and post-surgical scores in our study, despite participants not exhibiting low self-esteem according to the Rosenberg scale. These outcomes contrast with a systematic review by Lonie et al. (2019) which included nine studies that reported a significant improvement in self-esteem among women undergoing breast reduction. The reviewed studies observed an improved self-image leading to increased self-esteem, which, in turn, improved social functioning and relationships (Lonie et al., 2019). The high expectations on physical and appearance improvement coupled with the resolution of health problems, likely contributes to improve their self-esteem (Mello et al., 2010). However, our results may be attributed to the small sample size and the timing of data collection. In this research, data was collected only 4 weeks after intervention, allowing for a limited observation of the surgical outcomes and their potential influence on women. Other studies that have assessed self-esteem typically collected data after a longer period, enable women to experience the real results of the intervention and develop an awareness of the physical changes they have undergone.

Beyond the evaluation of sexual well-being using the reduction module of the BREAST-Q scale, our study aimed to assess sexuality more specifically by evaluating sexual desire using the IDS. To the best of our knowledge, no other study has focused on studying this variable in women undergoing breast reduction. Only a few studies have explored sexual function to determine whether surgical intervention can alleviate sexual dysfunctions reported by these women. In our study, a significant improvement in sexual desire was observed after breast reduction, in the three factors of this scale. Janik et al. (2019) evaluated the sexual function of 75 women applying the Female Sexual Function Index (FSFI) and observed an improvement in functionality. Beraldo et al. (2016) also conducted a study with 60 women with breast hypertrophy and found a significant improvement in desire measured with the FSFI, three months after the intervention, along with a decrease in sexual dysfunction. These authors assume that improved body perception and decreased body shame may influence women's ability to reach orgasm and enhance their desire for sexual relations (Beraldo et al., 2016; Janik et al., 2019). Women undergoing breast reduction surgery often feel uncomfortable with their adult sexuality and may have had unsatisfactory sexual experiences, including negative comments from sexual partners about their breast appearance. As a result, breast reduction surgery seems to promote feelings of femininity and sexual attractiveness, although women may require time to adjust to their new image and sexual life (Cerovac et al., 2005).

In addition to examining the influence of breast reduction intervention on body image, self-esteem, and sexual desire in women, this study also aimed to explore the possible association between these variables and certain demographic characteristics, such as age, relationship status, surgical procedure, and the reasons for reduction mammoplasty. Neither the BREAST-Q domains nor sexual desire showed any association with these characteristics before the intervention. Only self-esteem was associated with age and surgical procedure, with older women and those who underwent the procedure without implants exhibiting lower levels of self-esteem. This contrasts with the review conducted by Liao et al. (2023), which observed that older age correlated with higher scores of sexual well-being before the intervention, suggesting that older patients generally have greater

Table 7
Correlation analysis between studied variables.

		Age	Psychosocial well-being	Sexual well-being	Satisfaction with breasts	SN: Location	SN: Symmetry	SN: Shape	SN: Appearance	SN: Sensitivity	Self-Esteem	DSD-P	DSD-A	SSD
Age	<i>r</i>	1	0.06	-0.03	0.10	-0.11	-0.08	0.19	0.21	0.15	-0.18	-0.25	-0.12	-0.18
	<i>p</i>	-	0.67	0.82	0.47	0.45	0.56	0.19	0.14	0.31	0.22	0.09	0.42	0.22
Psychosocial well-being	<i>r</i>		1	0.83	0.74	0.57	0.51	0.54	0.57	0.37	0.15	0.34	0.28	0.19
	<i>p</i>		-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009	0.30	0.02	0.04	0.18
Sexual well-being	<i>r</i>			1	0.73	0.50	0.46	0.60	0.62	0.39	0.11	0.28	0.10	0.09
	<i>p</i>			-	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	0.46	0.05	0.50	0.54
Satisfaction with breasts	<i>r</i>				1	0.55	0.43	0.55	0.54	0.34	0.03	0.28	0.24	0.07
	<i>p</i>				-	<0.001	0.02	<0.001	<0.001	0.016	0.81	0.04	0.09	0.62
SN: Location	<i>r</i>					1	0.81	0.47	0.46	0.30	0.19	0.28	0.28	0.11
	<i>p</i>					-	<0.001	<0.001	<0.001	0.035	0.19	0.05	0.04	0.44
SN: Symmetry	<i>r</i>						1	0.38	0.41	0.02	0.07	0.22	0.25	0.08
	<i>p</i>						-	0.007	0.003	0.92	0.63	0.13	0.08	0.60
SN: Shape	<i>r</i>							1	0.91	0.44	0.25	0.09	-0.11	-0.10
	<i>p</i>							-	<0.001	0.002	0.08	0.54	0.43	0.48
SN: Appearance	<i>r</i>								1	0.48	0.18	0.11	-0.09	-0.07
	<i>p</i>								-	<0.001	0.22	0.44	0.53	0.62
SN: Sensitivity	<i>r</i>									1	-0.04	-0.03	-0.03	-0.16
	<i>p</i>									-	0.78	0.85	0.82	0.28
Self-Esteem	<i>r</i>										1	0.09	0.08	0.10
	<i>p</i>										-	0.52	0.57	0.48
DSD-P	<i>r</i>											1	0.61	0.71
	<i>p</i>											-	<0.001	<0.001
DSD-A	<i>r</i>												1	0.41
	<i>p</i>												-	0.003
SSD	<i>r</i>													1
	<i>p</i>													-

r = Spearman correlation; *p* ≤ 0.05.

self-confidence. While our results did indicate that the older age group had higher scores in sexual well-being and two factors of sexual desire, the differences were not statistically significant compared to the younger age group. Moreover, post-intervention, no relationship was observed between age groups and self-esteem, nor was there any association between self-esteem and the surgical procedure. This, however, aligns with [Liao et al. \(2023\)](#), which suggested that the positive impact of breast reduction surgery is evident across all BREAST-Q domains regardless of age.

