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Fat Grafting Versus Implants: Who's Happier? A Systematic Review and Meta-analysis

Greffe de tissu adipeux versus implants : qui est le plus satisfait? revue systématique et méta-analyse

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Abstract

Background: Breast implants were first introduced in the 1960s and have long been used for augmentation and reconstructive breast surgery. More recently, fat grafting for breast augmentation has gained popularity due to the 'natural' outcome and lack of implant-related complications. The aim of this study was to conduct a systematic review and meta-analysis comparing patient-related outcome measures between fat grafting and implant-based primary augmentation using the validated BREAST-Q questionnaire. **Methods:** A systematic review of the literature according to the PRISMA guidelines was conducted in PubMed®, Cochrane Library®, EMBASE®, MEDLINE®, and Scopus® databases. Papers were screened by two independent blinded reviewers. Quality was assessed using MINORS criteria. **Results:** Fourteen studies were included in the meta-analysis representing a total of 81 fat grafting augmentations and 1535 implant augmentations. The average overall patient satisfaction mean post-operative scores were 13.0 points higher in the implant group based on meta-regression (95% CI: 2.4-23.5; $P = .016$). There was no statistical difference in reported post-operative sexual well-being, psychosocial well-being, or physical well-being BREAST-Q scores. **Conclusion:** Although implant-based augmentation resulted in higher post-operative overall satisfaction scores, fat grafting remains a highly desirable alternative for augmentation in the right patient. This meta-analysis strongly highlights that careful patient selection and evaluation of patient goals must be assessed when selecting an augmentation method.

Résumé

Contexte : Les implants mammaires ont été introduits pour la première fois dans les années 1960 et sont utilisés depuis longtemps en chirurgie d'augmentation et de reconstruction du sein. Plus récemment, le recours à la greffe de tissu adipeux pour augmentation mammaire s'est répandu en raison du résulatat « naturel » et de l'absence de complications liées à l'implant. Le but de cette étude était d'effectuer une revue systématique et une méta-analyse comparant les mesures de résultats liés aux patients entre la greffe de tissu adipeux et l'augmentation principalement basée sur un implant au moyen du questionnaire validé BREAST-Q. **Méthodes :** une revue systématique de la littérature conforme aux lignes directrices PRISMA a été exécutée dans les bases de données PubMed®, Cochrane Library®, EMBASE®, MEDLINE® et Scopus®. Les articles ont été sélectionnés par deux réviseurs indépendants tenus dans l'insu. La qualité a été évaluée en utilisant les critères MINORS.

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Résultats : Quatorze études ont été incluses dans la méta-analyse, représentant un total de 81 augmentations par greffe de tissu adipeux et 1535 augmentations par implants. Les cotes postopératoires moyennes de satisfaction globale moyenne des patients ont été plus élevées de 13,0 points dans le groupe « Implant », d'après une méta-régression (IC À 95 % : 2,4 à 23,5; P = 0,016). Les cotes du questionnaire BREAST-Q n'ont mis en évidence aucune différence statistique sur le bien-être sexuel, psychosocial ou physique déclarés en postopératoire. **Conclusion :** Bien que l'augmentation mammaire par implant ait obtenu des cotes de satisfaction globale postopératoire plus élevées, la greffe de tissu adipeux reste un choix hautement désirable pour l'augmentation chez les bons patients. Cette méta-analyse souligne avec force qu'une sélection et une évaluation soigneuses des buts des patients doivent avoir lieu au moment du choix de la méthode d'augmentation mammaire.

Keywords
fat grafting, breast implants, breast augmentation, BREAST-Q, quality of life

Mots-clés
greffe de tissu adipeux, implants mammaires, augmentation mammaire, BREAST-Q, qualité de vie

Background

Breast Augmentation

Breast implants were first introduced in the 1960s and have long been used for reconstructive and cosmetic surgery.[1–4] However, implant-based breast procedures carry risks of complications, including capsular contracture, breast animation, implant failure, breast implant-associated anaplastic large cell lymphoma (BIA-ALCL), breast implant illness, and possible consequences to psychological well-being.[4–6]

Autologous fat grafting (AFG), otherwise known as fat transfer, lipoagumentation, liposculpture, or lipomodeling, is an alternative for breast augmentation and reconstruction.[4,7] Since 2000, fat grafting accounted for a 29% increase in breast reconstruction and a 25% increase in cosmetic breast surgery.[1] This procedure is best suited to patients who want a moderate increase in their breast volume, typically seen in patients who underwent significant weight loss, post-pregnancy, or in reconstructive patients such as in post-mastectomy reconstructive surgery.

Patient-Reported Outcome Measures

In cosmetic and reconstructive patients, it is important to assess a patient's perception of their quality of life (QoL) to determine the impact on a patient's appearance, functional status, and mental health.[8] By assessing QoL in a valid, systematic, and reliable way, it can help influence future decision-making for patients and physicians.[9] However, when using the patient's perspective on their QoL and outcomes, it is subjected to many biases and can be heavily influenced by motivation, health, age, and socioeconomic status.[10]

For the breast, there are three prominent patient-reported outcome measures (PROMs), and assessment strategies, including BREAST-Q, Breast Evaluation Questionnaire (BEQ), and Breast Reduction Assessed Severity Scale Questionnaire (BRASSQ).[11] BREAST-Q is currently the most well-validated breast-specific PROM instrument available, with the added benefit of having a pre-operative and post-operative components.[11]

BREAST-Q

The BREAST-Q questionnaire was developed in 2009 and can be used for augmentation, reduction, and for reconstructive patients. It aims to investigate topics known as modules such as psychosocial, physical, sexual well-being, satisfaction of care, and satisfaction of breasts.[8,9,12] BREAST-Q has since become the gold standard for assessing QoL and patient satisfaction for patients undergoing breast surgery.[12]

This article aims to provide an updated review of the literature and PROMs for two common methods of breast augmentation surgeries. PROMs provide a valuable objective and standardized scale of patient satisfaction, and trends in this data can help surgeons identify areas of potential improvement. This systematic review and meta-analysis aimed to compare patients' QoL outcomes using BREAST-Q to assess the satisfaction of patients who undergo fat grafting compared to implant-based primary breast augmentation.

