Abstract: Health insurance funds in Germany are increasingly reluctant to fund the cost for reduction mammoplasty. However, several studies have already demonstrated the beneficial effects of breast reduction on symptom relief and health-related quality of life. More specifically, the psychological and social consequences of breast reduction surgery were also recently evaluated. Relating to the contemporary debate on financial restraint, the present article describes a follow-up study conducted in a sample of 40 patients undergoing reduction mammoplasty. The purpose of the investigation was to assess indicators of health-related quality of life following reduction mammoplasty. Furthermore, the study aimed to assess body image changes and to test a new assessment instrument - Digital-Body-Photo-Test (DBFT) - in comparison...
with a well-validated body image measure (Colour-A-Person Body Dissatisfaction Test - CAPT) (concurrent validity). As hypothesized the findings indicate significant improvements in health-related quality of life measures and body image characteristics. The substantial improvement of body image satisfaction of all body areas suggests a generalised positive effect of reduction mammaplasty on overall body image. The strong association between the DBFT- and the CAPT-scores in this study indicate that DBFT is an efficient and valid new tool for measuring body image changes relating to patients' evaluations of their average satisfaction of specific body parts or areas, and their overall appearance acceptance.
Please find attached the point-by-point response to the comments of the reviewers.

Comments of the 1. Reviewer:

1. Statistics on the number of breast reductions performed in Germany (as well as the percentage covered by insurance) would be a nice addition to the introduction.

I added the sentence that there are only estimations about the number of breast reductions performed in Germany because there is no registration. In contrast to the USA there is no valid information about the number of breast reductions performed in Germany. Experts guess that 30,000 breast reductions were performed in Germany per year.

2. The third sentence of the introduction requires a citation.
I added a citation.

3. In general, the introduction would benefit from updating and a more detailed discussion of the supporting literature. Young and Watson have recently reviewed this literature in detail in Sarwer, Pruzinsky et al's book, Psychological Aspects of Reconstructive and Cosmetic Plastic Surgery. This chapter should likely be included here.

I included the literature and updated the introduction.

4. The Pruzinsky and Edgerton reference, while relevant, is now dated. I believe that Pruzinsky's chapter in Sarwer et al's book also makes this point.

A current study of Glatt et al. concerning body image is added.

5. The biggest concern about the manuscript centers around the validation procedures for the DBFT. The authors did not appear to follow more traditional validation strategies for a psychometric measure, which would have involved a series of studies with a variety of samples. In addition, there is no evidence of discriminant validity, which would have required the use of a non-surgical control group (a curious omission from this study). In the absence of these methods, it is not accurate for the authors to conclude that they have established the validity of the DBFT. The other main findings from this study are interesting and consistent with the existing literature and, thus, make a worthwhile contribution to the literature.

The DBFT is a new instrument. Therefore we evaluated it in comparison with a well-validated body image measure (Colour-A-Person Body Dissatisfaction Test - CAPT). We proved the so called concurrent validity of the DBFT by comparing it with a well-validated test. This is one of the possibilities to prove the criterion validity of a test (see Fisseni, H-J. Lehrbuch der psychologischen Diagnostik. Göttingen 1990, S. 79).
We also have had a control group of German psychological students (like it is common in other studies). But we have to notice that there was a big bias caused by
our controls. Our controls scored in all measures (not also in the DBFT but also in the BSF, GBB, LSI, WHOQOL-Bref, ASCA higher than normal comparison groups). We have to conclude that psychological students from Berlin have much more complaints and a reduced quality of life and that most of them are depressive. On the CAPT and also in the DBFT they showed a distorted image. Therefore, we decided not to report about our controls and to choose a validation strategy that shows that the DBFT is reliable to the CAPT which is a well-validated body image measure. In the literature you can find concurrent validity as a valid approach to prove the validity of a test.

6. The statistical data (F and t tests etc.) should be reported in the text. Similarly, the figures could be improved. Figures and tables of the same data are not necessary.

The standard deviations have not been included in several of the tables. The results of F and t tests are reported and the figures are removed. In all case the standard deviations are reported.

7. The statement "none of our participants reported solely medical reasons" is curious. 86% of pts wanted to be relieved of pain. Many people would likely see this is a medical reason for breast reduction. The statement is deleted.

8. The first paragraph of the discuss relies on dated studies. It should be updated using the Young and Watson chapter. A two paragraph discussion does not do this study justice. The first paragraph is updated. The second paragraph is been corrected.

