OPEN FORUM

Research

Public Perception of Ideal Breast Shape

Jason D. Kelly, PhD; Bryan Comstock, MS; Orr Shauly, MD; James M. Smartt Jr., MD; and Daniel J. Gould, MD, PhD

Aesthetic Surgery Journal Open Forum 2021, 1–8

https://doi.org/10.1093/asjof/ojab049
www.asjopenforum.com

OXFORD UNIVERSITY PRESS

Abstract

Background: In the past decade, there has been a dramatic increase in trends related to body-shaping procedures. According to the American Society of Plastic Surgeons, nearly 300,000 breast augmentation procedures were conducted in 2019. Learning the ideal shape of a breast and which esthetics lead to public perception of the most attractive breast is beneficial to properly performing these procedures.

Objectives: The authors aimed to quantify the public's perception of attraction to breast shape by measuring public opinion for various esthetic elements of breast anatomy and linking this to various demographic factors.

Methods: Survey responses were collected from 1000 users of Amazon Mechanical Turk to collect demographic data and ask users to rank preferences for randomized image panels of breast proportions.

Results: 960 responses were used for analysis. A majority of respondents were male (60%), with a plurality being 25 to 34 years old (49.3%). The most notable preferences between all groups were breast projection proportion and nipple direction, with preferences of 1.0 and frontal nipple direction, respectively. Breast width to shoulder width ratio also had a clear preference among the crowd, with 105% being the preferred percentage, and the 25 to 34 age group having a very strong preference for this.

Conclusions: The authors used a crowdsourcing survey technique with randomized image panels to analyze ideal breast preference using images of various anatomical traits of the female breast. It was concluded that crowdsourcing can be a favorable technique for learning ideal overall preferences for specific anatomy.

Editorial Decision date: November 9, 2021; online publish-ahead-of-print November 26, 2021.

Breast augmentation is one of the most common aesthetic surgeries performed each year, with nearly 300,000 conducted in 2019.[1-3] Although there are many different techniques and articles describing technical aspects of the procedure, there is no agreed-upon consensus regarding the public's collective perception of the ideal breast shape.[4-6] In previous studies, the authors sought to learn about a specific demographic group's preferences toward breast shape or to learn about aspects of breast shape.[7,8] A study of the overall ideal breast with a large number of

Dr Kelly is a research engineer and Mr Comstock is a biostatistician, Love My Delta, Inc., Philadelphia, PA, USA. Dr Shauly is a plastic surgery resident, Division of Plastic and Reconstructive Surgery, Emory University School of Medicine, Emory University, Atlanta, GA, USA. Dr Smartt is a plastic surgeon in private practice in Philadelphia, PA, USA. Dr Gould is a plastic surgeon, Keck School of Medicine of USC, Los Angeles, CA, USA.

Corresponding Author:
Dr Jason D. Kelly, 16 Hull Street Apt 3, Boston, MA 02113, USA.
E-mail: jasonkelly@lovemydelta.com

specific subcategories has not been performed for the public as a whole. Furthermore, the use of crowdsourcing, which is now a common practice to evaluate outcomes, has not been previously utilized to examine the general population's perception of breast augmentation.

Patients and surgeons disagree on what the ideal breast shape is, specifically for the shape of the upper pole.[9] More work should be done to learn what non-surgeons' preferences are, as this may lead to higher satisfaction levels in breast augmentation procedures. It is intriguing that in fact there is often a dichotomy between patient and surgeon preferences.[9] Independent objective data for the ideal breast would be valuable to both patient and surgeon.

This serves as a rationale behind examining the ideal preferences of the crowd which represents the population as a whole. These data may help not only to uncover the populations' perceptions of the ideal breast but also to guide future studies by providing a metric for outcomes and success. Comparing these findings to the existing literature with surgeon preferences is also a potential place for discourse. In the future, ideal metrics may make it possible to grade outcomes and to formulate objective measures for the quality of the aesthetic outcome.

METHODS

Amazon Mechanical Turk (Amazon Web Services, Amazon, Seattle, WA), a popular website for crowdsourcing tasks, was used to collect 1000 responses for learning the public's perception of the ideal breast shape.[10] This method of data collection has been shown to be a source of high-quality data and has been previously used in various medical research applications.[11-18] The population of Mechanical Turk crowds has also been shown to be representative of the US internet population.[12]

A link was displayed for interested Turkers to use, which directed them to an external site created to record survey responses. A consent page was displayed, informing users about the types of questions that they would be asked in the survey. After agreeing to take part in the survey, participants were directed to a survey with a total of 19 questions.

