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Examining the impact of breast augmentation vs. hormone therapy on chest femininity of transgender women

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MANUSCRIPT

1. INTRODUCTION

Transgender individuals are those whose gender identity differs from the gender they were assigned at birth.[1] Gender affirming healthcare may vary from patient to patient, as different individuals may have different goals. For transgender women, hormone therapy typically includes androgen blockade and estrogen supplementation to facilitate the development of feminine secondary sex characteristics and minimization of masculine characteristics.[2] In general, there are minimal adverse effects associated with hormone therapy, however results can vary greatly based on age, physiology, and individual genetics.[2] Another important component of transgender care is gender-affirming surgery. For transfeminine patients, surgical options may include top surgery, bottom surgery, and facial feminization surgery. Like hormone therapy, gender affirmation therapy is associated improved mental health and quality of life.[2,3] However, surgery is typically less accessible to patients than hormone therapy due to prohibitive cost, lack of qualified—or even unsupportive and hostile—healthcare providers, and limited number of surgeons with training in gender affirming surgeries.[2,4]

Patient outcomes regarding breast augmentation in cis-gender women, typically focus on six metrics: physical, psychosocial, and sexual well-being and satisfaction with breasts, outcome, and care.[5] Similar to transgender patients, studies have found that breast augmentation significantly improves psychosocial and sexual wellbeing in cisgender women; furthermore, the majority of cisgender women report high satisfaction with their breasts.[6,7] In addition to patient reported outcome measures, Eltahir et. al also measured cosmetic outcomes as determined by a third-party panel utilizing the Strasser Grading System.[8]

For transgender female patients undergoing breast augmentation, similar metrics should be used to measure patient outcomes. However, for transgender female patients, it is also important to consider the additional metric of perceived femininity, as misgendering is a significant contributor to psychological distress in transgender patients.[1] There is often the assumption that surgical breast augmentation will inherently increase perceive femininity beyond hormone therapy alone. However, there are few studies that objectively compare hormone therapy and surgical outcomes in transgender patients. This study aims to assess whether lay individuals found surgically augmented breasts to be more feminine than natural breast development from hormone therapy. This information will help inform patients' decision-making concerning breast augmentation with regards to its impact of perceived femininity.

2. Methods

2.1 Image selection

We obtained frontal view images from all patients who underwent breast augmentation between 2018 - 2021 from the Mayo Clinic Transgender and Intersex Specialty Care Clinic (n=22). Pre-operative chest images were of patients' maximal breast growth on hormone therapy (Figure 1) and post-operative chest images (Figure 2) were from the most recent follow-up after primary augmentation. All breast implants were round, smooth silicone implants placed in the subfascial pocket with an average implant size of 267 cc. Generally, implant size was chosen based on patient BMI. The subfascial pocket was chosen as it have been shown to possibly provide the benefit of low capsular contracture while avoiding animation

deformity associated with subpectoral augmentation. [9] We generally do not alter implant location based on amount of tissue, as fat grafting and implant selection can mitigate any step off and rippling that might occur. Follow up time averaged 4.4 months after surgery. Patients were excluded on the grounds of breast revisions after initial augmentation.

The images were age and BMI matched with cisgender male (n=17) and cisgender female control patients (n=21). Cisgender male images (Figure 3) were sourced from American Society of Plastic Surgeons (ASPS) website and through a chart review of Mayo patients with other unrelated diagnoses that had chest images. Cisgender female control images (Figure 4) were sourced similarly.

All images were edited using PIXLR to remove body hair, scars, clavicles, and body art such as piercings and tattoos.

2.2 Survey Analysis

The images were analyzed by human evaluators through a survey. Participants were sourced using Amazon Mechanical Turk, a crowdsourcing marketplace utilized to outsource virtual tasks to a distributed workforce. Survey participants were offered $0.50 to complete out survey. A total of 275 responses were solicited due to budget constraints; 4 responses were excluded due to incomplete survey completion.

There were 271 participants who each evaluated 20 randomly selected images. Survey participants were also asked for basic demographic information including race (183 White, 56 Asian, 26 Black or African American, 4 Native American, 2 Latino or Hispanic), gender identity (179 male, 91 female, 1 non-binary; 74 transgender, 193 not transgender, 4 prefer not to answer), and sexual orientation (163 heterosexual or heterosexual, 101 bisexual, 7 gay or lesbian). The masculinity of each chest image (1=very feminine, 3-neutral, 5=very masculine) and gender of person in the image determined by each evaluator was recorded. Five survey respondents were excluded: one because they did not rate every image group, and the remainder because they did not disclose whether or not they identified as transgender.