Methods

Search Strategy

The methodology was then designed and registered in the PROSPERO database (CRD42022297860). The preferred reporting items for systematic reviews and meta-analysis (PRISMA) guideline was used (Figure 1). The search strategy included search terms related to primary breast augmentation, the two methods of interest, and terms related to the primary outcome, BREAST-Q.

Five bibliographic databases were searched on November 4, 2021: PubMed®, Cochrane Library®, EMBASE®, MEDLINE®, and Scopus®. References were manually screened from relevant review articles to identify if there were any studies that were not captured in the initial search. However, no additional sources were identified in this process.

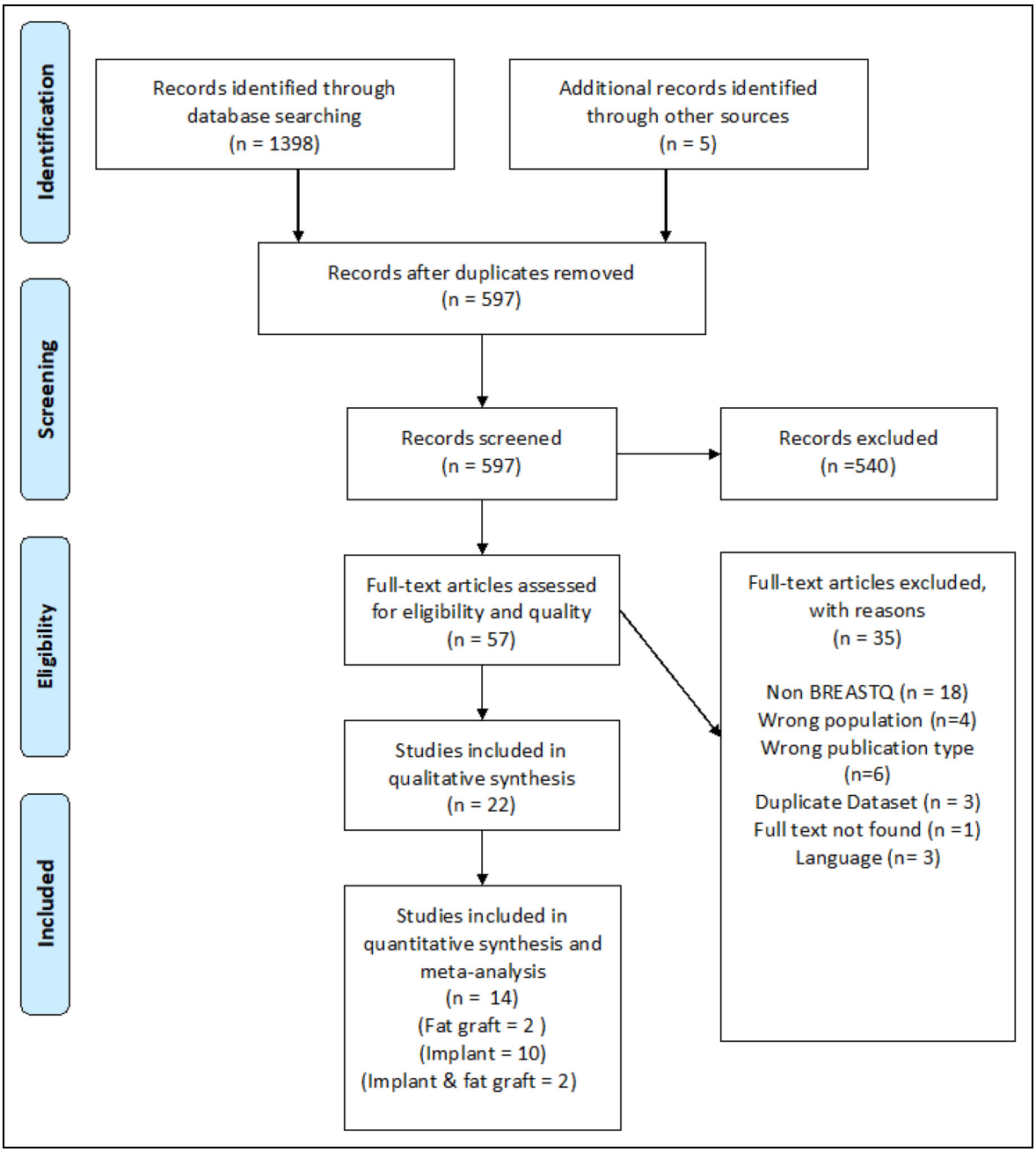

Figure 1. PRISMA diagram for records screened, and final papers included in data extraction and analysis.

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were determined a priori. We included prospective studies, retrospective studies, and randomized controlled trials written in English or French and published in peer-reviewed journals over the past ten years from the date of the search. Only studies that included patients who underwent primary breast augmentation using either implants or fat grafting for aesthetic purposes were included. Studies reporting on augmentation with a combination of implant and fat grafting or breast reconstruction were excluded. Patients who have had a previous mastectomy, gender-affirming surgery, massive weight loss, or multiple fat grafting sessions were excluded due to the multifactorial nature of their cases. All studies must report, at minimum, post-operative BREAST-Q data as a study outcome to be included. Single case reports, reviews, animal studies, conference proceedings, abstracts, inaccessible manuscripts, and editorials were excluded.

Study Selection

Studies extracted were analyzed, and duplicates were eliminated and underwent screening by two independent reviewers using Rayyaan platform (Rayyaan Systems Inc., Cambridge, MA, USA). For the primary screen, titles and abstracts were reviewed. Selected articles underwent full-text review for the secondary screening. The principal investigator functioned as an independent arbitrator. The methodological index for non-randomized studies (MINORS) score was used to assess the quality of all articles selected for the review and meta-analysis. Papers that failed to achieve a benchmark score of 60% or higher were excluded.

Data Extraction

The two independent reviewers extracted data using the Google Sheet platform (Google, Mountain View, CA, USA). Study type, number of patients, average age, BMI, type of augmentation, augmentation characteristics, surgical technique, pre- and post-operative BREAST-Q data, and common complication rates were extracted. Attempts were made to contact the authors of any study with incomplete BREAST-Q data.