Each respondent was asked several demographic questions including age group, gender, ethnicity, marital status, number of children, number of children in household, education level, and socioeconomic status. The socioeconomic status question is shown, in which users were asked about their perception of where they belong in their countries socioeconomic system (Figure 1).

Breast Preference Questions

In addition, respondents were asked about their preference for variations of a female breast. As mentioned in Lee and Ock, the authors believe that breast preferences should be calculated in proportion to the rest of the body.[7] For this reason, 11 image panels were used, taken from Lee and Ock, which depict different proportions and ratios for various aspects of the female breast. Some of these characteristics include the "vertical nipple position" and "upper anterior breast to lower anterior breast ratio." The vertical nipple position, for example, is defined as the ratio of the distance from the sternal notch to the nipple level divided by the vertical distance from the sternal notch to the umbilicus. The more in-depth definition for each of the other characteristics can be found in their original research article.[7]

Each of the 11 image panels was cropped into individual subimages. The original image panels can be seen in the Lee and Ock study, although the image panels used were:

- Breast width to shoulder width %—frontal view (90%, 95%, 100%, and 105%)
- Breast width to upper buttock width %—frontal view (90%, 95%, 100%, and 105%)
- Lower pole height to breast width %—frontal view (40%, 45%, 50%, and 55%)
- Vertical nipple position %—frontal view (35%, 40%, 45%, and 50%)
- Nipple direction—lateral view (upward 20°, upward 10°, front, downward 10°, and downward 20°)
- Breast projection proportion—lateral view (0.6, 0.8, 1.0, 1.2, and 1.4)
- Upper anterior breast to lower anterior breast—lateral view (45:55, 50:50, 55:45, 60:40, and 65:35)
- Upper breast slope—lateral view (moderate concave, mild concave, straight, mild convex, and moderate convex)
- Upper pole height to lower pole height—lateral view (45:55, 55:45, and 65:35)
- Vertical nipple position %—lateral view (35%, 40%, 45%, and 50%)

These subimages were randomized for each survey participant completing a survey, to encourage careful examination of each image panel for differences. Participants were prompted to not only choose the subimage, which was most attractive to them, but also rank the following subimages in order of preference.

All participants were given a code after finishing their survey, which they used at the original website to confirm their completion. All users who submitted their correct completion code were compensated $0.25USD for their response. The survey was available for completion during the time period of July 22, 2021, to July 27, 2021, although all surveys were completed within 21 hours of the creation time. The average ranking of preferences between images was calculated overall and across demographic variables and compared using a generalized estimating equation (GEE) model. Statistical inference was determined through