Reviewer #2: Drs Borkenhagen et al report on their study of 40 women undergoing reduction mammaplasty. The focus of their study is a pre to postoperative comparison of self-reported health related quality of life and body image. They used 6 different instruments to collect their data. All measures showed improvement from preop to postop consistent with prior literature.

For the Digital-Body-Foto-Test, since it is a new instrument, it would be useful if the authors could share any data on the reliability and validity of the test. If this information is not yet available, then the authors should state such in their discussion of possible weaknesses of the study design.

The weaknesses of the study design – missing of a data from controls – is described.

The authors also used the Colour-A-Person Body Dissatisfaction Test which is well validated but it is not made clear to the readers the possible merit of the DBFT over the CPBD. For instance, why not just use the latter? The reader could probably sort this out if they were willing to track down the references cited by the authors but it would strengthen the paper if a brief summary were included.

A sentence is added which emphasizes that the DBFT is a combination of the Color-A-Person-Test and self-assessment-tests like the Body-Cathexis-Scale and that using a digital photo like in the DBFT instead of female silhouettes leads to high
emotional identification, which implies more valid results. A further argument is the applicability of the measurement: the images used for the test ratings were those obtained by the surgeons in the process of preparation for mammaplasty.
Mean (SD) of GBB-Subscales, *** = significant, with p ≤ .001
Dissatisfaction with Breasts

Scored Mean of DBPT-Breast-Scale, *** = significant, with p ≤ .001

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<th>T1</th>
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Figure
Short title: Body Image and Quality of Life Following Breast Reduction

Title: Changes in Body Image and Health-Related Quality of Life Following Breast Reduction Surgery in German Macromastia Patients: a new Tool for Measuring Body Image Changes

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Abstract:

Health insurance funds in Germany are increasingly reluctant to fund the cost for reduction mammaplasty. However, several studies have already demonstrated the beneficial effects of breast reduction on symptom relief and health-related quality of life. More specifically, the psychological and social consequences of breast reduction surgery were also recently evaluated. Relating to the contemporary debate on financial restraint, the present article describes a follow-up study conducted in a sample of 40 patients undergoing reduction mammaplasty. The purpose of the investigation was to assess indicators of health-related quality of life following reduction mammaplasty. Furthermore, the study aimed to assess body image changes and to test a new assessment instrument - Digital-Body-Photo-Test (DBPT) – in comparison with a well-validated body image measure (Colour-A-Person Body Dissatisfaction Test - CAPT) (concurrent validity). As hypothesized the findings indicate significant improvements in health-related quality of life measures and body image characteristics. The substantial improvement of body image satisfaction of all body areas suggests a generalised positive effect of reduction mammaplasty on overall body image. The strong association between the DBPT- and the CAPT-scores in this study indicate that DBPT is an efficient and valid new tool for measuring body image changes relating to patients' evaluations of their average satisfaction of specific body parts or areas, and their overall appearance acceptance.

Keywords: body image, reduction mammaplasty, health-related quality of life, self-esteem, surgery outcomes

Introduction
Reduction mammaplasty is one of the most common procedures in plastic surgery. In contrast to the USA there is no valid information about the number of breast reductions performed in Germany. Experts guess that about 30,000 breast reductions were performed in Germany per year. Unfortunately, rejection of insurance coverage and policy exclusions for breast reduction are becoming increasingly common in Germany\(^1\). More often reduction mammaplasty is seen as a purely cosmetic operation by the German health insurance funds. According to the definition of reconstructive surgery by the American Society of Plastic Surgeons (ASPS) reduction mammaplasty is considered reconstructive in nature. Women who seek reduction mammaplasty are primarily interested in having average-sized breasts that are proportional to the rest of their bodies\(^2\). The improved physical and psychosocial functioning that leads to an enhanced quality of life has to be seen as an additional benefit of reduction mammaplasty. Accordingly several studies in recent years revealed positive changes in body image and increase in self-esteem in patients following reduction mammaplasty\(^2\). But studies investigating the outcome and the implications on psychosocial functioning of German women undergoing reduction mammaplasty are very rare\(^3\).