Statistical Analysis

Statistical and meta-analyses were conducted by a contracted statistician. Cohen's kappa coefficient was calculated to assess inter-rater reliability for article selection, with values 0.41-0.60, 0.61-0.80, and 0.81-1.00 representing moderate agreement, substantial agreement and perfect agreement, respectively. Studies that reported multiple patient groups

Table 1. Studies Comparing Satisfaction Scores for Both Augmentation Methods (N = 2).

	Fat grafting		Implant	
Study label	Size (N)	Post-op score mean (SD)	Size (N)	Post-op score mean (SD)
Brault (2017)	22	71.4 (21.8)	15	51.6 (8.6)
Tenna (2017)	22	78.0 (22.0)	16	72.0 (11.0)

Abbreviation. SD, standard deviation.

Table 2. Reported Pre-Op and Post-Op Satisfaction Scores (N = 14 Studies).

Study	Method	Size (N)	Pre-op score mean (SD)	Post-op score mean (SD)
Overschmidt (2018)	Implant	72	20.6 (15.1)	85.3 (12.3)
Overschmidt (2018)	Implant	13	19.3 (18.2)	87.2 (14.1)
Randquist (2018)	Implant	22	n.r.	69.2 (14.8)
Guo (2019)	Fat grafting	8	16.8 (16.5)	50.4 (16.6)
Xu (2006)	Implant	70	14.7 (11.0)	64.9 (5.6)
Deschler (2020)	Fat grafting	42	23.8 (20.8)	62.8 (13.3)
Diaz (2017)	Implant	150	n.r.	80.6 (15.1)
McCarthy (2012)	Implant	41	27.0 (18.0)	70.0 (23.0)
Bracaglia (2020)	Implant	70	29.6 (13.3)	85.5 (6.6)
Xiao (2020)	Implant	57	30.3 (6.1)	55.8 (7.8)
Xiao (2020)	Implant	66	29.6 (6.3)	55.4 (8.6)
Gryskiewicz (2014)	Implant	670	n.r.	76.0 (16.6)
Faure (2021)	Implant	40	n.r.	71.8 (18.5)
Li (2021)	Implant	65	22.5 (12.1)	76.6 (11.8)
Li (2021)	Implant	155	16.1 (10.3)	60.8 (19.3)
Brault (2017)	Fat grafting	15	n.r.	51.6 (8.6)
Brault (2017)	Implant	22	n.r.	71.4 (21.8)
Tenna (2017)	Fat grafting	16	n.r.	72.0 (11.0)
Tenna (2017)	Implant	22	n.r.	78.0 (22.0)

Abbreviations. n.r., not reported; SD, standard deviation.
For analysis, groups were pooled within studies if the same augmentation method was used.

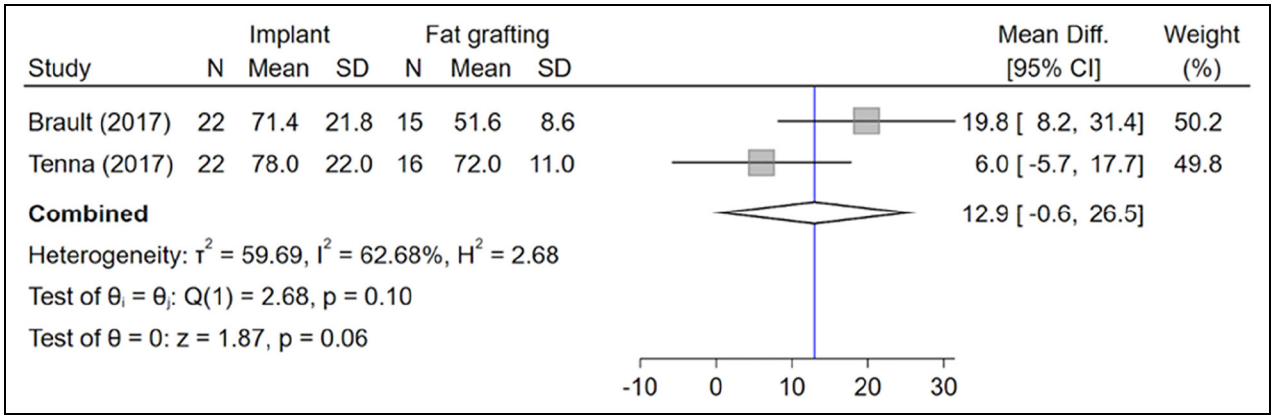

Figure 2. Forest plot of mean difference in post-op satisfaction score between augmentation methods.