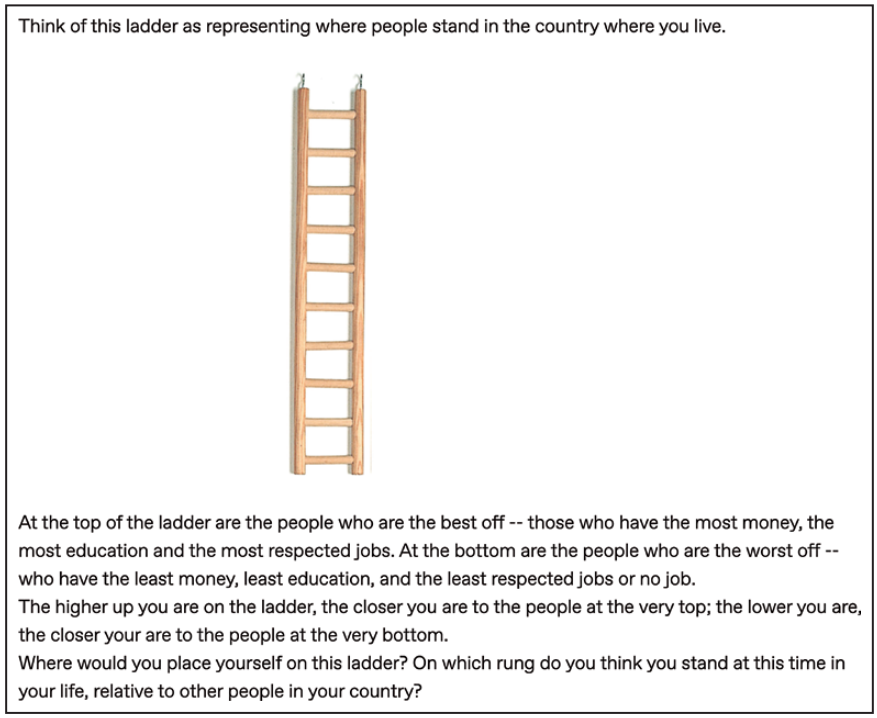

Figure 1. Survey participants were asked this socioeconomic question to learn their perception of their social status in their country.

a GEE Wald test of an interaction term in the mixed effects model between each separate demographic variable and the image number. Data from the surveys were analyzed using both Python and R programming languages.[19,20]

RESULTS

In total, there were 1000 survey results from Mechanical Turk participants. After removing unfinished or incorrectly finished surveys (40), there were 960 survey participants with results to analyze. This represents a similar size study to those previously published utilizing Turk-based crowdsourcing.

Study Demographics

Approximately, half of the participants were between the ages of 25 and 34 years old (49%), with 26% being between ages 35 and 44 and 11% between 45 and 54 years old. Approximately, 60% of respondents were male, whereas 40% were female. The majority of respondents were married (622), were white/ Caucasian (497), and believed that they were roughly in the middle socioeconomic class of their country. Other demographic data are summarized in Table 1.

Overall, breast characteristic preferences significantly differed across each panel of images except for vertical nipple position from the frontal view. Table 2 presents the most preferred (lowest average ranking) and least preferred (highest average ranking) image according to each breast characteristic, sorted by the difference in average rating from greatest to least, where lower average rankings indicated greater preference. The association between image number within each panel and average overall ranking was classified as U-shaped for 5 characteristics and negatively associated with the other 5 characteristics. Nipple direction yielded the greatest difference in average ranking between the top-rated image (front-facing nipple; mean ranking 2.64) compared with the image with a 20° downward facing nipple (mean ranking 3.42). Vertical nipple position had the least difference between most and least attractive images whether viewed laterally or from the front.

More male participants preferred a breast width to upper buttock ratio of 105% than did females, who preferred 100% and 105% slightly more than smaller ratios albeit to the same degree, as shown in Figure 2. Similarly, males preferred higher lower pole height to breast width ratios, whereas females did not choose a clear favorite, as shown in Figure 3.

Average rankings of the breast characteristics with the greatest difference between most and least attractive rated photographs are stratified by age and ethnicity as shown in Figure 4. Nipple direction and breast projection proportion exhibited U-shaped patterns in average rankings, with the concavity of the association increasing with age ($P < 0.001$). Average rankings in nipple direction ($P < 0.001$) and projection proportion

Table 1. Demographics of All Study Participants Who Completed the Survey and Answered All Questions (N = 960)

	No. of participants (%)
Gender	
Male	577 (60%)
Female	383 (40%)
Age	
18-24	58 (6%)
25-34	473 (49%)
35-44	252 (26%)
45-54	108 (11%)
55-64	46 (5%)
>65	23 (2%)
Education level	
HS/GED or less	123 (13%)
Associate's degree	72 (8%)
Bachelor's degree	549 (57%)
Graduate degree	216 (23%)
Marital status	
Single & Never Married	267 (29%)
Married	622 (65%)
Other	71 (7%)
Socioeconomic well-being (1 = lowest, 10 = highest)	
Mean (SD)	5.1 (2.9)
Median (IQR)	5 (2)
Poverty (0-1)	36 (3.8%)
Lower middle class (2-3)	156 (16%)
Middle class (4-6)	542 (56%)
Upper middle class (7-8)	182 (19%)
Wealthy (9-10)	44 (4.6%)
# Children raised	
None	333 (35%)
1	274 (29%)
2	293 (31%)
3 or more	60 (6%)
# Children in household	
None	390 (41%)
1	259 (27%)
2	203 (21%)
3 or more	108 (11%)
Race/ethnicity	
Asian	23 (2%)
Black/African	80 (8%)
Hispanic/Latino	57 (6%)
Indian subcontinent	232 (24%)
Other/multiracial	71(7%)
White/Caucasian	497(52%)

HS, high school; GED, Graduate Equivalency Degree; IQR, Interquartile Range; SD, standard deviation.

