

# Breast Augmentation and Breast Reconstruction Demonstrate Equivalent Aesthetic Outcomes

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**Background:** There is a perception that cosmetic breast surgery has more favorable aesthetic outcomes than reconstructive breast surgery. We tested this hypothesis by comparing aesthetic outcomes after breast augmentation and reconstruction.

**Methods:** Postoperative images of 10 patients (cosmetic,  $n = 4$ ; reconstructive,  $n = 6$ ; mean follow-up, 27 months) were presented anonymously to participants who were blinded to clinical details. Participants were asked if they believed cosmetic or reconstructive surgery had been performed. Aesthetic outcome measures were quantified: (1) natural appearance, (2) size, (3) contour, (4) symmetry, (5) position of breasts, (6) position of nipples, (7) scars (1 = poor and 4 = excellent). Images were ranked from 1 (most aesthetic) to 10 (least aesthetic). Analyses included two-tailed  $t$  tests, Mann–Whitney  $U$  tests, and  $\chi^2$  tests.

**Results:** One thousand eighty-five images were quantified from 110 surveys (99% response rate). The accuracy of identifying cosmetic or reconstructive surgery was 55% and 59%, respectively ( $P = 0.18$ ). Significantly more of the top 3 aesthetic cases were reconstructive (51% vs 49%;  $P = 0.03$ ). Despite this, cases perceived to be reconstructive were ranked significantly lower (5.9 vs 5.0;  $P < 0.0001$ ). Mean aesthetic outcomes were equivalent regardless of surgery for 5 categories ( $P > 0.05$ ), with the exception of breast position that improved after reconstruction (2.9 vs 2.7;  $P = 0.009$ ) and scars that were more favorable after augmentation (2.9 vs 3.1;  $P < 0.0001$ ). Age and nipple position ( $R^2 = 0.04$ ;  $P = 0.03$ ) was the only association between a demographic factor and aesthetic outcome.

**Conclusions:** Aesthetic outcomes after cosmetic and reconstructive breast surgery are broadly equivalent, though preconceptions influence aesthetic opinion. Plastic surgeons' mutually inclusive–reconstructive and aesthetic skill set maximizes aesthetic outcomes. (*Plast Reconstr Surg Glob Open* 2016;4:e811; doi: 10.1097/GOX.0000000000000824; Published online 20 July 2016.)

**B**reast reconstruction rates have increased by 30% each year since 2000.<sup>1</sup> Although nipple-sparing mastectomy and preservation of the tissue envelope have led to improved aesthetics, evolving technologies and techniques have also enhanced reconstructive outcomes. Since the advent of breast implants in the 1960s,<sup>2</sup> subse-

quent generations of implants have progressed in terms of internal composition, external texture, and shape to provide a more natural reconstruction.<sup>3</sup> Contemporary adjuncts such as acellular dermal matrices and fat grafting further augment aesthetic results.<sup>4,5</sup> In addition, plastic surgeons have developed increasingly advanced pedicled and microsurgical methods to optimize autologous breast reconstruction.

Despite such reconstructive advances, patients may perceive aesthetic outcomes after reconstructive breast surgery to be inferior to outcomes after purely aesthetic breast surgery. Favorable expectations for cosmetic breast surgery are implicit in patients' motives, with the goal of improving patient satisfaction after adjusting breast size, shape, or position.<sup>6,7</sup> In contrast, women undergoing mastectomy and reconstruction underestimate postoperative health-related quality of life gains from reconstructive surgery.<sup>8</sup>

To guide preoperative expectations in reconstructive breast surgery, we sought to evaluate whether the percep-

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Received for publication July 25, 2015; accepted May 20, 2016.

Presented at the American Society of Plastic Surgeons (ASPS) 2015 Annual Meeting (Boston, Mass., October 17, 2015) and at the eighth Annual Plastic Surgery Research Symposium (Stanford University, Calif., April 28, 2015).

