

# Personality Traits as Predictors of Quality of Life and Body Image after Breast Reconstruction

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**Background:** It has been suggested that personality traits may influence patient-reported outcomes of breast reconstruction, but the research is limited. We investigated, in a prospective study, whether personality traits predict the achieved body image and quality of life (QoL) after breast reconstruction.

**Methods:** Patients planning to undergo breast reconstruction at a University Hospital were consecutively recruited from January 2014 to January 2016. Participants completed validated measures of personality, body image, and QoL, before and 6 months after breast reconstruction. The influence of personality traits on achieved body image and QoL was explored with multivariate linear regression modelling, adjusting for baseline scores, demographics, and clinical variables.

**Results:** Of 247 eligible patients, 208 (84%) participated. Twelve patients (6%) were excluded due to failed reconstruction. Of the remaining 196 patients, 180 (92%) completed the follow-up questionnaire. When adjusted for baseline QoL scores, higher trait Neuroticism, higher trait Openness, and higher body mass index measured at baseline showed to be independent and statistically significant predictors of deteriorating QoL scores from baseline to 6-month follow-up ( $P < 0.001$ ;  $R^2 = 0.45$ ). When adjusted for body image scores at baseline, higher trait Neuroticism and immediate reconstruction were found to be independent predictors of poorer body image from baseline to 6-months follow-up ( $P < 0.001$ ;  $R^2 = 0.36$ ).

**Conclusions:** The present study suggests personality traits, in particular Neuroticism, as independent predictors of the achieved body image and QoL after breast reconstruction. Weighing in the personality traits of the patients may be an important adjunct in improving patient-reported outcomes after breast reconstructions. (*Plast Reconstr Surg Glob Open* 2017;5:e1341; doi: 10.1097/GOX.0000000000001341; Published online 25 May 2017.)

## BACKGROUND

Breast cancer is the most common cancer among women in Western Europe and the United States.<sup>1</sup> As the treatment leaves the patient with deformity or asymmetry of the breast, an increasing number of women pursue breast reconstructive procedures.<sup>2</sup> Currently, 16–40% of women

having received a mastectomy undergo a breast reconstructive procedure, and it has become an important part of the rehabilitation process.<sup>3–5</sup> Attaining a better body image and improving quality of life (QoL) are often, by the patients, listed as the predominant motivations for seeking a breast reconstructive procedure.<sup>5,6</sup> Patient-reported outcome measures have thus come to play an essential role as indicators of the success of the breast reconstruction.<sup>7</sup>

Previous studies have primarily focused on how treatment-related variables such as reconstructive procedure, timing of the reconstructive procedure, adjuvant therapy received, breast size, and surgical complications affect the patient-reported outcomes.<sup>8–12</sup> In addition to treatment-related variables, preoperative psychosocial factors such as depression, emotional distress, and state anxiety have been reported to correlate negatively with the achieved

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patient-reported aesthetic outcome.<sup>13</sup> These psychosocial factors can be considered as temporary emotional reactions, or states, which may be influenced by a variety of factors, including the patient's personality traits.<sup>14,15</sup> In contrast, personality traits are relatively stable over time.<sup>16</sup>

Research into the possible influence of personality traits on QoL in various cancer populations has gained interest during recent years.<sup>17–21</sup> For example, van der Steeg et al.<sup>21</sup> found personality traits, and especially high trait Neuroticism, to be associated with lower QoL after breast conserving surgery. Despite the significant associations reported between personality traits and general health-related QoL after breast cancer treatment, the impact of personality traits on patient-reported outcomes after breast reconstruction has, so far, only been explored in 1 study.<sup>22</sup> In a prospective study, Bellino et al.<sup>22</sup> found an independent positive correlation between the personality trait Harm Avoidance, as measured by the Temperament and Character Inventory (TCI), and change in QoL at a 3-month follow-up after immediate breast reconstruction with tissue expander. However, the generalizability of their results may be limited by the small sample size ( $N = 57$ ), the short follow-up period, and by only investigating a single type of reconstructive procedure. The findings by Bellino et al.<sup>22</sup> warrant further investigation in a larger cohort consisting of different types of breast reconstructive procedures. The present study aimed to fill this gap in the literature, hypothesizing that personality traits predict the achieved body image and QoL following reconstruction in a prospective, breast reconstructive cohort.