($P < 0.001$) also significantly differed across ethnicity categories. The average ranking was strongly correlated with increasing breast width to upper buttock width ($P < 0.001$) and shoulder width ($P < 0.001$) percentages overall, but the pattern was not statistically different across age categories ($P = 0.07$, $P = 0.34$). Associations for breast width ratios were significantly different by ethnicity ($P = 0.002$, $P < 0.001$), with raters from the Indian subcontinent and those of Hispanic/Latino descent tending to prefer higher ratios.

DISCUSSION

The findings demonstrate these key points:

1. The position of the breast footprint (labeled as lateral nipple position or front nipple position) in relation to the thorax is key. We know that one common issue in breast augmentation is releasing the lower fold or dropping the IMF to accommodate larger implants or as an error. When the lower fold is dropped down, for instance, to accommodate a 12-cm base width implant in a female with a 5-cm nipple to inframmary fold (IMF) distance, there is a risk of this larger fold making the entire chest appear heavier by decreasing breast projection. The crowd agrees that wider breasts or breasts that are slightly wider than the upper hip width tend to be more attractive. However, this should not come at the expense of making the breasts appear lower. This also explains why larger implants may satisfy the crowd's aesthetic preference for volume, and the shape is in fact also a key determinant of outcome. Surgeons know this to be true and modern breast augmentation incorporates concepts including lower breast skin expansion

Table 2. The Overall Public's Choices for the Most Attractive Image and Least Attractive Image for Each Breast Characteristic Panel, Sorted From Highest to Lowest Difference in the Average Ranking

Image panel	Most attractive (average ranking)	Least attractive (average ranking)	*P*-value
Nipple direction—LV	Front (2.64)	Down 20° (3.58)	0.001*
Projection proportion—LV	1.0 (2.71)	0.6 (3.42)	0.001*
Breast width to upper buttock width %—FV	105% (2.20)	90% (2.89)	0.001**
Breast width to shoulder width %—FV	105% (2.24)	90% (2.92)	0.001**
Upper anterior breast to lower anterior breast—LV	55:45 (2.72)	45:55 (3.26)	0.001*
Upper pole height to lower pole height—LV	65:35 (1.71)	45:55 (2.25)	0.001**
Vertical inframammary fold position %—FV	60% (2.32)	65% (2.70)	0.001*
Lower pole height to breast width %—FV	50% (2.34)	40% (2.70)	0.001**
Upper breast slope—LV	Mild convex (2.85)	Moderate concave (3.20)	0.001**
Vertical nipple position %—LV	40% (2.32)	50% (2.70)	0.001*
Vertical nipple position %—FV	50% (2.46)	35% (2.58)	0.14

FV, frontal view; LV, lateral view. *U-shaped association between breast characteristic image number and average overall ranking. **Negative association between breast characteristic image number and average overall ranking.