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DOI: 10.1097/GOX.0000000000000824

**Disclosure:** Dr. Nguyen is a consultant for Fibralign. Neither of the other authors has any financial disclosures. The Article Processing Charge was paid for by the authors.

tion that aesthetic outcomes are inferior after reconstructive surgery compared to cosmetic breast surgery is true. Given advanced reconstructive techniques, we hypothesized that reconstructive outcomes can be statistically comparable with cosmetic results. We, thus, constructed and executed an image-based survey study using a diverse medical and nonmedical group to determine if perceivable differences exist between the appearance of cosmetic and reconstructive breast surgery outcomes.

## METHODS

This study was conducted in accordance with Institutional Review Board regulations and conforms to the Declaration of Helsinki.

### Survey Design and Distribution

Surveys included original unlabeled and anonymous images ( $n = 10$ ) of postoperative chests after bilateral breast surgery. Patients were positioned in front view, adhering to standard posture and clinical backgrounds.<sup>9</sup> Sample survey layout is demonstrated (Fig. 1). Participants indicated whether they believed the images were of cosmetic or reconstructive surgery. In addition, they rated the images (1 = poor, 2 = fair, 3 = good, and 4 = excellent) for each of the 7 outcome measures: natural appearance, size, contour, symmetry, position of breasts, position of nipples, and scars. Participants also ranked the images (1 = most aesthetic and 10 = least aesthetic). Demographic information was obtained.

The survey consisted of cosmetic cases ( $n = 4$ ) and reconstructive cases ( $n = 6$ ) that were randomly selected. The cosmetic surgeries were done by various plastic surgeons. The reconstructive surgeries were performed by 1 plastic surgeon. Of the cosmetic cases (Fig. 2; Table 1), 2 were augmentations with saline implants, and 2 were augmentations with silicone implants and periareolar mastopexy. The type of incision was variable (axillary, inframammary, periareolar, and inframammary and periareolar). Images were taken at an average postoperative time of 51 months (range, 24–120 months). Of the reconstructive cases (Fig. 3; Table 2), 5 were anatomical implants with

fat transfer after immediate tissue expansion with AlloDerm (LifeCell Corporation, Bridgewater, N.J.), and 1 was an immediate latissimus muscle flap with round silicone implants. The type of surgical incision was also variable, with most being inframammary. Images were taken at an average postoperative time of 11 months (range, 6–24 months). All mastectomies were cancer related, with the exception of 1 case of bilateral prophylactic mastectomies. All images included in the study were final postoperative results, and no further “touching-up” procedures such as fat grafting or scar revision were planned.


### Statistical Analysis

Distribution of data was quantified using Kolmogorov–Smirnov tests (GraphPad Prism, GraphPad Software, Inc, La Jolla, Calif.). Reconstructive and cosmetic outcomes were compared using two-tailed  $t$  tests (parametric data) or Mann–Whitney  $U$  tests (nonparametric data).  $\chi^2$  tests were used to compare categories of the ranked images. Statistical significance was defined as  $P < 0.05$ .

## RESULTS

A total of 110 surveys were completed by participants (74% women) with a mean age of 38.6 years (range, 20–79 years). Participants were Caucasians (37%), Asians (29%), Hispanics (18%), Pacific Islanders (7%), African Americans (6%), and other categories (5%). Approximately 85% of participants worked in healthcare, including administrative staff ( $n = 38$ ), nurses or physician assistants ( $n = 18$ ), residents ( $n=17$ ), attending physicians ( $n = 15$ ), and medical students ( $n = 1$ ). A total of 14% were from the Division of Plastic and Reconstructive Surgery at Stanford University.

There was no significant difference in participants’ ability to distinguish cosmetic and reconstructive surgery outcomes (Table 3; Fig. 4). Of a total 1,085 cases reviewed (99% response), participants were correct 55% (239 of 434) of the time in identifying cosmetic surgery cases, and correct 59% (385 of 651) of the time in identifying reconstructive cases ( $P = 0.18$ ). Overall accuracy rates were similar, with 58% correct identification of surgery type.