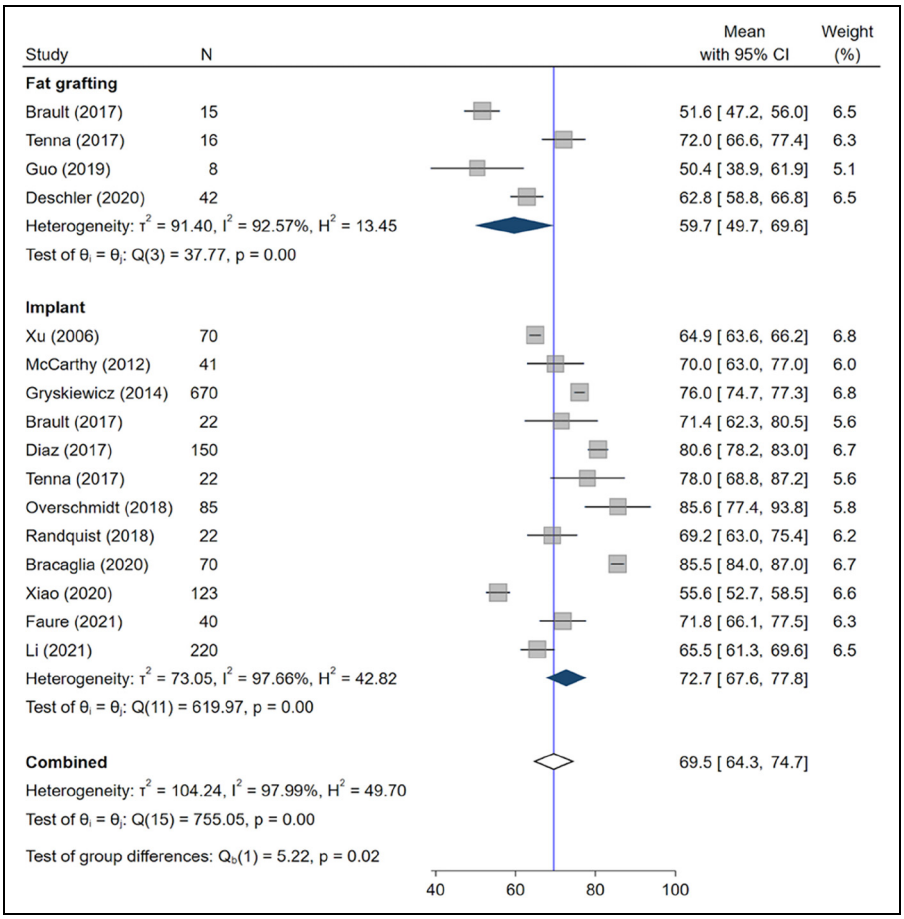

Figure 3. Forest plot of post-op satisfaction scores, stratified by augmentation method (raw mean).

Table 3. Univariable Meta-Regression of Post-Op Satisfaction Score on Baseline Characteristics.

Factor	Studies	Mean	95% CI	*P*-value	R^2 (%)	I^2 (%)
Age, mean	13	0.86	(−0.15, 1.86)	.094	14.2	97.7
BMI, mean	8	2.83	(−1.02, 6.68)	.149	14.5	97.9

Table 4. Multivariable Meta-Regression of Post-Op Satisfaction Score.

Factor	Mean	95% CI	*P*-value
Implant method	10.45	(−5.59, 26.49)	.202
Age, mean	1.01	(−0.32, 2.35)	.137
BMI, mean	3.51	(0.16, 6.87)	.040
Joint test of coefficients: 80.36			
P-value: 0.044			
R^2: 45.7%			
I^2: 94.3%			
Studies: 8			

using the same augmentation technique were pooled to create a single summary for that study.

Mean scores from the BREAST-Q instruments were meta-analyzed using random-effects models with the empirical Bayes between-study variance estimator.[13] As pre-operative scores were not consistently available, the primary outcome measure was the post-operative mean BREAST-Q score and whether the pooled average was different between breast augmentation methods, either using implants or fat grafting. Therefore, post-operative mean scores were stratified by the surgical method as the main factor of interest. Inferences about the differences in pooled subgroup means were performed using meta-regression. In addition, reported demographics in the pre-operative period (eg, age, BMI) were used to explore possible sources of heterogeneity by meta-regression.

Between-group heterogeneity was characterized using the random-effects heterogeneity parameter (τ^2) and I^2, which describe the absolute or relative degree of between-study heterogeneity. For the meta-regression models, the adjusted R^2 statistic was used to assess the proportion of variance between studies, which could be attributed to the covariates. Publication bias was assessed by funnel plots, as well as Egger's regression test. Finally, Galbraith plots with the same random-effects model were assessed to examine between-study heterogeneity and identify potential outlier studies.

Bivariate meta-regression of scores were used to corroborate whether and to what extent were potential differences in pooled estimates of post-op scores between surgical methods confounded by

the few available pre-operative scores. These models included the surgical method as the only factor and were fit using a random-effects model, a restricted maximum likelihood estimator. A conservative value of 0.2 was assumed for the within-study correlation between pre-op and post-op scores. All analyses were performed in Stata 17 (StataCorp LLC, College Station, TX, USA).

Results

Study Characteristics

The search strategy identified a total of 1398 articles, and an additional five were added from relevant reviews discovered in the search. After duplicates were removed, a total of 597 articles were screened using titles and abstracts. A total of 57 articles were selected for full-text review, and 22 fit the inclusion criteria and were deemed suitable by both reviewers and independent arbitrators for data extraction. The Cohen's Kappa scores were 0.87 for the primary screen and 0.88 for the secondary screen. All studies included received a MINORS score of 60% or higher. Of these 22 studies, 14 included data that could be pooled for a meta-analysis, including two fat grafting studies, 10 implant studies, and 2 studies that included data from both methods. The total number of patients included in this study was 1616, with 81 in the fat grafting group and 1535 in the implant group.

Post-Operative Satisfaction Score

Two small studies (Brault and Tenna) reported on both fat grafting and implant augmentation methods (Table 1). The mean satisfaction score for implants was 12.9 points greater than with fat grafting (95% CI: −0.6, 26.5, $P = .061$; Figure 2), with only moderate heterogeneity ($Q = 2.68$, $P = .11$).

There were 14 studies that reported post-operative satisfaction scores and infrequently reported pre-operative scores (Table 2). Mean post-operative scores were pooled for each method of augmentation, and overall (Figure 3), there was no evidence of publication or small study bias, but the relative heterogeneity within augmentation groups was high.

The mean overall satisfaction score in the implant group was statistically greater than in the fat grafting group (Figure 3). Based on meta-regression, the estimated difference in mean post-op satisfaction scores is 13.0 (95% CI: 2.4-23.5; $P = .016$). The augmentation method explained 26.4% of observed variation.

Table 3 shows a univariable meta-regression of post-operative satisfaction scores on mean post-op age and BMI. Despite some studies failing to report demographic details, both age and BMI were strongly associated with greater post-op satisfaction scores. Both factors explained about 20% of observed variation among the subset of reporting studies.

Meta-regression of post-operative scores on age, BMI and method substantially reduced the between-study heterogeneity parameter (τ^2), reduced (I^2), and increased the proportion of explained variance (R^2). The implant method was still associated with a greater score than fat grafting after adjusting for age and BMI. Overall, these three factors appear to account for much of the between-study heterogeneity (Table 4).

To support the claim that differences in post-operative mean scores between methods are not confounded by pre-operative scores, a bivariate meta-regression was conducted to account for pre-op scores, using method as the only covariate. Using bivariate meta-regression, the mean change in the implant group was greater in magnitude but not statistically significant from the change in the fat grafting group 12.4 (95% CI: −4.9 to 29.6; $P = .160$). That this difference was similar in magnitude corroborates that pre-op scores did not differ between groups. Following bivariate meta-analysis, heterogeneity was reduced in post-op scores ($I^2 = 74.4\%$).