2.2 Statistical analysis

Respondents were stratified into 4 groups by demographic information: Lesbian, Gay, or Bisexual (LGB) and cisgender; LGB not transgender; heterosexual and transgender; heterosexual and cisgender. Averages and standard deviations were calculated for each respondent for each of the control images rated and for pre- and post- surgical patient images. These ratings were then averaged across each subgroup and the whole set of respondents to control for respondents who were randomly assigned a larger or smaller selection from each image group. Standard deviations for image ratings were calculated similarly. Mean testing among respondent subgroups was evaluated using one-way ANOVA and Tukey's Method for comparisons between subgroup pairs. A mixed-methods linear model was constructed to evaluate differences across image subgroups. Estimated marginal means were calculated to determine differences between subgroup pairs. All statistical analysis was conducted using R Version 4.1.1.

3. RESULTS

3.1 Whole group analysis

Mean masculinity ratings were compared across respondent subgroups. Results were stratified by gender image group type: female control, male control, pre-operative transgender, post-operative transgender. As

determined by all survey participants, the mean masculinity score was 2.7/5 for cisgender female controls, 3.8/5 for cisgender male control patients, 3.4/5 for preoperative transgender patients, and 2.9/5 for postoperative images (Table 1, Figure 5). A mixed-methods linear model revealed a significant difference in mean masculinity score between all image types (α=0.05). The mean masculinity score for transgender patients fell by 0.475 points after surgery ($p<0.0001$). Female control images were rated the lowest (most feminine), followed by post-operative transgender patients, pre-operative transgender patients, and male control images. Interestingly, the smallest difference in mean rating was between the female control images and post-operative transgender patients (md=-0.235, 95%CI=[-0.364,-0.105]).

Participants also categorized each image as male or female. On average, 76% of survey participants categorized the female control images as female and 88% of participants categorized the male control images as male. For the transgender patient images, 79% of participants categorized pre-operative images as male. For post-operative images, this number decreased to 61%. Furthermore, the average % of participants who categorized the images as female increased from 58% to 67%.

3.2 Gender identity sub-group analysis

For self-identified transgender respondents, the mean masculinity score was 3.072/5 (sd=1.045) for cisgender female controls, 3.579/5 (sd=0.969) for cisgender male controls, 3.369/5 (sd=0.924) for preoperative transgender patients, and 3.456/5 (sd=0.868) for postoperative images. ANOVA provided evidence of a difference in means across image groups (α=0.05, $p<0.0001$). Tukey's method provided evidence of significant mean masculinity score differences between cisgender male and female controls, preoperative transgender patients and cisgender female controls, and postoperative transgender patients and cisgender male controls (α=0.05). Interestingly, there was insufficient evidence of any difference between mean score for the cisgender female controls and postoperative transgender patients ($p = 0.132$).

Transgender respondents rated every image group more masculine than non-transgender respondents, except for the cisgender male controls. The mean scores of each group were significantly different at α=0.05, except for the mean scores of the preoperative transgender patients.

3.3 Gender identity and sexual orientation sub-group analysis Image group mean difference analysis

We also compared the average masculinity score across four different survey respondent subgroups: participants who self-identified as cisgender and heterosexual, cisgender and lesbian, gay, or bisexual (LGB), transgender and heterosexual, and transgender and LGB. (Table 1)

Among all image groups, cisgender and heterosexual respondents rated their images more feminine than both -the LGB and cisgender sub-group (md=-0.372, 95% CI = [-0.577, -0.167]) and the LGB and transgender sub-group (md=-0.428, 95% CI=[-0.648,-0.209]). The cisgender and heterosexual vs. transgender and heterosexual comparison was not statistically significant (p=0.604). (Figure 6, Figure 7)

For survey participants who identified as both cisgender and LGB, there was significant difference in mean masculinity score between cis-male controls vs. cis-female controls and cis-male controls vs. post-op transgender patients. Furthermore, this group's average rating for the cis-female controls and post-op transgender patients differed by only 0.001.

For participants identifying as transgender and LGB, there was only a significant difference in mean masculinity score between cis-male and cis-female controls. This was the lowest difference for this comparison across the four respondent subgroups.

Finally, for participants who identified as transgender and heterosexual, there was a significant difference in mean masculinity score between all image groups, as compared to cis-female controls; however, there

was not a significant difference between cis-male controls and pre-op or post-op transgender patients, or between pre-op and post-op transgender patients.