Do you think this is cosmetic or reconstructive surgery?

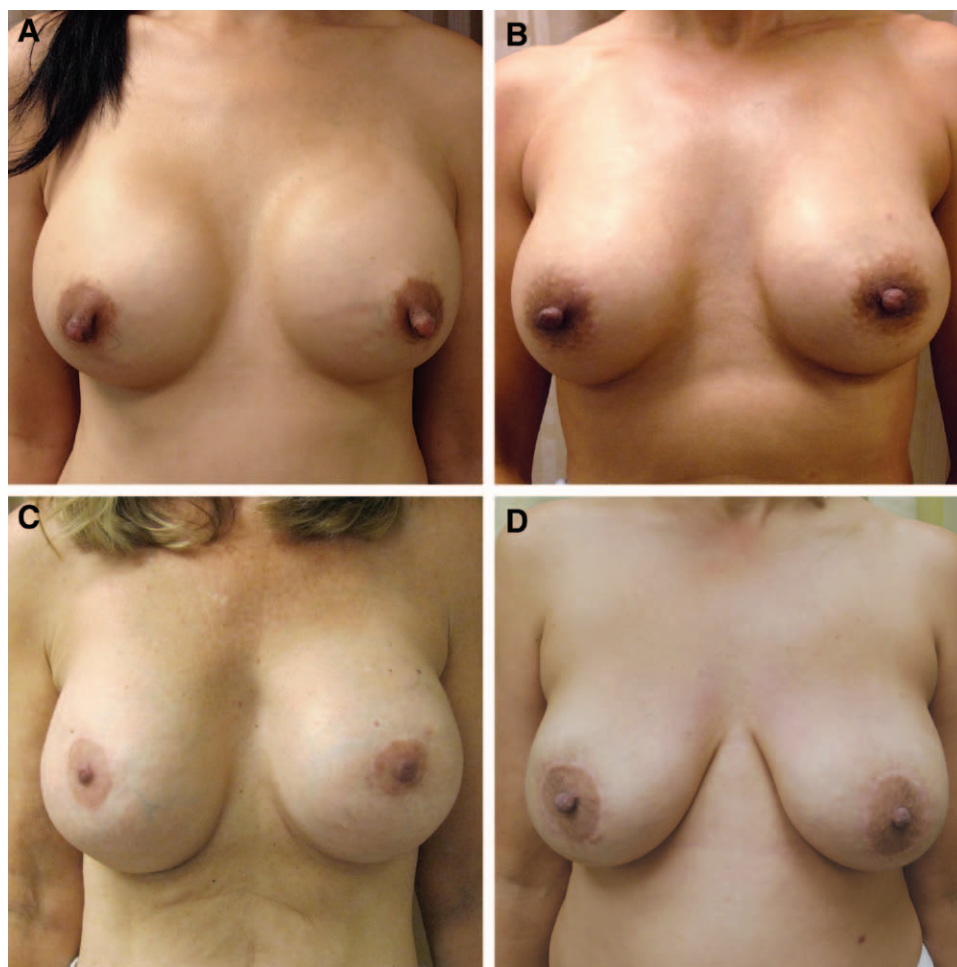
Cosmetic

Reconstructive

Please rate the following (circle one number in each row):

	Poor	Fair	Good	Excellent
Natural appearance	1	2	3	4
Size	1	2	3	4
Contour	1	2	3	4
Symmetry	1	2	3	4
Position of breasts	1	2	3	4
Position of nipples	1	2	3	4
Scars	1	2	3	4

**Fig. 1.** Sample image and survey questions. Participants were presented with clinical images of 10 postoperative patients after bilateral breast surgery for cosmetic or reconstructive indication. Three areas were explored: (1) perception of cosmetic or reconstructive surgery; (2) 7 categories of aesthetic outcomes; and (3) overall ranking awarded from 1 to 10 based on overall aesthetic outcome.