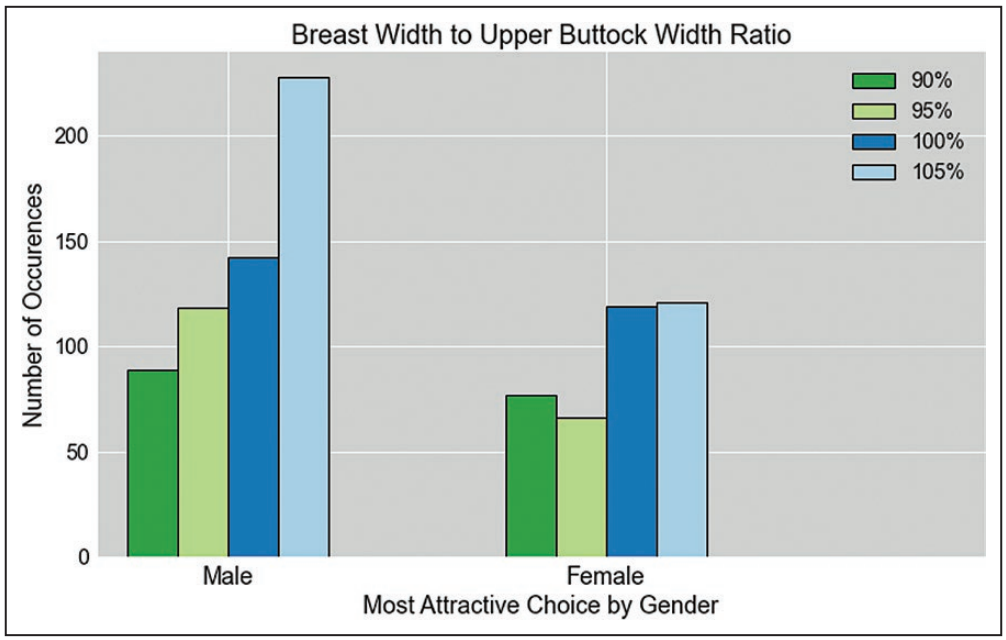

Figure 2. Breast width to upper buttock width ratio preference by gender.

with modern cohesive implants.[21] Austin et al described in several talks and articles the fact that modern constricted breasts and short lower pole distances can be managed in some cases without lowering the IMF, as these newer implants are capable of tissue expansion over time.[22]

2. The crowd shows a split in several areas between males' and females' preferences. This may serve as an educational instrument for our patients, to show them that there are differences in preferences and to help provide appropriate data for selection of outcomes. For instance, we can show females that males prefer

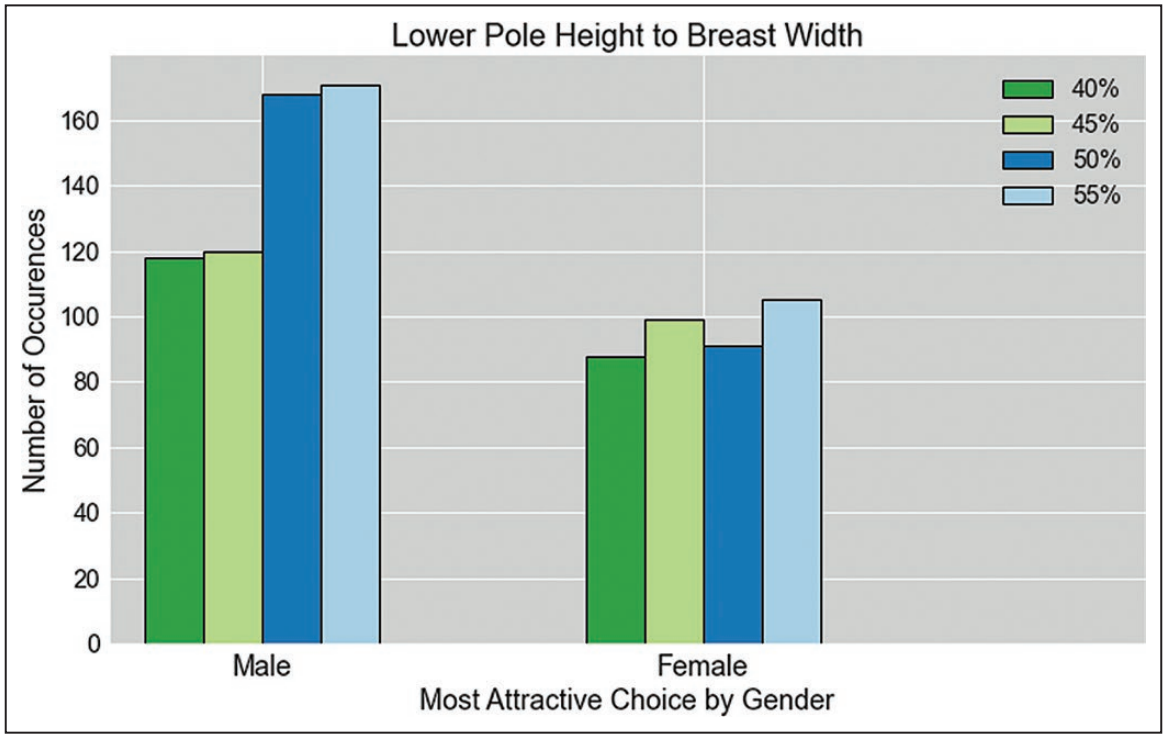

Figure 3. Lower pole height to breast width ratio preference by gender.

a higher breast width to hip width ratio, whereas females are more evenly split. This may change their targeted result depending on their goals, desires, sexual preferences, and motivations.