For ratings of only female control images, all respondent sub-group comparisons were statistically significant (α=0.05) except LGB and transgender-LGB and cisgender (p=0.956) and heterosexual and transgender-cisgender heterosexual (p=0.605). All respondent groups who identified as heterosexual rated the female control images differently from the respondent groups that identified as LGB, regardless of transgender status. Male image means were statistically significantly differently in only the LGB and transgender-cisgender and heterosexual comparison (md=-0.383, 95% CI [-0.763, -0.002]). ANOVA analysis of pre-operative transgender patient images revealed no statistically significant differences. Post-operative images were rated most femininely by the cisgender and heterosexual sub-group ($p<0.05$).

4. DISCUSSION

Hormone therapy and breast augmentation are both important components of gender affirming treatment for transgender female. Both hormone therapy and breast augmentation are shown to significantly improve the mental health and quality of life of patients.[4,8] Hormone therapy and breast augmentation are associated with different issues: hormone therapy effectiveness may vary greatly by individual and surgery is oftentimes cost prohibitive.[4,9] This is the first paper to our knowledge that compares the outcomes of surgical breast augmentation and hormone therapy in terms of femininity in transgender female patients. This study also effectively demonstrates the use of surgical images and lay person analysis as a means to ascribe objective measures to subjective outcomes.

This study objectively shows that hormone therapy alone increases the perceived chest femininity of transgender patients as compared to cisgender male controls. Furthermore, patients who had undergone breast augmentation were perceived as significantly more feminine than patients who had only undergone hormone therapy and nearly the same level of femininity as cisgender female patients. This suggests that both hormone therapy and breast augmentation are effective measures in increasing perceived chest femininity for transgender patients. Furthermore, transgender respondents specifically found no significant difference in femininity between cisgender female chests and postoperative transgender patient chests.

Survey participant sub-group analysis found whole-group trends to be consistent in the cisgender and LGB sub-group. However, for transgender and LGB participants, as well as transgender and heterosexual participants, there was no significant difference in perceived femininity between cisgender male controls vs. pre-op or post-op transgender patients or between pre-op and post-op transgender patients.

Discrepancies in perception by sub-group, such as transgender survey participants' tendency to rate images as more masculine, could be driven by differences in definitions of femininity based on gender identity. Studies focused on facial feminization surgery have found that transgender female perceptions of facial femininity and attractiveness differ significantly from non-transgender females, with transgender female patients preferring more "feminine" features.[10] This difference in perceived facial femininity could also reflect a difference in perceptions of chest femininity. Furthermore, the relatively small size of breast implants chosen (267 ccs) for our patients could increase perception of masculinity for transgender respondents who are looking for more "clear" feminine proportions. However, to our knowledge, no similar studies on perception of chest femininity by gender identity have been performed.

Several studies have found that breast augmentation in transgender patients is associated with improved gender dysphoria.[2,3] This study supports these findings, as objective increases in perceived chest

femininity likely improves patient misgendering, a significant stressor for those experiencing gender dysphoria. However, though outcomes of breast augmentation in transgender patients are generally favorable, breast augmentation does not guarantee patient satisfaction. Miller et. al found that patients with higher BMI and length of hormone therapy were associated with decreased patient satisfaction. Furthermore, male chests tend to be wider with laterally displaced nipple-areolar complexes, making it difficult to create a feminine cleavage.[3] Finally, surgical complications such as infection, hematoma, and scarring should be considered. These trade-offs should be discussed with patients considering breast augmentation, as, depending on their goals, this study demonstrates that the perceived chest femininity achieved through hormone therapy may be sufficient.

These study results may be incorporated in pre-surgical counseling to help inform patient decision-making regarding breast augmentation in terms of its impact of perceived femininity, helping reduce stress and unnecessary financial burden. Furthermore, this study lays the groundwork for future studies examining other procedures to assess the objective change in perceived femininity.

4.1 Limitations

This study has several limitations. About 90% of our images were of Caucasian patients, which could have potentially influenced perception of femininity. Furthermore, patients included in the study had an average BMI of 26. Therefore, inclusion of patients of different races or greater BMIs may alter the results in future studies. Average breast implant size was 267ccs, which is a relatively small implant size, potentially influencing femininity perception. Furthermore, patients are typically not seen naked by the general population, so the results of this study may be difficult to extrapolate. Finally, our survey had a relatively small participant size (n=271); in the future it could be meaningful to conduct a larger survey to enhance sub-group analysis.