**Fig. 2.** Survey images for cosmetic cases (n = 4). A and B, Bilateral breast augmentations with saline implants. C and D, Silicone implants plus periareolar mastopexy.

Survey participants more frequently ranked reconstructive cases as one of the top 3 most favorable images compared to cosmetic cases (Table 4). Of participants' top 3 ranked images, a mean of 51% were reconstructive cases, and 49% were cosmetic cases ( $P = 0.03$ ). Cases were ranked more unfavorably if they were believed to be a product of reconstructive surgery (Fig. 5). For all cosmetic images, cases were ranked more favorably if they were correctly believed to be cosmetic (mean, 4.5; median, 4) than if they were incorrectly believed to be reconstructive (mean, 5.9; median, 7;  $P < 0.0001$ ). For all reconstructive images, cases were ranked more favorably if they were

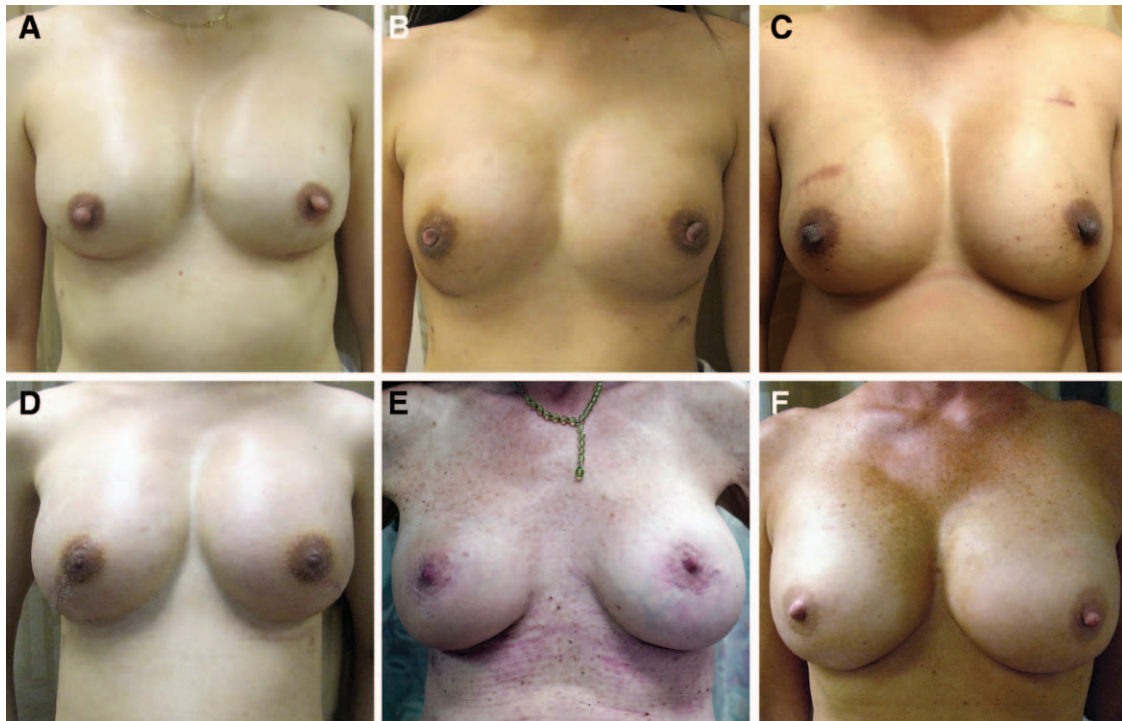
incorrectly believed to be cosmetic (mean, 5.1; median, 5) than if they were correctly believed to be reconstructive (mean, 5.9; median, 6;  $P = 0.0495$ ). Overall, regardless of accuracy, cases were ranked more favorably if they were believed to be cosmetic (mean 5.0; median 5) versus reconstructive (mean, 5.9; median, 6;  $P < 0.0001$ ).