3. The curves from Figure 4 with U-shaped results help us to identify key inflection points, and these may be expanded to hone in closer to exact ratios and proportions for the ideal breast. This study is a good early crowdsourcing study to help set guidelines for further exploration into breast shape, volume, and body proportions for the public's perception of ideal beauty. Given there are differences in preferences for proportions and shape, it may be possible to target outcomes and to inform patients better about their bodies and their proportions and what are achievable outcomes based on their starting proportions. Miroshink et al have lectured several times on the long torso vs the short torso and the implications for breast augmentation in these 2 groups, focusing on the full body proportion and how breast surgery can change the entire perception of the breast and body shape, not just the size of the patient's breasts.[23]
4. The linear relationships seen in preferences from Figure 4 may point to the fact that there are some areas where our metrics capture cross-cultural demographic preferences. For instance, the breast width to shoulder width data illustrated a common trend for all ethnicities except Asian culturally-identified Turkers. Additionally, younger age groups reported stronger attraction to a higher breast width to shoulder width ratio.

These findings trigger more questions, as to why there are differences that are dramatic between certain demographic groups and not others, at least in a non-scaled distribution. It may be valuable in the future to examine these demographic preferences more carefully and to hone in on the age groups, ethnicities, and demographics for purposes of targeting. Regardless, imagine the power of identifying first the target demographic customer or patient in this case, and then identifying their exact preferences and targeting them with appropriate aesthetically pleasing marketing, photographs, text, and outcomes. A good system could utilize these findings and translate them into a win-win for both patients and surgeons, by better identifying the granular desires of each patient group and better pairing them with the surgeons, implants, and practices which can help them achieve the results they do not even know that they want yet.

This study includes limitations that should be addressed. The image panels used for this study were taken from a previous study in which the authors illustrated effective use of the image panels with specifically Asian populations. It is possible a few of the image panels or the names of the characteristics may not fully convey the entire breadth of variation possible in each aesthetic characteristic, but the authors wanted to use the image panels in the form they