5. CONCLUSIONS

There is limited data on outcomes of gender affirmation surgery for transgender patients. For transgender female patients undergoing breast augmentation, or "top surgery," there is often the inherent assumption that breast augmentation will increase perceived femininity over hormone therapy. Our study objectively demonstrated that hormone therapy significantly increases perceived chest femininity, as compared to cis-male chests, and breast augmentation significantly increase perceived chest femininity, as compared to patients on hormone therapy. Furthermore, transgender patients post-surgery had nearly the same level of perceived chest femininity as cis-women. These results may be incorporated into counseling for transgender female patients considering breast augmentation.

WORKS CITED

1. Cooper K, Russell A, Mandy W, Butler C. The phenomenology of gender dysphoria in adults: A systematic review and meta-synthesis. *Clin Psychol Rev.* 2020;80:101875.
2. Wesp LM, Deutsch MB. Hormonal and Surgical Treatment Options for Transgender Women and Transfeminine Spectrum Persons. *Psychiatr Clin North Am.* 2017;40(1):99-111.
3. Miller TJ, Wilson SC, Massie JP, Morrison SD, Satterwhite T. Breast augmentation in male-to-female transgender patients: Technical considerations and outcomes. *JPRAS Open.* 2019;21:63-74.
4. Winter S, Diamond M, Green J, et al. Transgender people: health at the margins of society. *Lancet.* 2016;388(10042):390-400.
5. Klassen AF, Pusic AL, Scott A, Klok J, Cano SJ. Satisfaction and quality of life in women who undergo breast surgery: a qualitative study. *BMC Womens Health.* 2009;9:11.
6. Williams DC, Seifman MA, Hunter-Smith DJ. Patient related outcome measures for breast augmentation mammoplasty: a systematic review. *Gland Surgery.* 2019;8(4):425-430.
7. Ng S, Pusic A, Parker E, et al. Patient-Reported Outcome Measures for Breast Implant Surgery: A Pilot Study. *Aesthet Surg J.* 2019;39(8):Np314-np321.
8. Eltahir Y, Bosma E, Teixeira N, Werker PMN, de Bock GH. Satisfaction with cosmetic outcomes of breast reconstruction: Investigations into the correlation between the patients' Breast-Q outcome and the judgment of panels. *JPRAS Open.* 2020;24:60-70.
9. Gould DJ, Shauly O, Ohanissian L, Stevens WG. Subfascial Breast Augmentation: A Systematic Review and Meta-Analysis of Capsular Contracture. *Aesthet Surg J Open Forum.* 2020;2(1):ojaa006.
10. Ching AH, Hirschman A, Lu X, et al. Perception of femininity and attractiveness in Facial Feminization Surgery. *Ann Transl Med.* 2021;9(7):602.

Figure Legend

Figure 1. Representative image of pre-operative patient chest with maximal breast growth on hormone therapy. Patient is 36 years old.

Figure 2. Representative image of post-operative patient chest after breast augmentation. All breast implants were round, smooth silicone implants placed in the subfascial pocket with an average implant size of 267 cc. Patient is 36 years old and photo was taken 5 months post-operatively.

Figure 3. Representative image of cis-gender male chest. Patient is 29 years old.

Figure 4. Representative image of cis-gender female chest. Patient is 41 years old.

Figure 5. Whole group survey respondent (n=271) analysis of mean masculinity rating of female control, male control, pre-operative transgender, and post-operative transgender images. Each evaluator was asked to rate the masculinity of each chest image on a scale of 1 to 5 (1=very feminine, 3=neutral, 5=very masculine). There was a significant difference between all image types. Furthermore, the mean masculinity score for transgender patients fell by 0.475 points after surgery ($p<0.0001$). The smallest difference in mean masculinity rating was between female control images and post-operative transgender patients. Bars = Upper and Lower 95% CI. *$p<0.05$, **$p<0.01$, ***$p<0.001$.

Figure 6. Cisgender and heterosexual survey respondent (n=134) analysis of mean masculinity rating of female control, male control, pre-operative transgender, and post-operative transgender images. Sub-group analysis followed whole group analysis trends. Bars = Upper and Lower 95% CI. *$p<0.05$, **$p<0.01$, ***$p<0.001$.

Figure 7. Mean masculinity ratings of all images by each sexual orientation/gender survey respondent subgroup with 95% confidence intervals. Survey participants who identified as lesbian, gay, or bisexual rated images very similarly regardless of gender identity.