Comparison by surgery type for the 7 aesthetic outcome measures revealed broad equivalency between the 2 techniques (Table 5). Differences in score were not statistically significant for natural appearance, size, contour, symmetry, and nipple position. On average, reconstructive images were rated as having more favorable position of

**Table 1. Background Data for Cosmetic Cases**

Image	Type	Incision	Preoperative Cup Size	Postoperative Cup Size	Months Postoperative
1	Augmentation with saline implants	Axillary	A	C	24
2	Augmentation with saline implants	Inframammary	A	C	120
3	Augmentation with silicone implants and periareolar mastopexy	Periareolar	B	D	36
4	Augmentation with silicone implants and periareolar mastopexy	Inframammary and periareolar	B	D	24
				Mean	51





**Fig. 3.** Survey images for reconstructive cases (n = 6). Images demonstrate that mastectomy and immediate tissue expansion (AlloDerm) exchanged to anatomical implants with fat transfer (A–F) and mastectomy and immediate latissimus dorsi muscle flaps with round silicone implants (F). E, All mastectomies were cancer related with the exception of 1 case of bilateral prophylactic mastectomies.

the breasts (2.9 vs 2.7;  $P = 0.009$ ). Cosmetic case ratings indicated more favorable scars (2.9 vs 3.1;  $P < 0.0001$ ).

Analysis by demographic factors did not demonstrate any impact of such factors on study outcomes with the exception of age (Table 6). Sex, ethnicity, working in healthcare, and affiliation with the field of plastic surgery had no effect on accuracy of distinguishing between cosmetic and reconstructive cases, or on perceived aesthetic outcome on overall breast aesthetics and individual components (natural appearance, size, contour, symmetry, breast position, nipple position, and scars). Age also had no impact for all variables except for nipple position, where older survey participants were less satisfied with nipple position ( $R^2 = 0.04$ ;  $P = 0.03$ ; Fig. 6).

### DISCUSSION

The findings of our study both support the existence of a general belief that aesthetic outcomes for reconstructive breast surgery are inferior to those of cosmetic breast surgery and also disprove the accuracy of this belief. Participants were more likely to rank outcomes as less favorable if they believed them to be the product of reconstructive surgery. At the same time, survey participants were unable to distinguish actual cosmetic and reconstructive outcomes. Participants also ranked reconstructive images as more favorable on average and largely scored aesthetic outcome measures as equivalent between the 2 surgery types.

Patient expectations have been frequently cited within the surgical literature as playing a key role in affecting

**Table 2. Background Data for Reconstructive Cases**

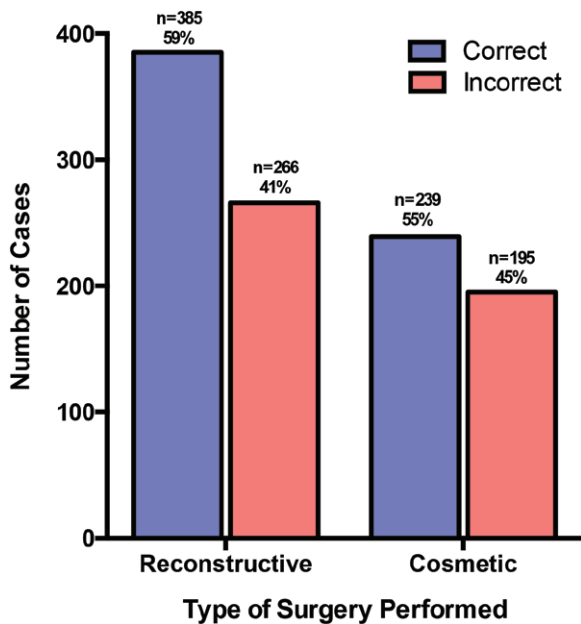
Image	Type	Incisions	Preoperative Cup Size	Postoperative Cup Size	Months Postoperative
5	Immediate TE with AlloDerm, exchanged to anatomical implants and fat transfer	Inframammary	A	C	6
6	Immediate TE with AlloDerm, exchanged to anatomical implants and fat transfer	Inframammary	A	B	6
7	Immediate TE with AlloDerm, exchanged to anatomical implants and fat transfer	Inframammary	C	C	9
8	Immediate TE with AlloDerm, exchanged to anatomical implants and fat transfer	Radial	A	C	7
9	Immediate latissimus dorsi muscle flap with round silicone implants	Lateral (old periareolar)	B	C	24
10	Immediate TE with AlloDerm, exchanged to anatomical implants and fat transfer	Inframammary	D	C	12
				Mean	11

TE, tissue expansion.