Post-Operative Sexual Well-Being Score

Two small studies reported on both fat grafting and implant augmentation methods. The mean sexual well-being score was similar in both implant and fat grafting groups (difference = -0.4, 95% CI: −16.9, 16.0, $P = .96$), with moderate heterogeneity ($Q = 3.41$, $P = .06$).

There were 13 studies that reported post-operative sexual well-being scores (Table 5). Mean post-op scores were pooled for each

Table 5. Reported Pre-Op and Post-Op Sexual Well-Being Scores (N = 13 Studies).

Study	Method	Size (N)	Post-op score mean (SD)	Post-op score mean (SD)
Overschmidt (2018)	Implant	13	36.2 (20.8)	95.1 (7.8)
Overschmidt (2018)	Implant	72	36.7 (18.2)	90.4 (13.5)
Randquist (2018)	Implant	22	n.r.	80.0 (22.7)
Guo (2019)	Fat grafting	8	25.6 (16.9)	75.4 (12.3)
Xu (2006)	Implant	70	16.1 (9.3)	83.9 (8.5)
Deschler (2020)	Fat grafting	42	40.4 (18.0)	57.1 (17.6)
Diaz (2017)	Implant	150	n.r.	88.0 (17.8)
McCarthy (2012)	Implant	41	35.0 (19.0)	72.0 (29.0)
Bracaglia (2020)	Implant	70	35.4 (25.7)	91.6 (6.5)
Xiao (2020)	Implant	66	35.6 (6.7)	51.0 (8.3)
Xiao (2020)	Implant	57	36.2 (8.8)	52.8 (9.3)
Faure (2021)	Implant	40	n.r.	62.4 (17.4)
Li (2021)	Implant	65	29.4 (9.7)	61.5 (14.6)
Li (2021)	Implant	155	30.5 (10.4)	62.4 (25.5)
Brault (2017)	Fat grafting	15	n.r.	56.8 (19.3)
Brault (2017)	Implant	22	n.r.	65.7 (24.4)
Tenna (2017)	Fat grafting	16	n.r.	82.0 (18.0)
Tenna (2017)	Implant	22	n.r.	74.0 (14.0)

Abbreviations. n.r., not reported; SD, standard deviation.
For analysis, groups were pooled within studies if the same augmentation method was used.

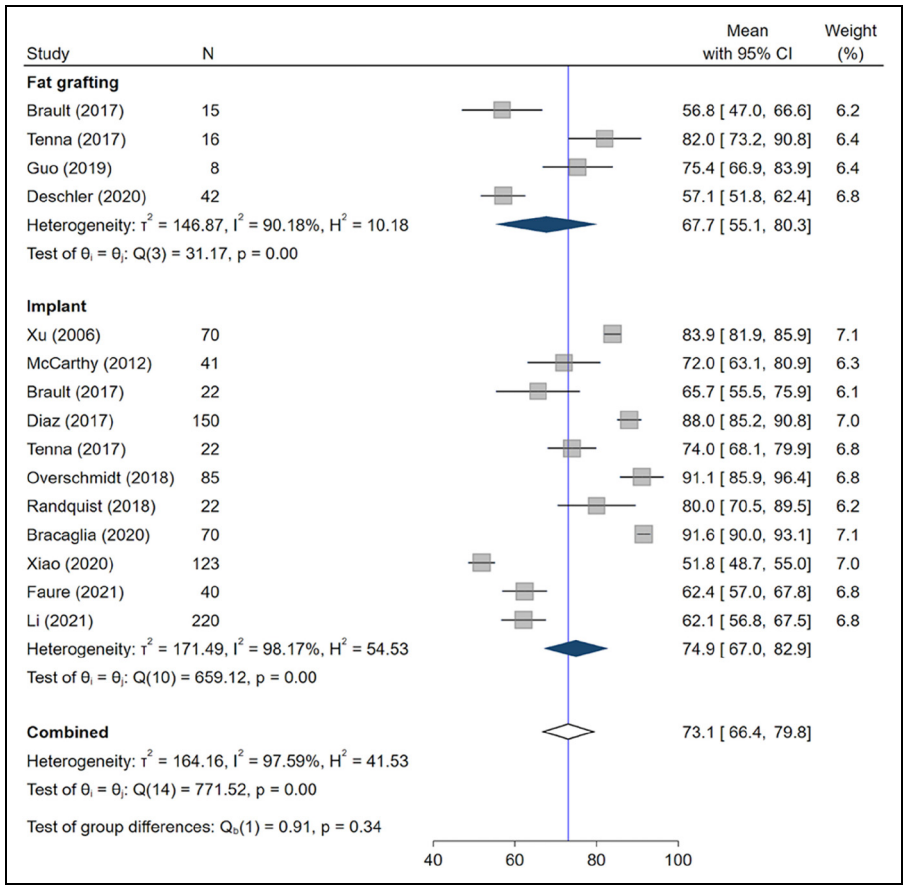

Figure 4. Forest plot of post-op sexual well-being scores, stratified by augmentation method (raw mean).

method of augmentation and overall (Figure 4). There was no evidence of publication or small study bias, but the relative heterogeneity within augmentation groups was high.

Post-Operative Psychosocial Well-Being Score

Two small studies reported on both fat grafting and implant augmentation methods. The mean sexual well-being score was similar in both implant and fat grafting groups (difference = -2.8, 95% CI: −3.1, 8.6, $P = .35$), with no heterogeneity ($Q = 0.96$, $P = .33$).

There were 13 studies that reported post-operative psychosocial well-being scores that could be pooled (Table 6). Mean post-operative scores were pooled for each method of augmentation and overall (Figure 5).

The pooled mean in the implant group showed no statistically significant difference than in the fat grafting group (Figure 5). Based on meta-regression, the estimated difference in mean post-operative psychosocial well-being scores is 10.1 (95% CI: −4.8 to 25.1; $P = .184$). The augmentation method explained 5.4% of observed variation. The study by Xiao et al (2020) is an apparent outlier based on a Galbraith plot. Excluding this study resulted in a more precise estimate of the difference between methods, in which the average implant group had a significantly higher score than fat grafting by 13.1 (95% CI: 1.2-25.1; $P = 0.031$). The variation explained by the method also increased to 24.1%.