## PATIENTS AND METHODS

### Patients

All women planning to undergo delayed or immediate breast reconstruction at The Department of Plastic and Breast Surgery, Aarhus University Hospital, Aarhus, Denmark, between January 2014 and January 2016 were eligible to participate. Women with prior attempts at breast reconstruction and women with other types of breast surgery than mastectomy were excluded from participation.

### Questionnaires

Participating patients completed a baseline questionnaire in the month prior to their breast reconstruction and a follow-up questionnaire 6 months after their first breast reconstructive procedure. The questionnaires consisted of validated scales measuring QoL, body image, and personality. Additional questions on demographic- and health-related characteristics were included.

### Personality

Personality was evaluated with the Neuroticism–Extraversion–Openness Five Factor Inventory (NEO-FFI). The NEO-FFI is a 60-item questionnaire assessing the respondent's personality according to the five-factor model, which is considered the gold standard in personality assessment. The 5 personality traits are: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. The

psychometric properties of the NEO-FFI are well established and considered good.<sup>23</sup> As personality traits are relatively stable over time, they were only assessed at baseline.<sup>16</sup> Internal consistencies (Cronbach alpha) for the NEO-FFI subscales in the present sample ranged from 0.70 to 0.88.

### QoL

The Satisfaction With Life Scale (SWLS) was used to measure the patients overall QoL at baseline and at 6 months. The SWLS is one of the most widely used instruments evaluating subjective well-being.<sup>24</sup> The scale has high internal consistency and test–retest reliability.<sup>25</sup> The SWLS have in previous clinical studies shown satisfactory sensitivity to change when measuring the effect of interventions.<sup>26</sup> The Cronbach's alpha coefficient for the SWLS was 0.94 at 6 months.

### Body Image

Body image was evaluated at baseline and at 6 months using Hopwood's Body Image Scale (BIS).<sup>27</sup> The BIS was developed for use in breast cancer patients and consists of 10 items evaluating different aspects of body image.<sup>27</sup> The scale has high reliability, good clinical validity, and sensitivity to change, when used in breast cancer populations.<sup>27</sup> Cronbach's alpha for the BIS was 0.89 at 6 months.

### Statistical Analyses

Following previous recommendations,<sup>28</sup> missing values on individual subscale items were imputed with the mean value of the remaining items of the scale but only if fewer than 50% of the items were missing and internal consistency (Cronbach's alpha) of the scale was  $\geq 0.70$ . Missing values for single items were not imputed. Overall changes in the SWLS and BIS scores were assessed with paired  $t$  tests. Responders and nonresponders to the follow-up questionnaire were compared with  $t$  tests for independent samples,  $\chi^2$  tests, or Fisher's exact tests, as appropriate. The unadjusted associations between the dependent variables (BIS and SWLS scores) and the possible predictors at baseline (demographic variables, clinical variables, and personality traits) were analyzed with linear regression. In addition, 2 multiple, hierarchical linear regression models with BIS and SWLS 6-month scores as dependent variables and all predictors as the independent variables were examined. The analysis included 4 steps before reaching a final model. In the first step, the baseline value of the investigated dependent variable was entered. In the second step, demographic variables were assessed separately, and then entered with the variable from the first step (the baseline score), if statistically significant at the  $P < 0.10$  level. In the third step, clinical variables were assessed separately, and then entered with all variables from steps 1 and 2, which reached statistical significance at the  $P < 0.10$  level. In the fourth step, the scores on the 5 personality traits were assessed separately and then entered with the variables from the previous steps, which were statistically significant at the  $P < 0.10$  level. The final model included all variables significant at the  $P < 0.10$  level in the adjusted fourth step. As the baseline scores were included as covariates in the final regression models, the statistical approach is similar

to investigating the change in QoL or body image from baseline to 6-month follow-up, in terms of change-scores, and the results can be interpreted accordingly. Normality of residuals was inspected with quantile-quantile-plots of the studentized residuals. Multicollinearity was investigated by calculating Variance Inflation Factors. Digitalization of data from the questionnaire was performed with Teleform version 10.5.1 (Cardiff Software, Calif.). All statistical analyses were performed using STATA IC13.1 (Stata Corporation, Tex.).

### Ethical Considerations

The study was approved by The Central Denmark Regional Biomedical Research Ethics Board (Req. Nr. 76/2013). All participants gave written informed consent to participate in the study.