**Table 3. Accuracy Rates by Type of Surgery**

	Cosmetic	Reconstructive	Total
Correct	239 (55%)	385 (59%)	624
Incorrect	195 (45%)	266 (41%)	461
Total	434	651	1,085

$P = 0.18$  ( $\chi^2$  test).



**Fig. 4.** Accuracy of recognizing the type of breast surgery from post-operative images, demonstrating equivalence between categories ( $\chi^2$  test,  $P = 0.18$ ).

**Table 4. Image Rank by Type of Surgery**

Image Rank	Cosmetic	Reconstructive
	n (%)	n (%)
1	54 (57)	40 (43)
2	48 (51)	46 (49)
3	32 (38)	52 (62)
	Mean = 49.51	Mean = 51

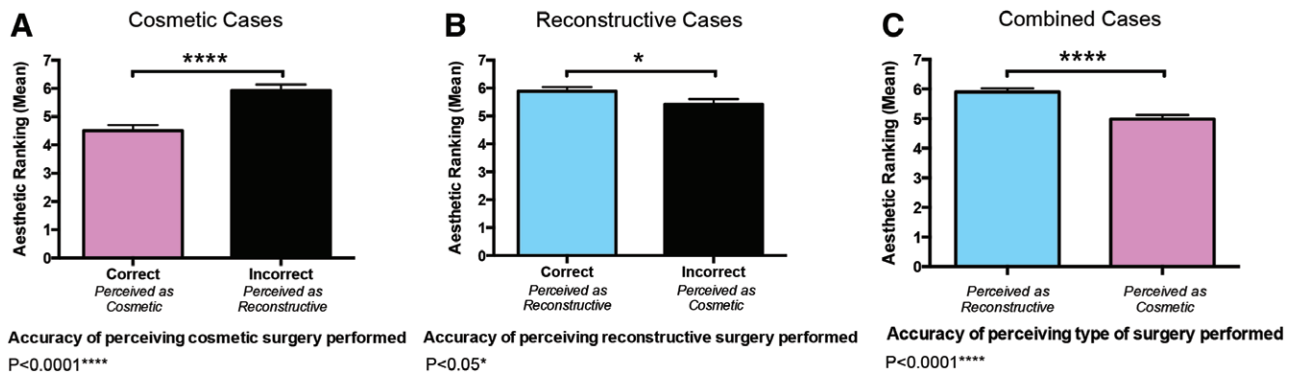
$P = 0.03$  ( $\chi^2$  test).

postoperative outcomes. In orthopedic surgery, unfulfilled preoperative expectations have been associated with greater postoperative discontent, although positive preoperative expectations have been associated with higher satisfaction and health-related quality of life.<sup>10,11</sup> Similar findings have been reported for other surgical fields, such as cardiac and laparoscopic surgery.<sup>12-14</sup> In reconstructive breast surgery, patient expectations play a critical role because success hinges on patient satisfaction, though a clear relationship between expectations and outcomes has not been proven.<sup>15</sup> Hoch et al<sup>16</sup> found that clinical factors such as operation type, complications, and revision rate were not predictive of long-term satisfaction in breast reconstruction and suggest redirecting focus to patient education. Our findings provide data necessary to correct misguided expectations, thereby optimizing patient satisfaction.

