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Body-Image Distress in Breast Cancer Survivors and Their Evaluation of Medical Tattooing Following Surgery

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BODY-IMAGE DISTRESS IN BREAST CANCER SURVIVORS AND THEIR EVALUATION OF MEDICAL TATTOOING FOLLOWING SURGERY

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ABSTRACT

A review of the literature reveals a high incidence of body-image distress among breast cancer survivors who have undergone surgery, which is a natural response to the significant changes in their appearance. Reconstructive surgery, utilizing implants or flaps, may be employed to restore breast size and shape. Medical tattooing can simulate the nipple-areola complex and decorative appliques can conceal scars and skin color variations. Both reconstructive surgery and medical tattoos are associated with patient-reported satisfaction, yet further research is necessary to understand their combined impact on body-image distress. To investigate this, a survey was distributed among national breast cancer support groups and advocacy organizations, yielding 207 responses from individuals meeting the study's criteria. The participants were categorized into two groups: those who received a post-surgical medical tattoo (n = 61) and those who did not (n = 146). The study also examined how participants evaluated the cosmetic and decision satisfaction of patients who made various cosmetic intervention choices post-mastectomy. This was accomplished by having participants rate images of patients who had received three types of intervention: mastectomy and reconstruction only, mastectomy and medical tattooing only, and mastectomy, reconstruction, and medical tattooing. Using linear regression and multilevel modeling that controlled for demographic and clinical factors associated with body-image distress, the findings demonstrated that participants with medical tattoos reported significantly lower levels of body-image distress, depressive symptoms, and perceived stress compared to those without medical tattoos. Furthermore, participants rated images of patients who underwent both reconstruction and medical tattooing post-mastectomy as having significantly higher cosmetic and decision satisfaction ratings than images of patients who received reconstruction or medical tattooing alone.

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LIST OF ABBREVIATIONS

ASI-R = Appearance Schema Inventory-Revised

BCS = breast conserving surgery, i.e., lumpectomy/partial mastectomy

BDD = body dysmorphic disorder

BIBCQ = Body Image After Breast Cancer Questionnaire

DSS = Decision Satisfaction Scale

Chemo = chemotherapy

CED = Cosmetic Expectation Discrepancy

GAD-7 = Generalized Anxiety Disorder Scale

IT = Intervention Type

IT1 = Image of Mastectomy and reconstruction only

IT2 = Image of Mastectomy and medical tattooing only

IT3 = Image of Mastectomy, reconstruction, and medical tattooing

MT = Montgomery Tubercle

NAC = Nipple-Areola Complex

PHQ-9 = Patient Health Questionnaire

PSS-10 = Perceived Stress Scale

SWD = Satisfaction with Decision Scale

Survivor = Breast cancer survivors

TNM system = Breast cancer staging according to tumor, node, and metastasis

LITERATURE REVIEW

Breast cancer is one of the most common diagnosed types of cancer among women, with an estimated 3.8 million survivors in the United States currently (American Cancer Society, 2022). Once diagnosed, women enter one of several treatment courses, which depends largely on the stage and type of the disease. The American Cancer Society refers to anyone who has been diagnosed with breast cancer as survivors, regardless of their treatment or outcomes.

There are five stages (0-IV) of the disease based on a combination of three factors: tumor status (whether a tumor is present, and if so, the size), lymph node status (the number and location of lymph nodes with cancer), and metastasis (whether the tumor spreads beyond regional lymph nodes) (Rosen & Sapra, 2023). This is often referred to as the TNM system (tumor, node, metastasis). Disease staging based on the TNM system includes stage 0, used to indicate carcinoma in situ, which is not considered cancerous but may become cancer in the future, and stages I-IV, used to indicate the severity of cancer, with stage IV being the most severe stage (Rosen & Sapra, 2023).

This system drives decisions for the standard treatment options: surgery, radiation therapy, chemotherapy, hormone therapy, immunotherapy, or a combination of these (Bland et al., 2018). Most survivors with breast cancer have surgery to remove the cancer (Bland et al., 2018). If the cancer is smaller than 5 cm and the survivor does not carry the BRCA or ATM gene, a lumpectomy or breast-conserving surgery (BCS) is indicated. BCS removes the cancer and limits the tissue removed while keeping as much of the natural breast intact as possible. When the cancer is found near the chest wall lining, a partial mastectomy may be required. If the cancer cells are found in more than one group of lymph nodes, the surgery is more extensive. A

total mastectomy involves removing the whole breast that has the cancer and may also involve removing some of the lymph nodes under the arm. Finally, a radical mastectomy removes the whole breast (unilateral being one breast and bilateral being both breasts), some of the lymph nodes under the arm, the lining over the chest muscles, and sometimes part of the chest wall muscles.