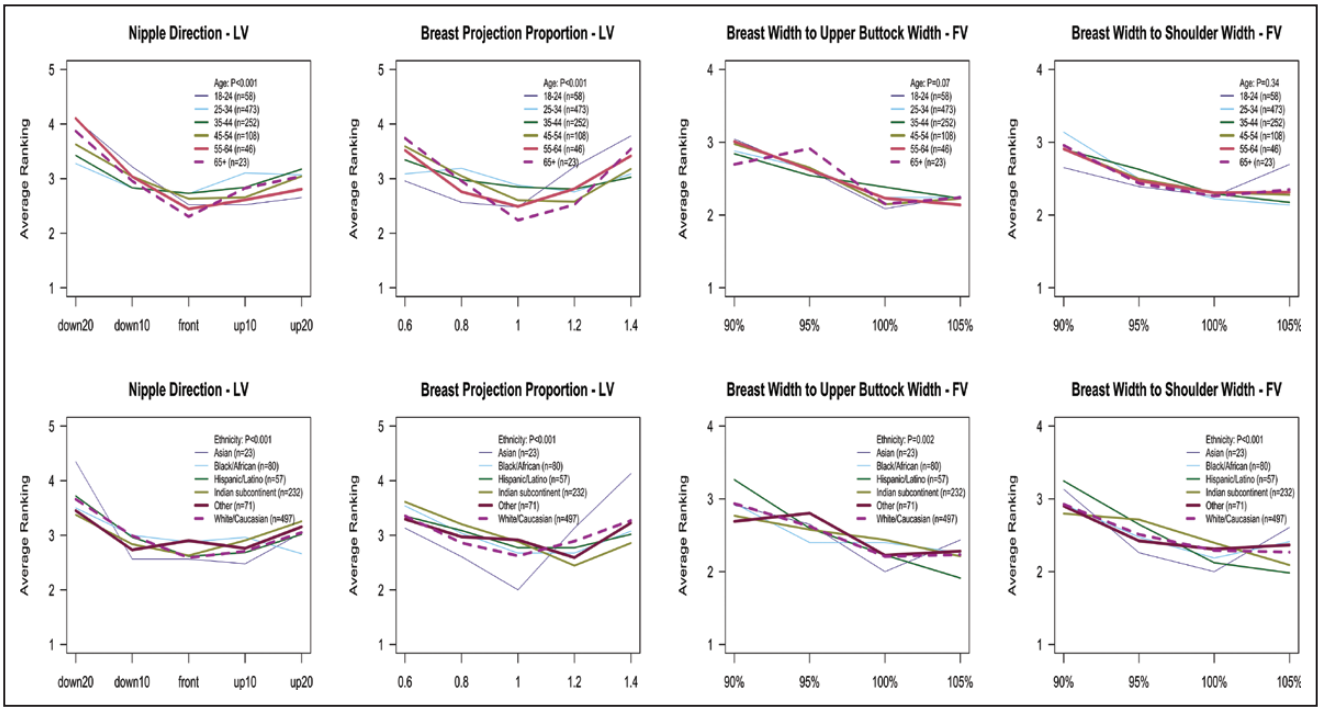

Figure 4. Nipple direction, breast projection proportion, breast width to upper buttock width, and breast width to shoulder width by age and ethnicity. FV, frontal view; LV, lateral view.

were previously created as opposed to altering panels any further. Additionally, it is worth noting that crowds may view illustrations of varying breast characteristics differently than they would view photographs of breast augmentation patients. The population of the Mechanical Turk crowd was fairly close to a representative sample of a crowd, albeit there was a slight skew toward males vs females. In addition, it should be noted that this grouping of people is an internet literate crowd with an age skew slightly favoring the 25 to 34 and 35 to 44 age groups. A few of the ethnic groupings included smaller amounts of peoples, but in accordance with previous research conducted by the authors regarding numbers of crowd workers needed for reliable data collection, the number of crowd workers in each subgroup as shown in Figure 4 should still be considered repeatable and trustworthy.[24]

In the age of crowdsourcing and targeted drip-based communication, data are becoming increasingly more valuable. This study helps to best elucidate the ideal aesthetic outcomes for several demographic groups. In the future, these data will be utilized to train reviewers for outcomes for breast augmentation and to better study the outcomes that are already published and available for view. The goal of this research is to improve our understanding of aesthetic outcomes and goals and to help improve patient outcomes by pairing the patients with the best possible cosmetic outcome for them.

CONCLUSIONS

Overall, the authors have shown the ability of specific crowdsourcing techniques to reveal the public's perception of the ideal female breast, which includes a front nipple direction, a breast projection proportion of approximately 1.0, a moderately convex upper breast slope, and a lateral breast width to upper buttock width ratio of 105%. Future prospective work involves using the results of this study to evaluate outcomes of patients having undergone breast augmentation by comparing clinical images to the ideal breast anatomy found in this research.

There are differences between demographic ideals, and future studies will further parse out these inequalities. Furthermore, these data will inform studies on actual outcomes of breast augmentation patients in order to improve patient outcomes and satisfaction.

Disclosures

Dr Kelly is an employee of Love My Delta Inc., Philadelphia, PA, USA, the funding source of this study. Dr Kelly, Mr Comstock, and Dr Smartt are cofounders of and have equity interests in Love My Delta Inc. Drs Shauly and Gould have no conflicts of interest.

Funding

The funding for this study was provided in full by Love My Delta, Inc.