In addition to affecting outcomes, patient expectations also play a central part in the decision to pursue reconstructive surgery. Despite the growth of post-mastectomy reconstruction over the past decade, a sizable proportion of women still do not undergo reconstruction, with reconstruction rates varying from 15% to 57% in various studies.<sup>17</sup> Factors associated with lack of reconstruction include demographic and clinical factors, such as age, ethnicity, income level, geographic location, and need for adjunctive treatments.<sup>17-20</sup> Insufficient information about reconstruction, particularly among ethnic subgroups, has also been suggested as a factor for such suboptimal reconstruction rates.<sup>21</sup> Our study may help fill this gap by appropriately setting expectations and allowing patients to make informed decisions about surgical options.

Demographic factors were not associated with accuracy or perceived aesthetic outcome in our analysis, with the exception of age. These findings deviate from previous studies, which demonstrate that sex and ethnic or cultural context influence ideals regarding breast aesthetics.<sup>22-25</sup> In addition, Hsia and Thomson<sup>26</sup> demonstrated that plastic surgeons and patients have different opinions of preferred breast shape. Age was the only significant modulator of perceived breast aesthetics in our study, reflective of previously reported associations. Broer et al<sup>23</sup> surveyed 614 plastic surgeons worldwide and found a negative correlation between age and both upper pole fullness and larger areola size. Similarly, Rapisio et al<sup>22</sup> observed differences in ideal breast size among different age groups, with younger age groups preferring larger breast sizes for underweight bodies. We found that younger survey participants rated post-operative nipple position more favorably compared with older participants, which may be expected given that ptosis is an age-related issue. This finding suggests that there is no uniform ideal for nipple position, and thus plastic surgeons should be aware of variability in patient preferences.

The main limitation of our study is the use of a non-validated survey measure. The current gold standard for measuring patient perceptions after breast surgery is the BREAST-Q, a validated patient-reported outcome instrument consisting of 5 independent modules that assess the full patient experience.<sup>27-31</sup> However, we sought to use 1 scoring method to compare a blinded group of people unaware of the clinical outcome, and thus the relevant augmentation and reconstruction modules of the BREAST-Q were not appropriate to accomplish this objective. Additional limitations include the bias associated with voluntary survey participation, a study population largely comprised of healthcare staff and providers, and image choice. Regarding this latter point, one could argue that the best reconstructive cases were chosen for comparison against average cosmetic cases, yet we employed multiple cosmetic and reconstructive images and a heterogeneous surgeon population in an effort to optimize the equality of comparisons. Our conclusion is not intended to encompass all reconstructive outcomes, but rather relates to the ability of reconstructive results in



**Fig. 5.** Aesthetic ranking varies according to perception of the type of surgery performed. Data represent mean + standard error of mean (SEM) score of all cosmetic (A), reconstructive (B), and combined (C) cases performed, demonstrating the cosmetic surgery cases were ranked more favorably if participants believed that the indication was cosmetic (mean, 4.5; median, 4) versus reconstructive (mean, 5.9; median, 7;  $P < 0.0001$ ) (A). B, Reconstructive surgery cases were ranked less favorably if participants believed that the indication was reconstructive (mean, 5.9; median, 6) versus cosmetic (mean, 5.1; median, 5;  $P = 0.0495$ ). C, Overall, regardless of surgery performed for cosmetic or reconstructive indications, participants ranked cases less favorably if they believed that the indication was reconstructive (mean, 5.9; median, 6) versus cosmetic (mean, 5.0; median, 5;  $P < 0.0001$ ).

**Table 5. Comparison of Aesthetic Outcomes Between Cosmetic and Reconstructive Cases**

Aesthetic Outcomes	Surgical Category Mean Score (SEM)		P	Significance
	Reconstruction	Cosmetic		
Natural appearance	2.65 (0.04)	2.71 (0.04)	0.22	NS
Size	2.80 (0.03)	2.81 (0.04)	0.75	NS
Contour	2.72 (0.03)	2.73 (0.04)	0.57	NS
Symmetry	2.78 (0.05)	2.83 (0.07)	0.50	NS
Position of breasts	2.86 (0.05)	2.67 (0.05)	0.009	*
Position of nipples	2.61 (0.04)	2.69 (0.04)	0.14	NS
Scars	2.85 (0.04)	3.13 (0.04)	<0.0001	†

Data are expressed as mean (SEM). Score from 1 (poor) to 4 (excellent).