Health-Related Quality of life, Mood, Complaints and Body Image in Patients with Macromastia

The majority of reduction mammaplasty patients present with physical complaints ranging from neck, shoulder, and upper back pain, to the inability to perform daily or work-related activities. Most empirical studies describe a high satisfaction rate after reduction mammaplasty. Significant improvements in emotional, psychological, and physical well-being\(^2\)\(^4\)\(^5\)\(^6\)\(^7\)\(^8\)\(^9\)\(^10\)\(^11\)\(^12\)\(^13\) were reported by patients who underwent bilateral breast reduction. In a meta-analysis of published studies, Chadbourne\(^13\) reported that current evidence suggests that women undergo-
ing reduction mammaplasty have significant postoperative improvement of symptoms and quality of life.

Jones\textsuperscript{11} found in her review of studies\textsuperscript{14 15 16 17 18} on the benefits of reduction mammaplasty consistent improvements in patient’s quality of life scores as well as body image and psychological well-being (especially self-esteem)\textsuperscript{17 18}. Young & Fung\textsuperscript{2} added in their review 3 current studies\textsuperscript{19 20 21} which revealed also significant improvement in quality of life as well as in psychological well-being. Mizgala\textsuperscript{18} demonstrated an improvement in self-esteem of 85% and of 77% in activity level. 95% of the respondents felt they had made the right decision in having breast reduction surgery and 31% of patients reported improvement in their intimate relationship postoperatively. The prospective study by Hollyman et al.\textsuperscript{10} showed that the women displayed a distorted body image, low self-esteem, and poor body perception prior to mammaplasty. After reduction mammaplasty, body image returned to normal, and patients’ views of their femininity and sexual attractiveness were enhanced. The distorted body image adversely affects psychosocial functioning and quality of life in reduction mammaplasty patients is often described. Glatt et al.\textsuperscript{6} specifically investigated the body image concerns of reduction mammaplasty patients after procedure. They found the reduction patients’ postoperative scores on the BDDE-SR (Body Dysmorphic Disorder Examination-Self Report) were significantly lower than those reported by women awaiting breast reduction surgery, as well as those who sought other forms of cosmetic surgery. But studies about health-related quality of life and changes in body image in German reduction mammaplasty patients are rare\textsuperscript{3}.

Methods

In this prospective study we assessed 40 consecutive female mammaplasty patients, preoperatively and postoperatively, using measures of health related quality of life and body image (body part satisfaction and overall body image).
We evaluated a specific new assessment tool (Digital-Body-Photo-Test - DBPT) in comparison with a well-validated instrument - Colour-A-Person Body Dissatisfaction Test (CAPT).\(^{22}\) Investigating health-related quality of life following breast reduction surgery, scores on complaints lists were compared pre- and post-operatively, using scores in general German population as a benchmark. The following German standardized questionnaires were used to investigate several dimensions of health-related quality of life: physical symptoms and complaints with ‘Gießener Beschwerdebogen’\(^{23}\) (GBB, 24 Item scale version), which has been standardized for the German population; psychological well-being with the ‘Berliner Stimmungsfragebogen’\(^{24}\) (BSF, 6 scale version per 5 items). As a measure for global satisfaction with life a visual analogue scale was used (Anamnestic Comparative Self Assessment\(^{25}\), ACSA, 1 item), providing a mean score of satisfaction, ranging on a Likert-type scale from +5 (‘best time in life’) to -5 (‘worse time in life’). Other aspects of satisfaction with life were assessed with the ‘Lebenszufriedenheitsinventar’\(^{26}\) (LZI, 15 items), which includes a sum score and 14 items relating to different dimensions of life: family/partnership, health, personal characteristics/skills. One of the subscales also assesses the global satisfaction of life (scale 1 =‘very satisfied’, 5 =‘very unsatisfied’). We chose this questionnaire because it belongs to the Heath-Related-Quality-of-Life-questionnaires. Furthermore, the ‘WHO-Quality of Life Assessment’\(^{27}\) (WHOQOL-BREF, 26 items) was used. For the purpose of this study, a questionnaire was constructed to ascertain patients’ reasons and expectations concerning reduction mammoplasty and their assessment of surgery outcome.