Breast Cancer and Body-Image Distress

Survivors experience extreme psychological, emotional, and social distress, not only at the initial diagnosis and throughout treatment, but they often suffer chronic stress for many years after (Alagizy et al., 2020; Corkum et al., 2020; Park et al., 2017; Gosain et al., 2020). In fact, distress after diagnosis may in part determine the treatment patients receive (Corkum et al., 2020). Studies suggest that among women with breast cancer, changes in physical appearance effect anywhere from 31%-67% of survivors (Fiser et al., 2021; Falk, 2010) and is among the most significant cause of distress (Proietti et al., 2021). Body-image distress reflects "a direct personal perception and self-appraisal of one's physical appearance, whereby negative thoughts and feelings related to one's body indicate a disturbance of body-image and lead to dissatisfaction with one's self" (Przezdziecki et al., 2013, p. 1872; Stokes & Frederick-Recascino, 2003). Alleviating body-image distress in breast cancer survivors is a priority given its chronic nature, incidence, and the substantial psychosocial consequences for survivors (Morales-Sánchez, 2021; Sebastián, 2008; Koçan & Gürsoy, 2016; Porroche-Escudero et al., 2017).

Body-image distress in survivors differs from other body-image-related psychopathologies (i.e., anorexia nervosa and body dysmorphic disorder or BDD) because it develops after cancer-related radical surgery and treatment. Whereas BDD is defined as a

preoccupation with an ‘imagined’ defect in appearance (Guedes et al., 2018; Thakur et al., 2022). Indeed, body-image concerns may exist prior to breast cancer diagnosis and treatment, but body-image distress post-treatment and during survivorship is the focus of this study.

A recent evaluation of body-image in breast cancer survivors by Brunet et al. (2022) notes that even though research in this context has increased in recent years (Brunet & Price, 2021; Davis et al., 2020; Paterson et al., 2016), knowledge gaps still exist because most studies fail to acknowledge the complex multidimensional nature of body-image distress. Consequently, our understanding of how breast cancer influences body-image in this population remains poorly understood (Dempsey et al., 2022).

Body-Image Distress as a Multidimensional Construct

According to breast cancer survivors, the most prominent aspects of body-image distress they experience are in the areas of identity and sexual functioning, perceived stigma, fear of cancer recurrence, appearance investment, role in decision making, and treatment expectations (Sarang et al., 2023; Paterson et al., 2016; Manderson & Stirling, 2007; Knapp et al., 2014), which are reviewed below.

Identity and Sexual Functioning

Interviews with breast cancer survivors following mastectomy reveals a sense of loss, and a struggle to come to terms with changes to their bodies (Manderson & Stirling, 2007). Concerns about disfigurement and loss of femininity can persist several years after the operation (Cash & Smolak, 2011; Lasry et al., 1987; Polivy, 1977). Studies suggest that changes in body-image post-breast cancer surgery may have a direct impact on sexuality, sexual response, sexual roles, and relationships (Pelusi, 2006; Hopwood, 1993; Schover, 1991; Andersen & LeGrand, 1991; Carver et al., 1998). Therefore, the physical alterations from surgical treatment can lead to sexual

dysfunction or avoidance of sexual intimacy (Cash & Smolak, 2011, Kissane et al., 2004; Mock, 1993; Manderson & Stirling, 2007). Impact on identity also varies by surgery type such as when they undergo a full (bilateral) mastectomy, as opposed to a single (unilateral) mastectomy, or a BCS. Survivors talk about their bodies at different stages of the past and present, within different discourses (medical, sexual, maternal) and from their own perspective and that of their medical professionals or their family. Because of the links between the breasts and female identity, beauty, and sexual attractiveness, the impacts can be far reaching (Manderson & Stirling, 2007; Park et al., 2005; Pikler & Winterowd, 2003). Despite this, a review of the literature on breast cancer survivors from 2008-2014 found that identity and sexual functioning continues to be understudied (Jeffrey et al., 2015).

Perceived Stigma

Body-image distress is exacerbated by the ways others perceive us and the way we internalize this perception. Studies indicate that the reactions of others (whether positive or negative) to an individual after mastectomy can influence their body-image by contributing to perceptual discrepancies, negative attitudes, affective reactions, and cognitive distortions (Cash & Smolak, 2011; Pujols et al., 2010; Heidari et al., 2015). Fang et al. (2013), conducted a meta-analysis comparing women who received BCS versus mastectomy with reconstruction surgery, and found that the groups did not differ on body concern. However, they found that women with mastectomy and reconstruction experienced significantly worse body stigma than women receiving BCS. The authors noted that a significant limitation in the conduct of the meta-analysis was the lack of a standardized measure for body-image stigma among breast cancer survivors (Fang et al., 2013). In addition, considering that stigma varies across Eastern and Western

cultures, body-image stigma needs to be evaluated internationally (Bu et al., 2022; Yang & Kleinman, 2008; Krendl & Pescosolido, 2020).