REFERENCES

1. American Society of Plastic Surgeons. National Plastic Surgery Statistics: Cosmetic Surgical Procedures. 2020. Accessed October 1, 2021. https://www.plasticsurgery.org/documents/News/Statistics/2020/plastic-surgerystatistics-full-report-2020.pdf
2. Siddiqui A, Ueno C, Agarwal J, et al. Evidence-based performance measures for autologous breast reconstruction: an American Society of Plastic Surgeons quality performance measure set. *Plast Reconstr Surg.* 2020;145(2):284e-294e.
3. ContemporarybreastaugmentationpracticeintheUnitedStates. Annals of Plastic Surgery. Accessed August 27, 2021. https://journals.lww.com/annalsplasticsurgery/Fulltext/2021/03002/Contemporary_Breast_Augmentation_Practice_in_the.10.aspx?casa_token=pGOLMckzNyoAAAAA:z-0jO3owB-flT2wgblYFHq83FQJNbAnA99OA_xUXP6l6eUtQTexvFm0mmSQnOFByP9Ha7Cvep6M7uSC3StVZwm9A
4. Mallucci P, Branford OA. Concepts in aesthetic breast dimensions: analysis of the ideal breast. *J Plast Reconstr Aesthet Surg.* 2012;65(1):8-16.
5. Adams WP Jr, Mallucci P. Breast augmentation. *Plast Reconstr Surg.* 2012;130(4):597e-611e.
6. Tebbetts JB. Achieving a predictable 24-hour return to normal activities after breast augmentation: part II. Patient preparation, refined surgical techniques, and instrumentation. *Plast Reconstr Surg.* 2006;118(7 Suppl):115S-127S; discussion 128S.
7. Lee HJ, Ock JJ. An ideal female breast shape in balance with the body proportions of Asians. *Plast Reconstr Surg Glob Open.* 2019;7(9):e2377.
8. Lewin R, Amoroso M, Plate N, Trogen C, Selvaggi G. The aesthetically ideal position of the nipple–areola complex on the breast. *Aesth Plast Surg*. 2016;40(5):724-732.
9. Hsia HC, Thomson JG. Differences in breast shape preferences between plastic surgeons and patients seeking breast augmentation. *Plast Reconstr Surg.* 2003;112(1):312-320; discussion 321.
10. Buhrmester M, Kwang T, Gosling SD. Amazon's Mechanical Turk: a new source of inexpensive, yet high-quality data? In: Kazin AE, ed. *Methodological Issues and Strategies in Clinical Research*. American Psychological Association; 2016:133-139.
11. Ipeirotis PG, Provost F, Wang J. Quality management on Amazon Mechanical Turk. In: *Proceedings of the ACM SIGKDD Workshop on Human Computation*. HCOMP'10. Association for Computing Machinery; 2010:64-67.
12. Cunningham JA, Godinho A, Kushnir V. Using Mechanical Turk to recruit participants for internet intervention research: experience from recruitment for four trials targeting hazardous alcohol consumption. *BMC Med Res Methodol.* 2017;17(1):156.
13. Shauly O, Stone G, Gould D. The public's perception of the severity and global impact at the start of the SARS-CoV-2 pandemic: a crowdsourcing-based cross-sectional analysis. *J Med Internet Res.* 2020;22(11):e19768.
14. Shauly O, Calvert J, Stevens G, Rohrich R, Villanueva N, Gould DJ. Assessment of wellbeing and anxiety-related disorders in those seeking rhinoplasty: a crowdsourcing-based study. *Plast Reconstr Surg Glob Open.* 2020;8(4):e2737.
15. Maas M, Shauly O, Stone G, Gould DJ. Crowdsourcing the aesthetics of thumb repair in pediatric thumb hypoplasia. *Eur J Plast Surg*. 2020;43(6):789-794.
16. Shauly O, Gould DJ, Patel KM. Crowdsourcing the public's perception of microsurgical and nonsurgical interventions for erectile dysfunction. *Eur J Plast Surg*. 2020;43(4):443-452.
17. Gould DJ, Shauly O, Qureshi AA, Stevens WG. Defining "ideal abs" through a crowdsourcing-based assessment. *Aesthet Surg J*. 2020;40(4):NP167-NP173.
18. Stone G, Shauly O, Gould DJ. Crowdsourcing the public's perception and systematic review of nipple inversion and its repair. *J Women's Health*. 2021. doi:10.1089/jwh.2020.8953. [Epub ahead of print].
19. Python Software Foundation. Python Language Reference, Version 3.8. Accessed September 20, 2021. http://www.python.org
20. Bunn A, Korpela M, et al. dplR: Dendrochronology Program Library in R. R package version 1.7.2. (2021). Accessed September 16, 2021. https://github.com/AndyBunn/dplR
21. Austin RE, Lista F, Ahmad J. Hot topics in breast surgery. *Clin Plast Surg.* 2021;48(1):131-139.
22. Austin RE, Saheb-Al-Zamani M, Lista F, Ahmad J. Periareolar augmentation-mastopexy. *Aesthet Surg J.* 2019;39(9):953-965.
23. Magnusson MR, Connell T, Miroshnik M, et al. Breast implant selection: consensus recommendations using a modified Delphi method. *Plast Reconstr Surg Glob Open.* 2019;7(5):e2237.
24. Kelly JD, Comstock B, Kowalewski TM, Smartt JM. Crowdsourced reliability of an assessment of lower facial aging using a validated visual scale. *Plast Reconstr Surg Glob Open.* 2021;9(1):e3315.