**Digital-Body-Photo-Test (DBF-T) Approach**

For the assessment of different aspects of body image, including satisfaction of the breasts as well as other body parts and the overall integrated assessment of the body image pre and post mammoplasty, we developed the Digital-Body-Photo-Test (DBF-T).\(^{28}\)
In this new approach a digital photo of the patient is used instead of neutral female silhouettes (as in previous body image research); this leads to high emotional identification of the patients with the displayed image, implying construct validity of the test in respect of consecutive ratings on satisfaction with the body parts. This new approach combines methods like Colour-A-Person-Test and self-assessment-tests, for example the Body-Cathexis-Scale. It is important to note another advantage of this new measurement, because the images used for the test ratings were those obtained by the surgeons in the process of preparation for mammoplasty. After loading the digital photo to the computer the photo is divided into the following body parts by a raster: shoulders, décolleté, breasts, chest, stomach, hips, waist, arms, hands, thighs, lower legs. The patient is then confronted with the image and asked to indicate with different computer colours how satisfied she is with each body part, using a scale from 1 to 5. Being confronted with the own picture leads to high emotional identification of the patients with the displayed image, implying construct validity of the test in respect of consecutive ratings on satisfaction with the body parts. To analyse the data we calculate: (1) an index of the whole body with the mean of the labels of all body parts (overall body index), (2) an index for the problematic body parts: breasts, stomach, hip, waist, thighs (problematic body part index) and (3) an index for the neutral body parts: shoulders, décolleté, arms, hands, lower legs (neutral body part index).

Figure 1- about here

Statistical Analyses

Statistical analyses were performed using SPSS version 11.5 for windows and SAS 8.2. First, data were evaluated using paired t-test. Subsequently the Wilcoxon Matched Pairs Signed-Rank Test was used for pre- and post-operative comparisons with α-adjustment because the
data were not normally distributed. In addition, for the non-parametric comparison of the data the Kolmogorov-Smirnov-Test was used. Data of the Digital-Body-Photo-Test were analysed by 2-factor analysis of variance (ANOVA) with SAS 8.2 and an unpaired t-test. To evaluate the validity of the new Digital-Body-Photo-Test (DBF-T), Spearman’s rank order correlations are used for comparison the results of the DBF-T and the CAPT and taken as external criteria (concurrent validity).

Results
Study Cohort and Demographics
From January to December 2002, all 40 patients accepted for breast reduction surgery at the Department of Reconstructive Plastic Surgery/Park Hospital in Berlin were asked if they wanted to participate in the study. All 40 patients gave their formal written consent to participate and all patients were interviewed on the day prior to surgery. With the exception of 6 patients who moved away, the remaining 34 (85 %) patients were interviewed again after 3 months and after 6 months postoperatively. The age of patients ranged from 17 to 67 years, with a mean age of 41 (± 13.4) years. 57 % of the women were married, 25 % were singles, 15 % were divorced, 2 % were widowed. 60 % of the respondents were employed at the time of the survey. The mean duration between the request for a reduction mammaplasty and surgery was 4.6 years. The vast majority of patients (37 of 40) expected to have more comfortable feelings about their bodies and less pain postoperatively.

Comparison of Pre- and Postoperative Complaints
Prior to the operation, macromastia patients scored significantly higher on the GBB-subcales compared with an age- and gender-matched group of German women. The main complaint of patients was muscle pain. 3 and 6 months after surgery the patients scored lower and a com-
Comparison between the preoperative and 3 and 6 month postoperative scores showed a significant reduction of muscle pain and an overall increase of physical well-being. The improvement was of such a magnitude that the scores of the mammoplasty patients after the surgical procedure and the scores for the age- and gender-matched GBB-group were almost similar, indicating not only improvement but also normalization (see figure 2). Interestingly, the patients indicated less exhaustion than the age- and gender-matched group after surgery.

Table 1 - about here
Table 2 about here

Comparison of Preoperative and Postoperative Moods
The scores for depression on BSF decreased significantly after surgery (see table 4), whereas the scores for euphoria improved at the same time.

Table 3 about here
Table 4 about here

Comparison of Preoperative and Postoperative Life Satisfaction
Patients scored significantly higher on two of three subscales of the LZI-Questionnaire following surgery, indicating improvement (see table 6). These subscales were: health related quality of life and general satisfaction with life. The mean score for health related satisfaction was the most increased, compared with general satisfaction with life.

Table 5 about here
Table 6 about here

Comparison of Preoperative and Postoperative Quality of Life
Patients scored significantly higher on two of four subscales of the WHOQOL-BREF after surgery. These subscales were: psychological well-being and ‘environment’ which includes activity level as well as physical and psychological well-being (see table 8).