\* $P < 0.01$  and

† $P < 0.0001$  (Kolmogorov–Smirnov and Mann–Whitney  $U$  tests were performed).

NS, not significant; SEM, standard error of mean.

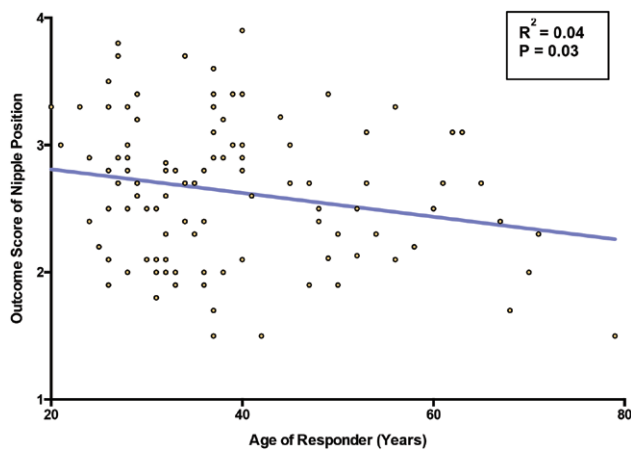
**Table 6. P Values ( $R^2$  Values) for Analysis by Demographic Variables**

	Accuracy	Natural	Size	Contour	Symmetry	Breast Position	Nipple Position	Scars
Age	0.45 (0.0055)	0.87 (0.0003)	0.64 (0.0021)	0.97 ( $1.07 \times 10^{-3}$ )	0.16 (0.0189)	0.24 (0.0131)	0.03 (0.0446)	0.47 (0.0050)
Sex								
Reconstructive	0.55	0.77	0.94	0.51	0.89	0.71	0.21	0.39
Cosmetic	0.36	0.82	0.10	0.79	0.81	0.62	0.30	0.35
Ethnicity	0.23	0.53	0.17	0.30	0.53	0.14	0.47	0.36
Health care	0.90	0.07	0.29	0.38	0.90	0.49	0.43	0.25
Plastic surgery affiliation	0.74	0.52	0.64	0.68	0.60	0.92	0.40	0.39

the appropriately selected patient to approximate typical cosmetic outcomes. In addition, our study compares outcomes on a purely visual level, although factors such as feel, sensation, and temperature response are also important elements that impact a patient’s postoperative experience.<sup>32</sup> The mean months postoperatively that the survey photos were taken also varied, although general satisfaction with breast surgery outcomes has been shown to remain relatively constant in the short term beyond 1 year.<sup>33</sup> Finally, our study includes only 1 case with a component of autologous reconstruction because we chose to limit confounders by selecting predominantly im-

plant-based reconstructions, given that multiple variables already exist for implants (eg, size, type, and shape). Future studies may seek to expand upon our comparison with a greater inclusion of autologous reconstructions.

In conclusion, participants were unable to distinguish the outcomes of cosmetic and reconstructive breast surgery. Participants were more likely to rank outcomes less favorably if they believed the surgery had been for reconstructive indications rather than cosmetic. However, when blinded to the surgery type, reconstructive cases were ranked as more favorable on average. Our findings support the ability of plastic sur-



**Fig. 6.** Outcome score of nipple position plotted against the age of participant. Older survey participants were more likely to rank nipple position less favorably.

geons to employ a growing number of reconstructive options to achieve outcomes that are comparable with the ideal aesthetic standards of cosmetic breast surgery. This information has significant value in preoperative counseling and may be used to correct negative expectations, with careful consideration to not disrupt the delicate balance between accurate expectations and unrealistic optimism.

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