## RESULTS

A total of 247 patients were eligible to participate in the study. Of these, 208 (84.2%) agreed to participate. Reasons for refusal were primarily the length of the questionnaire and lack of time. Baseline questionnaires were completed on average  $12 \pm 13$  days (range, 1–71 days) before the breast reconstruction. Twelve patients (5.8%) were excluded due to failed breast reconstruction (implant loss,  $n = 12$ ). Of the remaining 196 patients, 180 (92%) responded to the 6-month follow-up questionnaire. The patients with failed breast reconstruction did not differ significantly in their personality traits from the remainder of the study sample ( $P = 0.35$ – $0.93$ ). Follow-up questionnaires were completed on average  $6.9 \pm 1.1$  (range, 5.1–11.7) months after the breast reconstruction. Demographic and clinical characteristics of the population are presented in Table 1. Surgical complications are presented in Table 2.

### Responders Versus Nonresponders

No statistically significant differences between responders and nonresponders were found for the demographic, clinical, NEO-FFI, or SWLS variables. However, responders had significantly better body image (lower BIS scores) at baseline ( $P = 0.003$ ; Table 1).

### Missing Data

Missing items were present in 2.3% (Agreeableness) to 5.1% (Neuroticism) of the NEO-FFI. All NEO-FFI subscales for 1 patient (0.5%) and the Openness subscale for another patient (0.5%) had  $> 50\%$  missing data and were therefore not imputed. For the BIS, 13 (7.5%) patients at baseline and 4 (2.2%) patients at 6 months had at least 1 missing item. Five (2.9%) patients at baseline, and 1 (0.6%) patient at 6 months had  $> 50\%$  missing BIS items. For the SWLS, 3 (1.7%) patients at baseline and 2 (1.1%) patients at 6 months had missing items. Both at baseline and at 6 months, 2 (1.1%) patients had  $> 50\%$  missing SWLS items. Demographic data were missing in 5 (2.6%) patients for relationship status and in 2 (1.0%) patients for educational status. No clinical variables had missing data.

### Independent Predictors of QoL

The change in the SWLS (QoL) score from baseline to 6 months did not reach statistical significance ( $23.4 \pm 7.9$  versus  $23.4 \pm 7.9$ ;  $P = 0.94$ ). A hierarchical, multiple linear regression model was used to examine potential predictors of SWLS scores at 6-month follow-up. The final model significantly predicted the 6-month follow-up SWLS score [ $F(4, 169) = 36.4$ ;  $P < 0.001$ ; adjusted  $R^2 = 0.45$ ]. The statistically significant predictors of QoL at 6 months were baseline SWLS scores, Neuroticism, Openness, and body mass index (BMI). Higher baseline SWLS scores were associated with higher 6-month SWLS scores ( $\beta = 0.52$ ;  $P < 0.001$ ). When adjusted for baseline SWLS scores, higher Neuroticism ( $\beta = -0.21$ ;  $P < 0.001$ ), Openness ( $\beta = -0.12$ ;  $P = 0.034$ ), and BMI ( $\beta = -0.12$ ;  $P = 0.037$ ) measured at baseline emerged as independent and statistically significant predictors of deteriorating SWLS scores from baseline to 6-month follow-up (Table 3).

### Independent Predictors of Body Image

An overall significant improvement of body image (decrease in the BIS score) was observed from baseline to 6 months ( $19.0 \pm 6.9$  versus  $17.7 \pm 6.1$ ;  $P = 0.008$ ). Body image at baseline was statistically significantly better for immediate breast reconstruction recipients compared with delayed breast reconstruction recipients ( $15.8 \pm 5.8$  versus  $21.4 \pm 7.0$ ;  $P < 0.001$ ). A hierarchical, multiple linear regression model was used to examine potential predictors of BIS scores at 6-month follow-up. The final model significantly predicted the 6-month follow-up BIS score [ $F(3, 170) = 33.5$ ;  $P < 0.001$ ; adjusted  $R^2 = 0.36$ ]. The statistically significant predictors of body image at 6 months were baseline BIS scores, Neuroticism, and immediate reconstruction. Higher baseline BIS scores were associated with higher 6-month BIS scores ( $P < 0.001$ ). When adjusted for baseline BIS scores, higher Neuroticism ( $\beta = 0.13$ ;  $P = 0.045$ ), and immediate reconstruction ( $\beta = 0.34$ ;  $P < 0.001$ ) were statistically significant and independent predictors of worse body image from baseline to 6-months follow-up (Table 4).