Table 7 about here
Table 8 about here

Comparison of Preoperative and Postoperative Global Life Satisfaction

The patients rated their current global life satisfaction on the visual analogue scale as significantly increased over the preoperative level, suggesting that there was an improvement across many important aspects of their quality of life (see table 10).

Table 9 about here
Table 10 about here
Motivation and Reasons Having Reduction Mammaplasty

Asked about the main reasons for having reduction mammaplasty the answers fell into 10 categories as follows: 87 % highlighted the improvement of body acceptance and of physical and psychological well-being as an important reason for undergoing mammaplasty surgery. 86 % wanted to be relieved of pain, 58 % to improve their self-confidence, 34 % to improve the fit of their clothes, 23 % to improve physical activity. For 21 %, increased physical attractiveness was also an important motivation when requesting reduction mammaplasty, 20 % complained about a lack of femininity, as a reason for requesting surgery. For 11 % less inhibition in social situations and in sexual relations was an important reason for undergoing mammaplasty. Many patients provided answers that fell into more than one category. The reasons for having reduction were condensed into three main categories: 1. motivation to relieve pain or other medical reasons, 63 %; 2. to improve body acceptance, self- and body-image and physical attractiveness, 76 %; and 3. to feel less inhibition in social situations and sexually, 26 %.

Expectations

After 6 months we asked: ‘Which expectations have been fulfilled up to now (presenting the 10 categories patients reported prior to surgery)?’ 76 % reported that they felt an improvement of general well-being and increased body acceptance, 72 % reported less pain, and 60 % referred to more self-confidence following the operation. 25 % indicated more physical activity, 41 % felt more feminine than prior to the operation and 36 % felt more physically attractive than before. 15 % stated that they felt less inhibited in social situations and in their sexuality and 29 % considered that clothes suited them better.
Final Overall Assessment of Reduction Mammaplasty

Patients were asked if they would have reduction mammaplasty again and if they would recommend this surgery to others. The vast majority of patients (97 %) stated that they would have mammaplasty again and only 3 % were not sure. 93 % would recommend mammaplasty to another woman with macromastia, 5 % did not know and 2 % would not recommend reduction mammaplasty to others.

Comparison of Preoperative and Postoperative Body Image Satisfaction

Satisfaction with different body areas

Preoperatively, the patients revealed in DBPT and in CAPT greater dissatisfaction (high scores) with the so-called female problematic body areas: breasts, stomach, hips, waist and thighs. Postoperatively, patients scored in both tests significantly lower, indicating higher satisfaction with these body parts (p < .0001). Interestingly, there was not only an improvement in the ratings of the problematic body part index in DBPT and CAPT, but it was also noticeable that the indices of the neutral body parts like shoulders, décolleté, arms, hands and lower legs significantly changed (p < .002) towards higher satisfaction with the neutral body parts. Comparing the pre- and postoperative DBPT and CAPT scores for problematic body parts excluding breasts, patients’ scores for dissatisfaction were again significantly lower following surgery (DBPT mean score: preoperative 4.06, postoperative 3.95, p < .049).

Spearman’s rank correlation of the DBPT/CAPT test was greater than 0.7, indicating concurrent validity of the DBPT with the CAPT.

Figure 3 about here

Table 11 about here

Comparison of preoperative and postoperative satisfaction scores with breasts
Prior to surgery the patients indicated in DBPT as well as in CAPT a great dissatisfaction with their breasts. 3 and 6 months after surgery satisfaction with their breasts was significantly (p < .0001) increased in both tests. Spearmans’ rank correlation of the DBPT/CAPT test greater than 0.8 demonstrates the concurrent validity of the DBPT with the CAPT.

Discussion:
Consistent with results of previous studies¹ 4 6 10 14 18 19 20 21, we found a significant improvement of body image satisfaction (especially of dissatisfaction with breasts and overall appearance) and health related quality of life in patients following reduction mammaplasty. The data of our study provide further evidence that reduction mammaplasty has a positive effect on patients’ physical and emotional health. The results obtained with the new body image assessment tool (DBPT) suggest that the body image of the breasts is fully incorporated into an integrated body image after surgery. This is important as it implies that the reorganization of the body image experienced by women who underwent reduction mammaplasty was not only a normalizing effect restricted to the problem areas, but also enabled them to develop higher satisfaction with all body areas.