Fear of Cancer Recurrence

Fear of cancer recurrence has been found to be significantly associated with body-image distress because women with higher fears of reoccurrence tend to choose more radical surgery (Paterson et al., 2016). Despite attempts to encourage less invasive surgical treatments, according to the American Cancer Society, 56% of women in stage III undergo mastectomy. Furthermore, the number of women in early-stage breast cancer electing for mastectomy has increased to an estimated 39% in the United States (Metcalfe et al., 2012; Morris et al., 1997; Tuttle et al., 2007; Katipamula et al., 2008; Balch & Jacobs, 2009). This may in part be due to women's concerns that a less extensive surgery may raise the risk of cancer resurgence. It may also be due to women becoming more aware of breast reconstruction as an option post-mastectomy and are confident in the surgeons' ability to restore cosmetic appearance (Albornoz et al., 2013; Wachter et al., 2014; Piotr et al., 2020). Regardless, fear of cancer recurrence may lead women to opt for more radical surgery than necessary and may lead to increased body-image distress and regret (Cash & Smolak, 2011). Furthermore, fear of recurrence may hinder women from trying cosmetic interventions that will be futile if they believe they will need further treatment which will negate previous attempts at restoration.

Appearance Investment

Appearance investment refers to the value or importance placed by an individual on their appearance and their observable physical attributes. Appearance investment becomes associated with body-image distress when there is an incongruence between the real and ideal self (White, 2000; Altabe & Thompson, 1996). Data shows that women's experiences during and after cancer

treatment may influence their body-image and that their values and level of appearance investment can change over time (Brunet et al., 2013, Davis et al., 2020, Moreira & Canavarro, 2010, Paterson et al., 2016). Studies examining the impact of appearance investment has revealed that survivors who hold greater investment in physical appearance exhibited greater difficulty adjusting after intervention (Esplen et al., 2018; Fang et al., 2013; Dempsey et al., 2022; Helms et al., 2008).

The literature surrounding the impact that type of surgery has on the relationship between appearance investment and body-image distress is varied. For instance, Adachie et al. (2007) found that patients undergoing surgery with immediate breast reconstruction valued appearance and endorsed significantly higher appearance investment compared to patients undergoing mastectomy-alone or BCS (Chua et al., 2015). These results have been replicated in a longitudinal study evaluating the association between body-image and appearance investment (Moreira & Canavarro, 2010, 2012; Chua et al., 2015). Taken together these studies' findings suggest that both appearance investment and cosmetic outcomes significantly impact body-image distress, and that further research is needed to examine this relationship.

Role in Decision Making and Treatment Expectations

Survivors are not only confronted with the distress elicited from the initial diagnosis, but also are expected to learn, understand, and make life changing decisions all in the span of a few months. In fact, research has shown that decision making is complicated by the trauma of diagnosis and treatment (Manderson & Stirling, 2007; Arndt et al., 2004; Bloom et al., 2004; Schmidt & Andrykowski, 2004). Despite having so many different professionals involved, women with breast cancer may still feel there is inadequate information and communication, limited access to genuine choice, and a lack of tailored treatment strategies (Flitcroft et al., 2018).

Furthermore, when survivors are presented with examples of surgical outcomes, they are often shown images of optimal results and their surgical experience does not always match these ideal cosmetic outcomes. A survivors' subjective evaluation of treatment outcomes extends beyond the preservation, restoration, or enhancement of physical appearance (Dempsey et al., 2022). Their role in the decision-making process is also an important predictor for psychosocial outcomes (Paraskevi, 2012). For example, in one study, older survivors who felt that they did not have an active role in choice of treatment were associated with poorer mental health and less general satisfaction (Mandelblatt et al., 2003).

Keating et al. (2002) expanded on these results by surveying early-stage survivors to understand whether discrepancies between patients' desired and actual roles in decision making existed, and whether those discrepancies were associated with type of surgery received (i.e., mastectomy or BCS) and satisfaction with surgical choice. They assessed patients' desired roles in decision making by asking survivors to select a statement that best described how they felt using the President's Commission for the Study of Ethical Problems in Medicine (U.S. Government Printing Office, 1982). They also assessed patients' satisfaction with their choice of treatment using a 5-point Likert scale ranging from very satisfied to very dissatisfied (Keating et al., 2002).