## DISCUSSION

The results of the present study demonstrate that of the 5 personality traits, Neuroticism showed to be a statistically significant independent predictor of both poorer QoL and worse body image from baseline prior to breast reconstruction to follow-up 6 months later. In addition, Openness was also a statistically significant independent predictor of experiencing lower QoL from baseline to 6 months after breast reconstruction. Unsurprisingly, the patients' baseline scores were the most salient predictors of the 6-month QoL and body image.

Personality traits have, so far, only been studied sparsely in a breast reconstructive setting. To the best of our knowledge, only 1 study has reported the influence of personality traits on the patient-reported outcome after breast reconstruction.<sup>22</sup> Bellino et al.<sup>22</sup> found the personality trait Harm Avoidance, as measured by the TCI, to be significantly associated with improved QoL, as measured by the Short-Form

**Table 1. Demographic and Clinical Characteristics of the Population**

| Variables                         | Mean ± SD  |  | P     |
|-----------------------------------|--|--|-------|
|                                   | Responders to the Follow-Up Questionnaire, n = 180 | Nonresponders to the Follow-Up Questionnaire, n = 16 |       |
| Age at the time of reconstruction | 50.9±9.6   | 52.3±10.0  | 0.58  |
| BMI                               | 25.1±3.8   | 25.5±3.0   | 0.70  |
| SWLS (QoL) baseline               | 23.4±7.9   | 19.5±7.5   | 0.06  |
| BIS (body-image) baseline         | 19.0±6.9   | 24.5±7.5   | 0.003 |
| Personality traits                |  |  |       |
| Neuroticism                       | 19.8±8.0   | 21.8±9.3   | 0.36  |
| Extraversion                      | 30.3±7.7   | 27.3±9.1   | 0.14  |
| Openness                          | 27.6±6.7   | 27.8±6.6   | 0.92  |
| Conscientiousness                 | 34.2±6.1   | 32.0±6.4   | 0.14  |
| Agreeableness                     | 35.1±4.9   | 33.3±6.6   | 0.13  |
|                                   | <b>n (%)</b>                                       |  |       |
| Type of procedure*                |  |  | 0.43  |
| Abdominal-based flap              | 52 (22)  | 3 (13)   |       |
| Implant-based ± ADM               | 122 (51)   | 14 (61)  |       |
| Thoracodorsal-based flap          | 50 (21)  | 3 (13)   |       |
| Fat grafting                      | 17 (7)   | 3 (13)   |       |
| Partner status                    |  |  | 0.89  |
| In a relationship                 | 134 (77)   | 12 (75)  |       |
| Single                            | 41 (33)  | 4 (25)   |       |
| Educational level                 |  |  | 0.31  |
| Elementary                        | 51 (29)  | 5 (31)   |       |
| Secondary                         | 105 (59)   | 7 (44)   |       |
| University                        | 22 (12)  | 4 (25)   |       |
| Timing of breast reconstruction   |  |  | 0.86  |
| Immediate                         | 67 (37)  | 5 (31)   |       |
| Delayed                           | 95 (53)  | 10 (63)  |       |
| Combination                       | 18 (10)  | 1 (6)  |       |
| Type of breast reconstruction†    |  |  | 0.93  |
| Implant                           | 68 (38)  | 7 (44)   |       |
| Autologous                        | 89 (49)  | 7 (44)   |       |
| Combination                       | 23 (13)  | 2 (13)   |       |
| Laterality of procedure           |  |  | 0.43  |
| Unilateral procedure              | 119 (66)   | 9 (56)   |       |
| Bilateral procedure               | 61 (34)  | 7 (44)   |       |
| Previous chemotherapy‡            |  |  | 0.97  |
| No                                | 91 (51)  | 8 (50)   |       |
| Yes                               | 89 (49)  | 8 (50)   |       |
| Previous radiation therapy‡       |  |  | 0.66  |
| No                                | 91 (51)  | 9 (56)   |       |
| Yes                               | 89 (49)  | 7 (44)   |       |

\*Compiled per reconstructed breast.

†Of the 91 patients receiving an immediate reconstruction, 82 (90.1%) underwent skin-sparing mastectomy, 8 (8.8%) underwent nipple areola complex sparing mastectomy, and 1 (1.1%) underwent skin-reducing mastectomy.