Despite of the fact that the sample size was rather small, the strong positive association between the DBPT- and the well validated CAPT-scores indicate that DBPT is an innovative and promisingly new tool for measuring body image changes for both patients' evaluations of their average satisfaction with specific body parts or areas and their overall appearance acceptance. A possible weakness of the study design is that only the concurrent validity of the DBPT has been assessed yet. However, further studies are necessary in order to replicate the findings obtained with the DBPT in larger samples and controls and to evaluate the instru-
ment in other plastic surgery methods. Those studies should also aim to identify predictors of
positive and negative body image changes.

Literatur:
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Figure 1: Example of a Digital-Body-Photo-Test of a 35 Years Old Patient with Macromastia

Scale:
1 = very satisfied
2 = satisfied
3 = neither satisfied nor unsatisfied
4 = unsatisfied
5 = very unsatisfied
Figure 2: Comparison of Preoperative and Postoperative Complaints (on the GBB with GBB Norm Data)
Table 1: Mean Values and Standard Deviation of complaints on GBB

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<tr>
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<td>$\bar{X}$ [s]</td>
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Table 2: Comparison of Preoperative and Postoperative complaints

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<td>* [$&lt;0.0001$]</td>
<td>Ns [$0.024$]</td>
<td>ns [$0.241$]</td>
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Statistical analysis with $^1$Friedmann-test for more than two paired non-normal distributed samples and $^2$Wilcoxon-Test for two paired non-normal distributed samples with $\alpha$-Adjustment ($\alpha = 0.05$) after Bonferoni-Holm; * significant: $p < \alpha$ rep. $p < \alpha$ adjustated.
Table 3: Mean Values and Standard Deviation of Mood/Affect on BSF

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Table 4: Comparison of Preoperative and Postoperative Mood/Affect

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<td>Anger</td>
<td>ns [0.576]</td>
<td>ns [0.176]</td>
<td>Ns [0.909]</td>
<td>ns [0.581]</td>
</tr>
<tr>
<td>Commitment</td>
<td>ns [0.455]</td>
<td>ns [0.029]</td>
<td>Ns [0.136]</td>
<td>ns [0.838]</td>
</tr>
<tr>
<td>Euphoria</td>
<td>* [0.001]</td>
<td>* [&lt; 0.0001]</td>
<td>* [0.004]</td>
<td>ns [0.270]</td>
</tr>
</tbody>
</table>

Statistical analysis with ¹Friedmann-test for more than two paired non-normal distributed samples and ²Wilcoxon-Test for two paired non-normal distributed samples with α-Adjustment (α= 0.05) after Bonferoni-Holm; * significant: p< α rep. p < α adjustated
Table 5: Mean Values and Standard Deviation of Life Satisfaction scores on LZI

<table>
<thead>
<tr>
<th>Scale</th>
<th>$t_1$</th>
<th>$t_2$</th>
<th>$t_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$ [s]</td>
<td>$\bar{x}$ [s]</td>
<td>$\bar{x}$ [s]</td>
</tr>
<tr>
<td>Generally (LZ4-LZ10)</td>
<td>2.41 [0.66]</td>
<td>2.07 [0.79]</td>
<td>2.26 [0.70]</td>
</tr>
<tr>
<td>Health (LZ1-Z3)</td>
<td>2.41 [0.67]</td>
<td>2.27 [0.69]</td>
<td>2.15 [0.76]</td>
</tr>
</tbody>
</table>
Table 6: Comparison of Preoperative and Postoperative Life Satisfaction

<table>
<thead>
<tr>
<th>Scale</th>
<th>Progression $t_1$-$t_2$-$t_3$</th>
<th>Comparison $t_1$-$t_2$</th>
<th>Comparison $t_1$-$t_3$</th>
<th>Comparison $t_2$-$t_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally (LZ4-LZ10)</td>
<td>* [$&lt; 0.0001$]</td>
<td>ns [0.046]</td>
<td>* [0.003]</td>
<td>ns [0.106]</td>
</tr>
<tr>
<td>Health (LZ1-Z3)</td>
<td>* [$&lt; 0.0001$]</td>
<td>* [$&lt; 0.0001$]</td>
<td>* [0.001]</td>
<td>ns [0.962]</td>
</tr>
<tr>
<td>Family (LZ11,LZ12,LZ14)</td>
<td>ns [0.062]</td>
<td>ns [0.336]</td>
<td>ns [0.964]</td>
<td>ns [0.023]</td>
</tr>
</tbody>
</table>