Regarding the correlational analysis, it is notable that our study did not identify any significant correlation between age and the variables under scrutiny. This finding, as suggested by [Liao et al. \(2023\)](#), implies that breast reduction surgery may yield favourable outcomes across diverse age demographics. Nonetheless, it is imperative to exercise caution in interpreting these results, considering the limitations stemming from the modest sample size and the selective manner in which participants were recruited.

On the other hand, satisfaction with breasts and nipples exhibited positive relationships with psychosocial and sexual well-being. These findings corroborate previous assertions that breast reduction surgery improves self-concept, which, in turn, influences interpersonal relationships. [Coriddi et al. \(2013\)](#) also found a positive correlation between these variables, noting that women expressed satisfaction with the appearance of their breasts, and reported feeling more confident about their bodies, including sexuality. The appearance of the breasts significantly shapes a woman's self-image and self-perception, influencing her confidence in relationships and potentially contributing to psychosocial problems. These psychosocial issues can further exacerbate sexual problems due to mood disorders that reduce sexual drive ([van de Grift et al., 2020](#)). Thus, the outcomes suggest that reduction mammoplasty improves self-concept, and that this improvement is directly correlated with psychosocial and sexual performance.

Furthermore, solitary sexual desire was not related to any of the studied variables, while psychosocial well-being, satisfaction with breasts and with the height of the nipples were related to the two factors of the dyadic sexual desire. The systematic review carried out by [Lonie et al. \(2019\)](#) also indicated that reduction mammoplasty has positive effects on sexual function. However, the authors explain that a minimum period of three months is necessary to observe these effects, because they depend on the physical appearance which may not be properly perceived until a period of time after surgery ([Lonie et al., 2019](#)). This can explain our results as we collected data only 4 weeks after surgery, during which time the participants may not have fully appreciated the physical changes. Other studies ([Cerovac et al., 2005](#); [García et al., 2015](#)) have also found a correlation between sexual function and the outcomes of reduction surgery. However, these authors noted that this type of intervention often leads to a loss of sensitivity in the nipple area, which can affect sexual function ([Cerovac et al., 2005](#); [García et al., 2015](#)). This is consistent with our findings since no correlation was found between satisfaction with the nipple area and sexual desire, despite overall high ratings. [Cerovac et al. \(2005\)](#) further mentioned that sensitivity can be restored two years after surgery and, according to [Torresetti et al. \(2023\)](#), can potentially even improve beyond pre-surgery levels. Therefore, it would be necessary to re-evaluate these variables after that time to see if there are any changes.

Finally, self-esteem did not exhibit significant relationships with any of the variables studied, consistent with studies by [Mello et al. \(2010\)](#) and [Nuzzi et al. \(2017\)](#) that found no correlation between self-esteem, quality of life, or age. However, [Kececi et al. \(2015\)](#) carried out a study on breast hypertrophy and observed a negative correlation between BMI and self-esteem. The authors proposed that participants perceived their breasts as disproportionate prior to the surgery, and reduction directly influenced their physical appearance, subsequently enhancing their self-esteem ([Kececi et al., 2015](#)). As previously mentioned, our results may be attributed to the timing of data collection, which occurred only 4 weeks after surgery. Additionally, the

participants' self-esteem levels were not low before the intervention, making it challenging to observe improvements in this variable. Furthermore, it's important to consider that our sample size was small and intentionally selected.

Limitations

This research has several limitations that should be considered when interpreting the results. The main limitation lies in the pre-experimental design of this study, given its pre-post nature with a single non-randomized intervention group, resulting in limited control over variables. However, it serves as an initial exploration into this important topic. Secondly, the small sample size of only 50 women restricts the generalizability of the findings to the broader population of women undergoing breast reduction surgery. Third, data collection was performed only 4 weeks after the intervention, potentially missing long-term outcomes. According to [Corbolan et al. \(2018\)](#) it may take at least 6 months for individuals to fully perceive and adjust to the results of the surgery. Lastly, even though the questionnaires applied have demonstrated good psychometric properties, reliance on self-report measures introduces the possibility of social desirability bias.

Future research

In future research, it would be very interesting to conduct a longitudinal study to collect the data related to the variables studied at different times after surgery. It may provide a more comprehensive understanding of the effects of breast reduction surgery and its influence on sexual desire. It would also be appropriate to collect information on those factors that lead these women to undergo surgery, with emphasis on the sexual sphere. It would help to understand their concerns about sexuality in order to assess and treat them.

Conclusions

Despite its pre-experimental design and intentionally limited sample, our study provides insights into the impact of breast reduction surgery on women's body image, sexual desire, and self-esteem. According to our results, breast reduction surgery improves women's body image and sexual desire, while its direct impact on self-esteem appears to be limited. Additionally, there is an observed enhancement in satisfaction with breasts, which correlates with both psychosocial and sexual well-being, as well as sexual desire. However, these variables do not seem to be associated with self-esteem. Moreover, no associations were found between these variables and characteristics such as age, relationship status, surgical procedure, or reasons for reduction mammoplasty.

The results of this research show the importance of this type of intervention in order to improve the relationship of these women with their bodies and, consequently, with their sexuality. However, it is necessary to carry out studies that collect data over a longer period of time in order to know the evolution of these outcomes.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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