‡None of the patients were receiving chemo- or radiation therapy at the 6-month follow-up.

ADM, acellular dermal matrix.

**Table 2. Surgical Complications for Responders and Nonresponders at 6-Month Follow-Up**

| Variables                              | n (%)  |  | P    |
|--|--|--|------|
|  | Responders to the Follow-Up Questionnaire, n = 180 | Nonresponders to the Follow-Up Questionnaire, n = 16 |      |
| Major surgical complications           | 36 (20)  | 4 (25)   | 0.63 |
| Capsular contracture*                  | 3 (3.3)  | 0 (0)  |      |
| Implant rupture/rotation*              | 10 (11)  | 2 (22.2)   |      |
| Hematoma requiring surgical evacuation | 18 (10)  | 1 (6.3)  |      |
| Necrosis requiring revision surgery    | 14 (7.8)   | 1 (6.3)  |      |
| Seroma requiring aspiration/surgery    | 1 (0.6)  | 0 (0)  |      |
| Minor surgical complications           | 64 (36)  | 7 (44)   | 0.51 |
| Minor flap necrosis                    | 16 (8.9)   | 3 (18.8)   |      |
| Epidermolysis                          | 21 (11.7)  | 3 (18.8)   |      |
| Prolonged wound healing (> 4wk)        | 24 (13.3)  | 3 (18.8)   |      |
| Minor infection                        | 36 (20.0)  | 5 (31.3)   |      |
| Minor seroma                           | 11 (6.1)   | 1 (6.3)  |      |

Major complications are defined as any complication requiring surgical intervention. Minor complications are defined as any complication not requiring surgical intervention.

\*Percentage refers to number of patients with implant-based breast reconstructions.

**Table 3. QoL—Predictors of Improved SWLS Scores from Baseline to 6-Month Follow-Up: Results of Unadjusted and Adjusted Multiple, Hierarchical Linear Regression Analysis**

| Step        | Predictor                  | Unadjusted |                           | Adjusted*   |                   |
|-------------|----------------------------|------------|---------------------------|---|-------------------|
|             |                            | $\beta$    | <i>P</i>                  | $\beta$   | <i>P</i>          |
| Step 1      | Baseline                   |            |                           |   |                   |
|             | 1.1 Baseline SWLS score    | 0.64       | <b>&lt; 0.001</b>         |   |                   |
|             |                            |            | Adj. R <sup>2</sup> =0.41 |   |                   |
| Step 2      | Demographic variables      |            |                           | <i>Adjusting for 1.1 from step 1</i>                      |                   |
|             | 2.1 Age                    | 0.16       | <b>0.029</b>              | -0.02   | 0.80              |
|             | 2.2 BMI                    | -0.23      | <b>0.002</b>              | -0.12   | <i>0.051</i>      |
|             | 2.3 In a relationship      | 0.16       | <b>0.032</b>              | 0.05  | 0.42              |
|             | <i>Educational level</i>   |            |                           |   |                   |
|             | 2.4 Elementary             | 0.02       | 0.81                      | Referent  |                   |
|             | 2.5 Secondary              | -0.07      | 0.39                      | -0.00   | 0.95              |
|             | 2.6 University             | 0.07       | 0.33                      | 0.05  | 0.44              |
|             |                            |            |                           | Adjusted R <sup>2</sup> = 0.42                            |                   |
| Step 3      | Clinical variables         |            |                           | <i>Adjusting for 1.1, 2.2 from steps 1 and 2</i>          |                   |
|             | 3.1 Bilateral procedure    | -0.15      | <b>0.049</b>              | 0.06  | 0.44              |
|             | 3.2 Minor complications    | -0.12      | 0.12                      | -0.09   | 0.14              |
|             | 3.3 Major complications    | -0.01      | 0.87                      | -0.01   | 0.95              |
|             | 3.4 Radiation therapy      | -0.06      | 0.44                      | -0.00   | 0.44              |
|             | 3.5 Chemotherapy           | -0.03      | 0.71                      | 0.08  | 0.25              |
|             | <i>Type of procedure</i>   |            |                           |   |                   |
|             | 3.6 Autologous             | 0.07       | 0.36                      | Referent  |                   |
|             | 3.7 Combination            | -0.03      | 0.66                      | 0.03  | 0.67              |
|             | 3.8 Implant                | -0.05      | 0.52                      | -0.07   | 0.45              |
|             | <i>Timing of procedure</i> |            |                           |   |                   |
|             | 3.9 Delayed                | 0.11       | 0.14                      | Referent  |                   |
|             | 3.10 Delayed and immediate | -0.15      | <b>0.044</b>              | -0.08   | 0.29              |
|             | 3.11 Immediate             | -0.02      | 0.78                      | -0.06   | 0.53              |
|             |                            |            |                           | Adjusted R <sup>2</sup> = 0.41                            |                   |
| Step 4      | Personality traits         |            |                           | <i>Adjusting for 1.1 and 2.2 from steps 1, 2, and 3</i>   |                   |
|             | 4.1 Neuroticism            | -0.43      | <b>&lt; 0.001</b>         | -0.23   | <b>0.006</b>      |
|             | 4.2 Extraversion           | 0.23       | <b>0.003</b>              | -0.02   | 0.76              |
|             | 4.3 Openness               | -0.01      | 0.90                      | -0.12   | <i>0.08</i>       |
|             | 4.4 Conscientiousness      | 0.32       | <b>&lt; 0.001</b>         | 0.01  | 0.88              |
|             | 4.5 Agreeableness          | -0.01      | 0.89                      | -0.00   | 0.96              |
|             |                            |            |                           | Adjusted R <sup>2</sup> = 0.44                            |                   |
| Final model |                            |            |                           | <i>Entering all variables sign. P &lt; 0.10 at step 4</i> |                   |
|             | Baseline SWLS score        |            |                           | 0.52  | <b>&lt; 0.001</b> |
|             | Neuroticism                |            |                           | -0.21   | <b>&lt; 0.001</b> |
|             | BMI                        |            |                           | -0.12   | <b>0.037</b>      |
|             | Openness                   |            |                           | -0.12   | <b>0.034</b>      |
|             |                            |            |                           | Adjusted R <sup>2</sup> = 0.45                            |                   |