Despite some studies failing to report demographic details, a greater age and BMI were strongly associated with higher post-operative psychosocial well-being scores. Both factors explained about 20% of observed variation among the subset of reporting studies.

Meta-regression of post-operative scores on age and method substantially reduced the between-study heterogeneity parameter (τ^2), reduced (I^2), and increased the proportion of explained variance (R^2). BMI was not associated with post-op score in univariate regression and was not included in this model. The implant method is still associated with a greater score than fat grafting after adjusting for age and excluding the single outlier study by Xiao (2020) (Table 7).

Post-Operative Physical Well-Being Score

No studies provided a direct comparison of the physical well-being scores. There were 8 studies that reported post-operative sexual well-being scores that could be pooled (Table 8). Mean post-op scores were pooled for each method of augmentation and overall (Figure 6).

The pooled mean in the implant group showed no statistically significant difference compared to the fat grafting group (Figure 6). Based on meta-regression, the estimated difference in mean post-op physical well-being scores is −10.4 (95% CI: −46.0 to 25.3; $P = .569$).

The study by Faure et al (2021) was identified as an outlier based on Galbraith and funnel plots. Excluding this study resulted in making estimates of mean scores in each augmentation group more similar, with a difference in means of −1.0 (95% CI: −7.2 to 5.3; $P = .762$) (Figures 7 and 8).

Discussion

BREAST-Q is a validated tool that can be used to evaluate patient-reported QoL in post-operative breast augmentation patients.[13] This meta-analysis investigated the QoL using BREAST-Q in patients who underwent primary breast augmentation with either fat grafting or breast implants. To our knowledge, there has been no other study that compared breast augmentation using exclusively breast implants or exclusively fat grafting for cosmetic breast augmentation.

Overall, the results demonstrated that patients who received implant-based breast augmentation reported a higher overall satisfaction scores than those who received fat grafting. The results show no difference among both groups in terms of sexual well-being, physical well-being, and psychosocial well-being scores in the BREAST-Q modules. Implant-based augmentation is one of the most common cosmetic procedures, and surgeons have developed standardized methods to give an overall more reliable and predictable result in the size and shape of the breasts, which could possibly explain increased patient satisfaction.[14] In comparison, fat grafting is a newer procedure that lacks standardized surgical methods. The major limitation of fat grafting is the limited volume increase that can be reliably achieved and the degree of fat resorption, which can be up to 60% of fat injected.[15] More long-term follow-up studies are needed to determine the satisfaction of patients over their lifetime post-augmentation.

In this study, there were two major outliers. One implant study reported lower physical well-being scores; this is likely because it was a tuberous breast study.[16] A possible explanation is that patients who undergo breast augmentation with tuberous breasts sometimes require several surgical procedures during their primary procedure and often suffer from more severe post-operative symptoms, including bruising and swelling, which may impact the patient's QoL.[17] The second outlier was in the psychosocial well-being scores with a study from the implant group.[18] This study was conducted in China and may demonstrate cultural differences in what different groups define as psychosocial well-being. BREAST-Q was originally written in English with standardized questions and has since been translated into many languages. This study, as an outlier, may be more reflective of the need to not only ensure adequate translation of the modules but also to ensure that the modules are adapted to account for cultural differences when being disseminated to patients outside of North America.

In the context of the current practice, most breast augmentation is implant-based augmentation, which explains why more studies are focused on breast implants.[6] Worldwide, there is also significant variability in terms of surgical techniques and types and shapes of implants used, leading to a lack of standardization when using studies from around the world.[19]

In the future, it would be beneficial to investigate other ways to improve fat grafting techniques and improve outcomes for fat grafting patients. Additionally, larger studies comparing breast implant patients to fat grafting patients with matched cohort data would help draw more accurate conclusions on the true difference in QoL outcomes between the two groups.

Limitations

There was a lack of randomized control studies, likely due to the challenges with ethical and logistical concerns of patients receiving cosmetic breast augmentation.[20] Although this study aims to assess patient satisfaction with a similar goal, breast augmentation, the

Table 6. Reported Pre-Op and Post-Op Psychosocial Well-Being Scores (N = 13 Studies).

Study	Method	Size (N)	Post-op score mean (SD)	Post-op score mean (SD)
Overschmidt (2018)	Implant	72	49.5 (18.1)	91.0 (12.9)
Overschmidt (2018)	Implant	13	48.2 (14.1)	93.2 (12.7)
Randquist (2018)	Implant	22	n.r.	84.0 (21.0)
Guo (2019)	Fat grafting	8	37.1 (12.7)	55.1 (11.7)
Xu (2006)	Implant	70	10.2 (13.1)	78.9 (10.1)
Deschler (2020)	Fat grafting	42	43.1 (22.8)	63.5 (16.4)
Diaz (2017)	Implant	150	n.r.	89.1 (16.5)
McCarthy (2012)	Implant	41	45.0 (19.0)	78.0 (24.0)
Bracaglia (2020)	Implant	70	44.3 (10.9)	89.9 (8.7)
Xiao (2020)	Implant	57	36.5 (5.1)	48.5 (9.2)
Xiao (2020)	Implant	66	35.8 (5.5)	47.4 (6.9)
Faure (2021)	Implant	40	n.r.	64.7 (16.7)
Li (2021)	Implant	65	40.7 (13.4)	67.6 (17.8)
Li (2021)	Implant	155	41.4 (14.1)	71.9 (21.0)
Brault (2017)	Fat grafting	15	n.r.	67.2 (23.4)
Brault (2017)	Implant	22	n.r.	63.0 (22.8)
Tenna (2017)	Fat grafting	16	n.r.	79.0 (12.0)
Tenna (2017)	Implant	22	n.r.	83.0 (8.0)

Abbreviations. n.r., not reported; SD, standard deviation.
For analysis, groups were pooled within studies if the same augmentation method was used.