Representative image of pre-operative patient chest with maximal breast growth on hormone therapy. Patient is 36 years old.

206x180mm (300 x 300 DPI)

Representative image of post-operative patient chest after breast augmentation. All breast implants were round, smooth silicone implants placed in the subfascial pocket with an average implant size of 267 cc. Patient is 36 years old and photo was taken 5 months post-operatively.

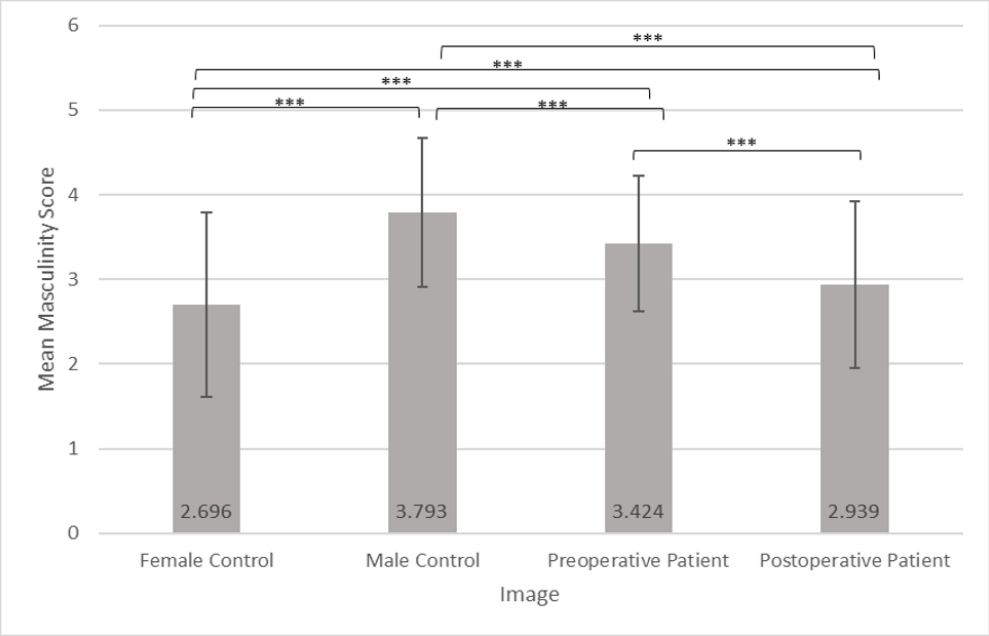
179x169mm (300 x 300 DPI)

Representative image of cis-gender male chest. Patient is 29 years old.

508x371mm (72 x 72 DPI)

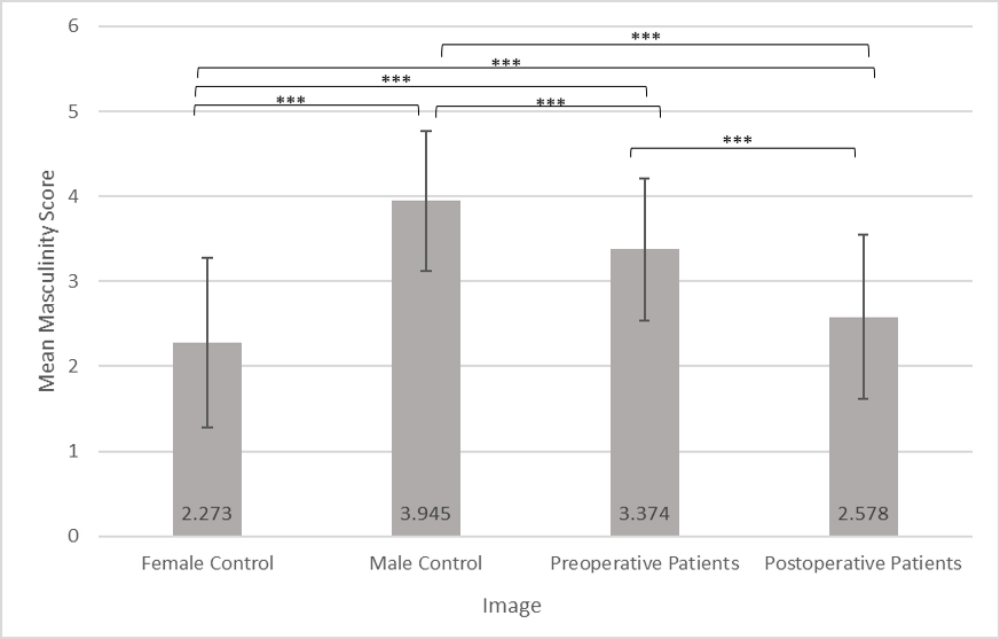
Representative image of cis-gender female chest.