A positive  $\beta$  indicates higher Satisfaction With Life.

\*Steps 2, 3, and 4: adjusting for variables, which were significant at  $P < 0.10$  at the previous steps. Findings at  $P < 0.05$  are shown in bold face, and findings at  $0.05 \leq P < 0.10$  are shown in italics.

36, 3 months after placement of an expander implant, in an immediate breast reconstruction cohort.<sup>22</sup> TCI harm avoidance is a trait that involves tendencies to excessive worrying and has previously been found to be positively correlated with the trait Neuroticism as measured by the NEO-FFI.<sup>29</sup> However, although studies have argued that there are substantial overlap in the traits measured by the TCI and the NEO-FFI, they are not equivalent.<sup>29</sup> The results from the present study are thus somewhat in contrast to the findings of Bellino et al.<sup>22</sup> Although we have no clear explanation, the contradictory findings could be due to methodological differences between the studies, for example, in the instruments used, in the reconstructive procedures investigated, the follow-up time points, or the smaller sample size (N = 57) in the study by Bellino et al. As patients with high trait Neuroticism are predisposed to high state anxiety,<sup>15</sup> our

results lend support to the findings of a prospective study on psychosocial factors by Roth et al.,<sup>13</sup> who found higher levels of state anxiety to be statistically significantly associated with poorer patient-reported aesthetic outcome after breast reconstruction. Furthermore, consistent with our results, studies investigating QoL in various cancer populations, including breast, colorectal, and testicular cancer patients, all report negative associations between Neuroticism and QoL.<sup>17-21</sup>

In the present study, high trait Openness was a significant independent predictor of poorer QoL but not body image, from baseline to 6 months after the breast reconstruction. Compared with the other 4 personality traits, Openness is less clearly correlated with QoL.<sup>30</sup> In univariate, but not multivariate analysis, Bellino et al.<sup>22</sup> found patients high in TCI Novelty Seeking to be associated with