Statistical analysis with 1) Friedmann-test for more than two paired non-normal distributed samples and 2) Wilcoxon-Test for two paired non-normal distributed samples with $\alpha$-Adjustment ($\alpha = 0.05$) after Bonferroni-Holm; * significant: $p < \alpha$ rep. $p < \alpha$ adjusted
Table 7: Mean Values and Standard Deviation of Quality of Life Scores on WHOQOL-BREF

<table>
<thead>
<tr>
<th>Scale</th>
<th>t₁</th>
<th>t₂</th>
<th>t₃</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X [s]</td>
<td>X [s]</td>
<td>X [s]</td>
</tr>
<tr>
<td>Environment</td>
<td>14.74 [2.31]</td>
<td>15.49 [2.74]</td>
<td>15.38 [2.64]</td>
</tr>
</tbody>
</table>
Table 8: Comparison of Preoperative and Postoperative Quality of Life

<table>
<thead>
<tr>
<th>Scale</th>
<th>Progression t₁-t₂-t₃ p₁</th>
<th>Comparison t₁-t₂ p²</th>
<th>Comparison t₁-t₃ p₃</th>
<th>Comparison t₂-t₃ p₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical well-being</td>
<td>ns [0.383]</td>
<td>ns [0.247]</td>
<td>ns [0.508]</td>
<td>ns [0.925]</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>* [0.017]</td>
<td>* [0.002]</td>
<td>* [0.003]</td>
<td>ns [0.762]</td>
</tr>
<tr>
<td>Relationship</td>
<td>ns [0.870]</td>
<td>ns [0.693]</td>
<td>ns [0.618]</td>
<td>ns [0.707]</td>
</tr>
<tr>
<td>Environment</td>
<td>* [0.019]</td>
<td>ns [0.046]</td>
<td>ns [0.112]</td>
<td>ns [0.885]</td>
</tr>
</tbody>
</table>

Statistical analysis with ¹Friedmann-test for more than two paired non-normal distributed samples and ²Wilcoxon-Test for two paired non-normal distributed samples with α-Adjustment (α= 0.05) after Bonferoni-Holm; * significant: p< α rep. p < α adjusted
Table 9: Mean Values and Standard Deviation of Global Life Satisfaction on ASCA

<table>
<thead>
<tr>
<th></th>
<th>$t_1$ $\bar{X}$ [s]</th>
<th>$T_2$ $\bar{X}$ [s]</th>
<th>$t_3$ $\bar{X}$ [s]</th>
</tr>
</thead>
</table>

0 = worst time in life; 10 = best time in life
Table 10: Comparison of Preoperative and Postoperative Global Life Satisfaction

<table>
<thead>
<tr>
<th>Scale</th>
<th>Progression t₁-t₂-t₃ p₁&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Comparison t₁-t₂ p²&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Comparison t₁-t₃ p²&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Comparison t₂-t₃ p³&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* [-0.0001]</td>
<td>* [0.001]</td>
<td>* [0.001]</td>
<td>Ns [0.116]</td>
</tr>
</tbody>
</table>

Statistical analysis with 1) Friedmann-test for more than two paired non-normal distributed samples and 2) Wilcoxon-Test for two paired non-normal distributed samples with α-Adjustment (α= 0.05) after Bonferoni-Holm; * significant: p< α rep. p < α adjusted
Figure 3: Comparison of Preoperative and Postoperative Body Dissatisfaction Scores (Comparison of Problematic Body Part Index and Neutral Body Part Index using a 2-factor Analysis of Variance (ANOVA)). Mean (SD) of Body Part Score

Mean (SD) of Body Part Score, *** = significant, with p ≤ .001
Table 11: Comparison of Preoperative and Postoperative Problematic Body Part Index and Neutral Body Part Index (ANOVA-type-statistic)

<table>
<thead>
<tr>
<th>QF</th>
<th>DF</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>57.395</td>
<td>1.4414</td>
</tr>
<tr>
<td>C</td>
<td>481.72</td>
<td>1.0000</td>
</tr>
<tr>
<td>TC</td>
<td>12.291</td>
<td>1.2545</td>
</tr>
</tbody>
</table>

T = time
C = group (Problematic Body Part Index and neutral Body Part Index)
TC = interaction of group and time
Figure 4: Comparison of Preoperative and Postoperative Breast Dissatisfaction Scores on the Digital-Body-Photo-Test