They found that while most survivors reported desiring a collaborative role in the decision-making process, only half of the survivors achieved this, and those that did match, were significantly more satisfied with treatment choice (Keating et al., 2002). Type of treatment was not significantly associated with satisfaction with that treatment, but concordance between desired and actual role in decision making was associated with satisfaction.

Health Disparities and Body-Image Distress

Persistent health disparities may also impact a patient's diagnosis, treatment options, and subsequent psychosocial functioning (Wheeler et al., 2013). Despite advances made in the quality of cancer care in the *general* population, lower quality and worse outcomes persist among minority groups (Hirko et al., 2022; Wheeler et al., 2013). It is known that black women tend to be diagnosed with more aggressive breast cancer with worse prognoses than white women (Vogel, 2008; Anders & Carey, 2008; Carey et al., 2006; O'Brien et al., 2010; Millikan et al., 2008; Peppercorn et al., 2008; Schneider et al., 2008; Wildiers & Brain, 2005; Wheeler et al., 2013), and younger black women, in particular, are more likely to have triple-negative breast cancers (Carey et al., 2006; Lund et al., 2009; Peppercorn et al., 2008; Chen et al., 1994; Wheeler et al., 2013). Black women, more often than other women with the same stage disease, do not receive timely diagnosis and recommended treatment (Shavers & Brown, 2002; Bradley et al., 2001; Wheeler et al., 2013). Further racial disparities exist indicating that Black and Hispanic women often fail to receive local therapy for curable breast cancers more often than whites (Freedman et al., 2009; Wheeler et al., 2013).

While there are some biological differences that contribute to these differences, it is widely agreed that these disparities are primarily due to social and health system determinants (Wheeler et al., 2013). Factors such as poverty, financial insecurity, lack of transportation, poor access to care, poor health literacy, low educational attainment, and lack of health insurance contribute to substantial differences in breast cancer outcomes and psychosocial functioning (Holmes et al., 2021; Bigby & Holmes, 2005; Gerend & Pai, 2008; Masi & Olopade, 2005; Baquet & Commiskey, 2000; Du et al., 2007; Du et al., 2008; Ren et al., 1999; Canto et al., 2001; Schleinitz et al., 2006; Wheeler et al., 2013). Physician and facility characteristics can impact quality of care received (Wheeler et al., 2013). For instance, distance can pose

transportation and mobility difficulties for elderly women or those in rural areas (Punglia et al., 2006), and many ethnic groups may prefer access to health care facilities which provide language interpreters (Wheeler et al., 2013). Research concerning body-image distress in survivors of color has been understudied (Holmes et al., 2021).

A review conducted by Holmes et al. (2021) examined the interaction of body-image distress and race and sexual orientation. They noted that there were common themes in the few studies they found. Many black survivors were greatly affected and "feared their partner's rejection of their physical appearance" while others were resilient and reported that breast cancer did not diminish their roles as women, mothers, or wives (Ashing-Giwa et al., 2004; Holmes et al., 2021). Latinas held concerns about weight gain and self-acceptance; Asians were distressed by the changes of their bodies; and younger survivors had more difficulties with self-acceptance than older survivors (Ashing-Giwa et al., 2004; Holmes et al., 2021). Boehmer et al. (2013) suggested that lesbian and bisexual survivors were more resilient because they used similar coping strategies following treatment as those used to navigate sexual identity discrimination (Holmes et al., 2021). Holmes et al. (2021) urges that more research is needed to better understand how these treatment disparities potentially impact body-image distress across survivors of all races, cultures, and sexual orientations.

Impact of Body-Image Distress on Depression, Anxiety, and Perceived Stress

While there is some overlap, body-image distress remains a separate construct from depression in the context of breast cancer research, because not all survivors who endorse body-image distress have depression and not all survivors who have depression endorse body-image distress. Many studies have discovered a positive association between body-image distress and depression (Begovic-Juhant et al., 2012) and it is well-known that individuals with depression

negatively distort their body-image (Zimmermann et al., 2010; Noles et al., 1985). However, depression and anxiety are common among breast cancer survivors at all phases (Massie, 2004; Rezaei et al., 2016; Pikler & Winterowd, 2003), which may contribute to body-image distress and may already be present in survivors prior to diagnosis (Begovic-Juhant et al., 2012). Regardless, poor body-image is a prominent factor predicting anxiety, depression, and hence quality of life, particularly during the first year of recovery (Begovic-Juhant et al., 2012; Corkum et al., 2020; Jørgensen et al., 2015).