185x167mm (38 x 38 DPI)



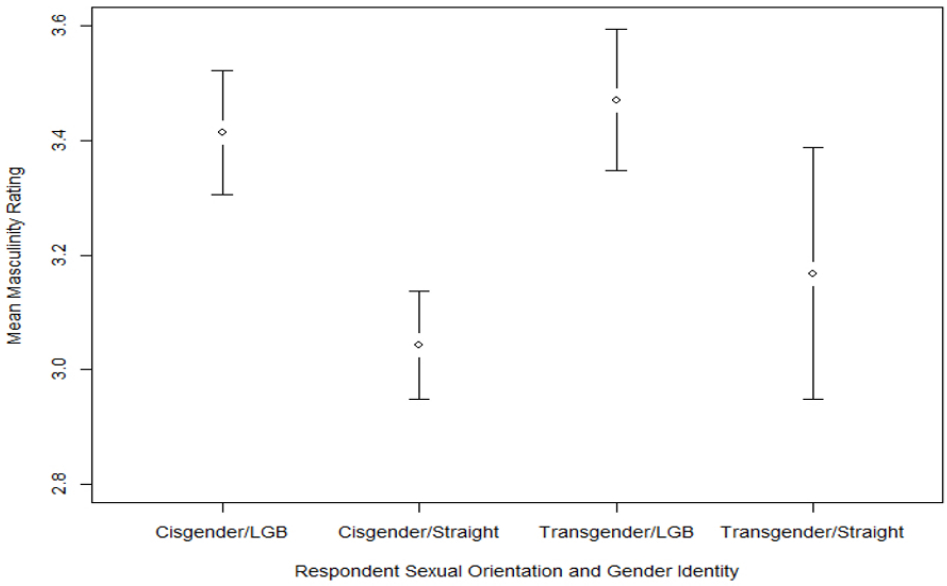
Whole group survey respondent (n=271) analysis of mean masculinity rating of female control, male control, pre-operative transgender, and post-operative transgender images. Each evaluator was asked to rate the masculinity of each chest image on a scale of 1 to 5 (1=very feminine, 3=neutral, 5=very masculine). There was a significant difference between all image types. Furthermore, the mean masculinity score for transgender patients fell by 0.475 points after surgery ($p<0.0001$). The smallest difference in mean masculinity rating was between female control images and post-operative transgender patients. Bars = Upper and Lower 95% CI. *$p<0.05$, **$p<0.01$, ***$p<0.001$.

526x341mm (47 x 47 DPI)



Cisgender and heterosexual survey respondent (n=134) analysis of mean masculinity rating of female control, male control, pre-operative transgender, and post-operative transgender images. Sub-group analysis followed whole group analysis trends. Bars = Upper and Lower 95% CI. *p<0.05, **p<0.01, ***p<0.001.

375x239mm (59 x 59 DPI)



Mean masculinity ratings of all images by each sexual orientation/gender survey respondent subgroup with 95% confidence intervals. Survey participants who identified as lesbian, gay, or bisexual rated images very similarly regardless of gender identity.

507x315mm (47 x 47 DPI)

	Whole group (N=271)	Transgender and heterosexual (N=25)	Cisgender and lesbian, gay or bisexual (LGB) (N=59)	Transgender and LGB (N=49)	Cisgender and heterosexual (N=134)
Female Control average masculinity score	2.696 +/- 1.091	2.538 +/- 1.114	3.247 +/- 0.951	3.344 +/- 0.903	2.273 +/- 0.998
Male Control average masculinity score	3.793 +/- 0.881	3.611 +/- 1.133	3.687 +/- 0.872	3.562 +/- 0.885	3.945 +/- 0.819
Preoperative Transgender patient average masculinity score	3.424 +/- 0.799	3.354 +/- 0.897	3.477 +/- 0.648	3.508 +/- 0.857	3.374 +/- 0.831
Postoperative Transgender patient average masculinity score	2.939 +/- 0.985	3.169 +/- 1.050	3.246 +/- 0.806	3.471 +/- 0.846	2.578+/- 0.965

706x281mm (47 x 47 DPI)