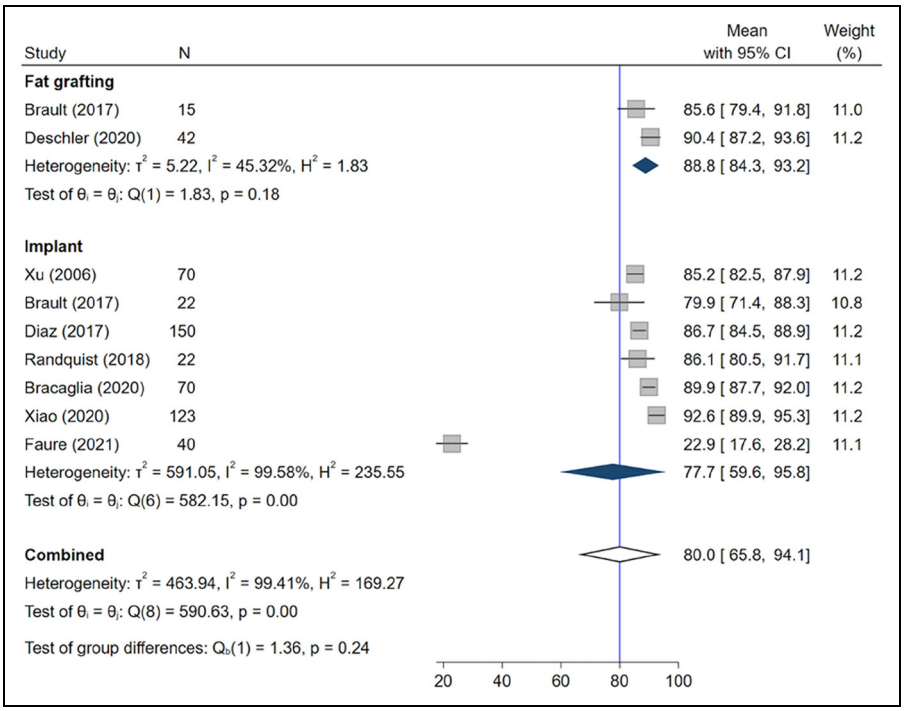

Figure 5. Forest plot of post-op psychosocial well-being scores, stratified by augmentation method (raw mean).

Table 7. Multivariable Meta-Regression of Post-Op Satisfaction Score.

Factor	Mean	95% CI	*P*-value
Implant method	12.13	(2.19, 22.06)	.017
Age, mean	1.25	(0.48, 2.03)	.002
Joint test of coefficients: 36.93			
P-value: 0.000			
R^2: 71.4%			
I^2: 82.9%			
Studies: 11			

Table 8. Reported Pre-Op and Post-Op Physical Well-Being Scores (N = 8 Studies).

Study	Method	Size (N)	Post-op score mean (SD)	Post-op score mean (SD)
Randquist (2018)	Implant	22	n.r.	86.1 (13.4)
Xu (2006)	Implant	70	87.1 (10.4)	85.2 (11.7)
Deschler (2020)	Fat grafting	42	90.1 (15.0)	90.4 (10.6)
Diaz (2017)	Implant	150	n.r.	86.7 (13.5)
Bracaglia (2020)	Implant	70	92.1 (10.2)	89.9 (9.0)
Xiao (2020)	Implant	57	92.8 (6.7)	92.8 (8.0)
Xiao (2020)	Implant	66	93.1 (7.1)	92.4 (7.0)
Faure (2021)	Implant	40	n.r.	22.9 (17.1)
Brault (2017)	Fat grafting	15	n.r.	85.6 (12.2)
Brault (2017)	Implant	22	n.r.	79.9 (20.1)

Abbreviations. n.r., not reported; SD, standard deviation.
For analysis, groups were pooled within studies if the same augmentation method was used.

two surgical methods are incredibly different with different patient expectations and goals. The much smaller patient population in the fat grafting group was a major obstacle in this review. It is important to note that at baseline, patients who opt for breast augmentation with breast implants versus fat grafting are different. Patients who choose to have fat grafting accept a risk of unpredictable volume increase but allow for a subtle and natural augmentation, while those who chose breast implants are choosing a predictable volume increase. Therefore, depending on the information provided to the patients pre-operatively, it could affect their expectations and, thus, some of their post-operative BREAST-Q scores. BREAST-Q is non-specific to breast augmentation; however, the data still represents deficiencies in fat grafting that need to be addressed. There was also not enough pre-operative data to measure the change in BREAST-Q scores across both groups accurately.

Furthermore, the time between surgery and the final BREAST-Q score typically ranged from 3 to 12 months postoperatively. Studies that reported early BREAST-Q scores may not represent the final results and post-operative satisfaction, particularly for the fat grafting group.

Conclusion

Overall, our study represents the first meta-analysis using BREAST-Q scores to compare patient satisfaction with

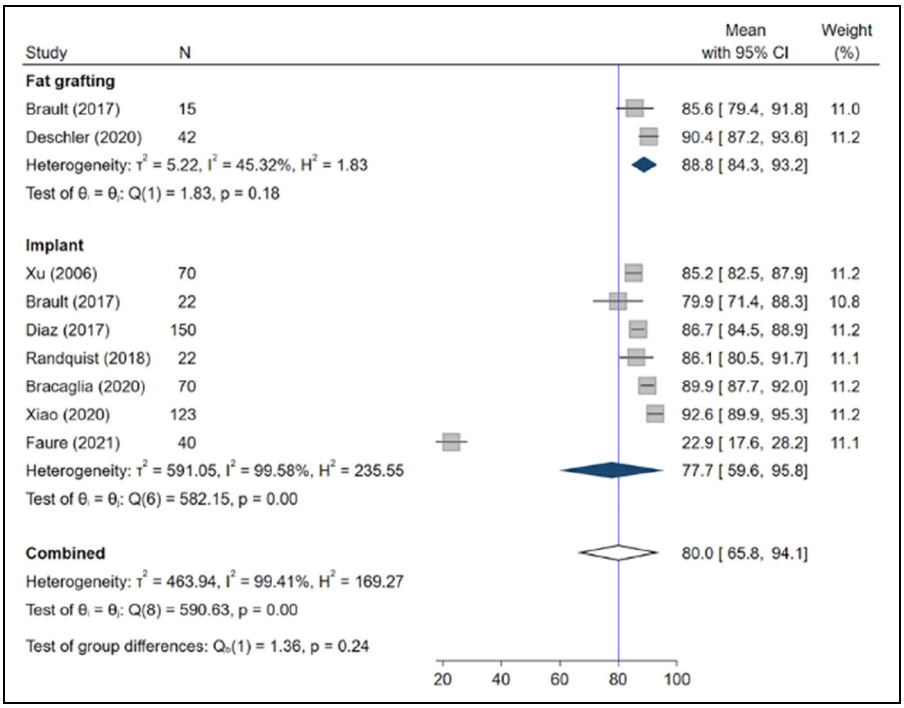

Figure 6. Forest plot of post-op physical well-being scores, stratified by augmentation method (raw mean).