**Table 4. Body Image—Predictors of Impaired Body Image (BIS-Scores) from Baseline to 6-Month Follow-Up: Results of Unadjusted and Adjusted Multiple, Hierarchical Linear Regression Analysis**

| Step        | Predictor                  | Unadjusted                     |                | Adjusted*   |                |
|-------------|----------------------------|--------------------------------|----------------|---|----------------|
|             |                            | $\beta$                        | <i>P</i>       | <i>B</i>  | <i>P</i>       |
| Step 1      | Baseline                   |                                |                |   |                |
|             | 1.1 Baseline BIS score     | 0.50                           | < <b>0.001</b> |   |                |
|             |                            | Adjusted R <sup>2</sup> = 0.24 |                |   |                |
| Step 2      | Demographic variables      |                                |                | <i>Adjusting for 1.1 from step 1</i>                            |                |
|             | 2.1 Age                    | -0.12                          | 0.11           | -0.15   | <b>0.032</b>   |
|             | 2.2 BMI                    | 0.09                           | 0.23           | 0.00  | 0.99           |
|             | 2.3 In a relationship      | -0.07                          | 0.35           | -0.04   | 0.61           |
|             | <i>Educational level</i>   |                                |                | Referent  |                |
|             | 2.4 Elementary             | 0.01                           | 0.87           | 0.02  | 0.77           |
|             | 2.5 Secondary              | -0.00                          | 0.96           | 0.03  | 0.70           |
|             | 2.6 University             | -0.01                          | 0.87           |   |                |
|             |                            | Adjusted R <sup>2</sup> = 0.26 |                |   |                |
| Step 3      | Clinical variables         |                                |                | <i>Adjusting for 1.1 and 2.1 from steps 1 and 2</i>             |                |
|             | 3.1 Bilateral procedure    | 0.08                           | 0.30           | -0.12   | 0.19           |
|             | 3.2 Minor complications    | 0.02                           | 0.74           | 0.02  | 0.72           |
|             | 3.3 Major complications    | -0.03                          | 0.69           | -0.02   | 0.78           |
|             | 3.4 Radiation therapy      | 0.07                           | 0.35           | 0.02  | 0.81           |
|             | 3.5 Chemotherapy           | -0.07                          | 0.35           | 0.01  | 0.93           |
|             | <i>Type of procedure</i>   |                                |                | Referent  |                |
|             | 3.6 Autologous             | -0.02                          | 0.80           | -0.09   | 0.23           |
|             | 3.7 Combination            | 0.00                           | 0.99           | -0.12   | 0.20           |
|             | 3.8 Implant                | 0.02                           | 0.80           |   |                |
|             | <i>Timing of procedure</i> |                                |                | Referent  |                |
|             | 3.9 Delayed                | -0.14                          | <i>0.064</i>   | 0.18  | <b>0.038</b>   |
|             | 3.10 Delayed and immediate | 0.08                           | 0.28           | 0.50  | < <b>0.001</b> |
|             | 3.11 Immediate             | 0.09                           | 0.21           |   |                |
|             |                            | Adjusted R <sup>2</sup> = 0.34 |                |   |                |
| Step 4      | Personality traits         |                                |                | <i>Adjusting for 1.1, 3.10, and 3.11 from steps 1, 2, and 3</i> |                |
|             | 4.1 Neuroticism            | 0.33                           | < <b>0.001</b> | 0.17  | <b>0.060</b>   |
|             | 4.2 Extraversion           | -0.22                          | <b>0.004</b>   | -0.04   | 0.67           |
|             | 4.3 Openness               | 0.02                           | 0.84           | 0.09  | 0.21           |
|             | 4.4 Conscientiousness      | -0.13                          | <i>0.079</i>   | 0.07  | 0.43           |
|             | 4.5 Agreeableness          | 0.04                           | 0.61           | 0.01  | 0.90           |
|             |                            | Adjusted R <sup>2</sup> = 0.35 |                |   |                |
| Final model |                            |                                |                | <i>Entering all variable sign. P &lt; 0.10 at step 4.</i>       |                |
|             | Baseline BIS score         |                                |                | 0.59  | < <b>0.001</b> |
|             | Immediate procedure        |                                |                | 0.34  | < <b>0.001</b> |
|             | Neuroticism                |                                |                | 0.13  | <b>0.045</b>   |
|             |                            | Adjusted R <sup>2</sup> = 0.36 |                |   |                |

A positive  $\beta$  indicates impaired body image.