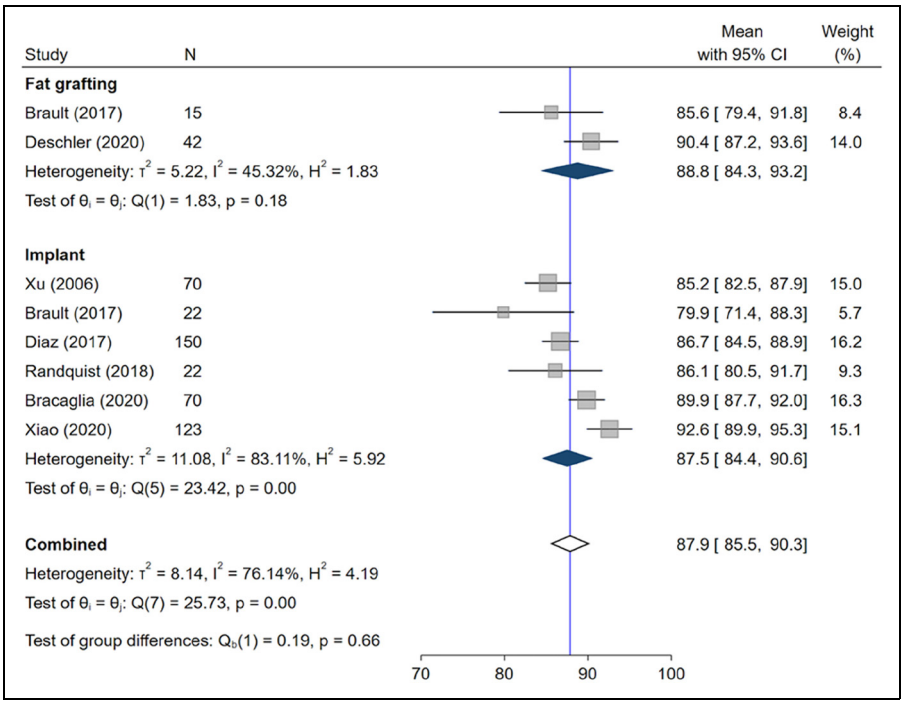

Figure 7. Forest plot of post-op physical well-being scores, stratified by augmentation method (raw mean), excluding outlier.

implant versus fat grafting techniques for primary breast augmentation. We found that there was a mean 13-point higher mean satisfaction score in the implant group, although there was no statistically significant difference in the other QoL parameters evaluated by the BREAST-Q score. More research using standardized methodology and longer-term follow-up is needed to further characterize patient satisfaction with the augmentation method. However, currently, our review suggests that those who undergo implant augmentation are 'happier' with their results.

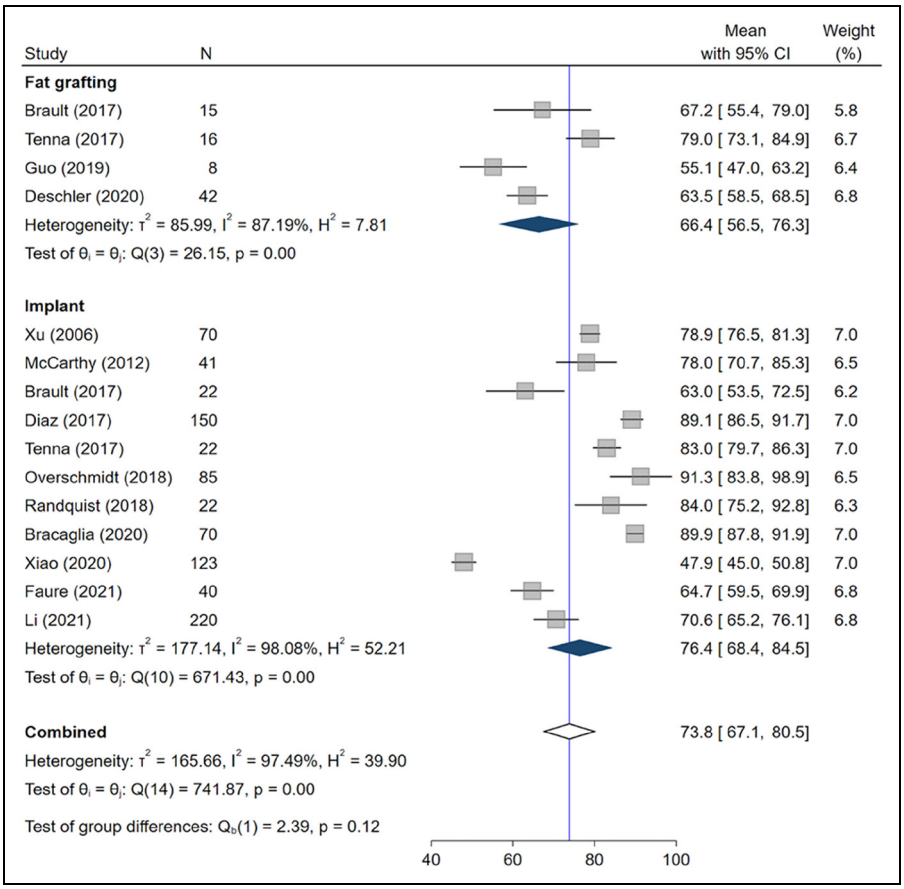

Figure 8. Forest plot of post-op physical well-being scores, stratified by augmentation method excluding outlier.

Declaration of Conflicting Interests

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Ethical Statement

In accordance with ethical standards, ethical approval was not required for this review.

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