\*Steps 2, 3, and 4: adjusting for variables, which were significant at  $P < 0.10$  at the previous steps. Findings at  $P < 0.05$  are shown in bold face, and findings at  $0.05 \leq P < 0.10$  are shown in italics.

poorer QoL after breast reconstruction. As Openness is positively correlated to TCI Novelty Seeking,<sup>29</sup> our finding that high trait Openness is associated with poorer QoL over time appears in line with the results of Bellino et al.<sup>22</sup>

Individuals characterized by high Neuroticism are generally more anxious, self-conscious, and susceptible to stress compared with individuals with low levels of Neuroticism.<sup>15,31</sup> Furthermore, Neuroticism has previously been found highly correlated to ineffective coping strategies such as hostile reactions and indecisiveness.<sup>32</sup> The ineffective coping strategies of high trait Neuroticism patients, combined with breast reconstruction being an extensive surgical procedure, provide a credible explanation for the results observed in the present study.

Although the results of our study indicate that patients scoring high on trait Neuroticism may be predisposed to experience less benefit after breast reconstruction in terms of body image and QoL, the results should not be interpreted as suggesting that patients with high trait

Neuroticism should be precluded from breast reconstructions. However, we believe the results are important as they demonstrate the diversity of factors affecting the patient-reported outcome after a breast reconstruction. As plastic surgeons continue to strive toward improving the outcome of breast reconstructive procedures, a growing number of factors must be taken into consideration. Pre-surgical assessment of personality traits could potentially be one of these factors. Patients scoring high on Neuroticism could preferentially, at an early stage, be referred to psychosocial counseling with hospital psychologists or encouraged to attend psychologist-led patient support groups for patients seeking a breast reconstruction. It is, however, important to note that the possible efficacy of such interventions cannot be established from the results of the present study. Future studies investigating clinical interventions for breast reconstructive recipients with high trait Neuroticism are therefore needed.

In our study, immediate reconstruction was a statistically significant independent predictor of a more impaired body image from prereconstruction to 6-month follow-up. Although studies have found patients to prefer immediate reconstruction over delayed reconstruction when given the option,<sup>9</sup> our results are in line with previous studies incorporating prereconstruction assessment of body image.<sup>33,34</sup> Furthermore, despite reaching a similar end point after longer follow-up, delayed breast reconstruction recipients have been shown to report more positive changes in body image and QoL after a breast reconstruction when compared with immediate breast reconstruction recipients.<sup>35,36</sup> One of the reasons for this is likely the different reference points for body image at baseline for immediate compared with delayed breast reconstructive recipients, which causes the prereconstruction body image to be significantly better in immediate breast reconstruction recipients compared with delayed breast reconstruction recipients.<sup>35</sup> This difference was also evident in the present study, where patients seeking a delayed breast reconstruction had significantly worse body image at baseline compared with patients receiving an immediate breast reconstruction. Consequently, the predictive power of having received an immediate breast reconstruction on the achieved body image is likely to depend on the follow-up time point chosen, and thus subject to differ if investigated at a different follow-up than 6 months as in our study.

With respect to SWLS scores, higher BMI was independently associated with lower experienced QoL over time. In the literature, there is currently no consensus with regard to the influence of BMI on breast reconstructive outcome.<sup>37,38</sup>

The present study has several strengths. First, the prospective design allowed the follow-up QoL and body image scores to be adjusted for the baseline scores. Second, both participation and response rates to follow-up questionnaires were high. Third, the present study used the NEO-FFI,<sup>23</sup> a widely acclaimed and validated instrument for personality assessment. Furthermore, the high response rate, the broad spectrum of socioeconomic backgrounds as well as the inclusion of several different types of breast reconstructive procedures increase the validity of the present findings. However, some limitations should also be noted. One limitation may be the relatively short follow-up period. Additionally, for a subset of the patients undergoing breast reconstruction with a tissue expander, the expander had been inflated to the desired volume but had not yet been exchanged to a fixed size implant at the 6-month follow-up. Furthermore, nonresponders at follow-up had significantly poorer baseline body image scores compared with responders to the follow-up questionnaire, wherefore bias may be present. However, no statistically significant differences between responders and nonresponders were found for the clinical or demographic variables. Finally, although using the BREAST-Q would have increased comparability with other studies, the BREAST-Q had not been officially released in Danish at the time when the present study was initiated.

## CONCLUSIONS

As breast reconstructive procedures have become an integrated part of breast cancer treatment, a growing number of patient and treatment factors must be considered in order for the patient to achieve a successful outcome. The results from the present study demonstrate that personality traits, and especially trait Neuroticism, may be independently predictive of the achieved body image and QoL after breast reconstruction. Weighing in the personality traits of the patients seeking a breast reconstructive procedure may thus be an important adjunct in attaining a higher success rate in terms of patient-reported outcome.

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