Overall, the literature suggests that body-image distress seems to put survivors at higher risk for developing depression or anxiety, and that body-image distress, anxiety, and depression reduce overall quality of life and hinder adjustment to breast cancer treatments among survivors (Mokhtari-Hessari & Montazeri, 2020; Chow et al., 2016; Paraskevi, 2012; Begovic-Juhant et al., 2012; Zimmermann et al., 2010). Research also suggests that survivors who were satisfied with their body-image exhibit a stronger belief in their ability to cope with breast cancer and associated treatments (Carver et al., 1998; Pikler & Winterowd, 2003; Begovic-Juhant et al., 2012). Ultimately, assessing body-image distress as its own construct is vital for understanding its role and impact on long-term psychosocial outcomes. Targeting body-image distress may also reduce risk for chronic stress, which holds a variety of physiological consequences.

Until recently, the primary focus of breast cancer research has been on increasing survivorship. Because of the medical advances made in the past decade, survivorship rates have increased dramatically (Komen, 2022; Weiss et al., 2018). This allows us to shift our focus to helping improve psychosocial outcomes among survivors. Survivors not only experience acute stress at initial diagnosis, but oftentimes suffer chronic stress throughout and after treatment. Recent studies have identified body-image distress, depression, anxiety, and poor quality of life

as significant contributors to acute and chronic stress among breast cancer survivors (Proietti et al., 2021; Antoni & Dhabhar, 2019). Chronic stress has many well documented negative physiological consequences.

Cancer recurrence and progression has been linked to stress and depression (Moreno-Smith et al., 2010; Steel et al., 2007; Satin et al., 2009). In fact, recent studies have revealed that higher acute and chronic stress associated with a breast cancer diagnosis, particularly for those who undergo a mastectomy, can lead to higher risks for breast cancer recurrence by affecting tumor emergence, progression, and metastasis (Moreno-Smith et al., 2010; Chiriac et al, 2018; Gosain et al., 2020; Antoni & Dhabhar, 2019; Antoni et al., 2006; Lutgendorf, 2010). Reducing chronic stress in breast cancer survivors requires comprehensive assessment and individualized counseling informed by research on common experiences of survivors before and after treatment and throughout survivorship (Jørgensenet al., 2015; Ermoshchenkova et al., 2021; Corkum et al., 2020; Begovic-Juhant et al., 2012).

Surgical Treatments, Reconstruction, & Body-Image Distress

It has been established that breast cancer survivors are susceptible to body-image distress throughout and following treatment, but there is currently no consensus as to how effective different approaches to surgical reconstruction are in reducing body-image distress. One of the seminal works in this area was conducted by Sneeuw et al. (1992).

Sneeuw et al. (1992) conducted a two-part study examining cosmetic and functional outcomes of BCS for early-stage breast cancer in 76 patients treated between the years of 1975 and 1985. Part 1 compared patients' ratings, health care provider ratings, and objective assessment of BCS cosmetic outcomes (Sneeuw et al., 1992). Part 2 examined the self-reported psychosocial functioning of each patient (Sneeuw et al., 1992). In part 1, the researchers

identified a discrepancy between patient and observer outcomes, which is frequently noted throughout more recent literature (Beesley et al., 2012); they also found that both cosmetic and functional results were significantly associated with the time since treatment, and outcomes became worse over time (Sneeuw et al., 1992). They did not find a significant correlation between cosmetic and functional outcomes with age. After evaluating for psychosocial functioning, Sneeuw et al. (1992) found that one-quarter of the study sample endorsed high levels of psychological distress, disturbance of body-image, and decreased sexual functioning, and half the patients expressed concern for disease recurrence and their future health.

Body-Image Distress Following Surgical Treatment

The fear and distress survivors experience at initial diagnosis may affect their decision-making ability and impact the treatment choices they make (Corkum et al., 2020; Rosenberg et al., 2020). For some survivors, treatment options (i.e., BCS versus mastectomy) are limited due to the severity and progression of the cancer, but for others, particularly in the earlier stages, there are a range of surgical treatments presented with little to no survival difference between the different approaches (Corkum et al., 2020). Recent randomized trials have established equivalent survival rates and similar local recurrence rates with BCS, yet the number of BCS-eligible woman opting for mastectomy with reconstruction has risen 34% during the years 2003-2011 (Jonczyk et al., 2019; El-Tamer et al., 2007; Flanagan et al., 2019). This may be due in part to recent advancements in reconstructive procedures and their association with higher cosmetic satisfaction (Albornoz et al., 2015; Jagsi et al., 2014; Sabino et al., 2016; Flanagan et al., 2019). With the dramatic increase in survival rates in recent years, the field is ready to compare the long-term quality of life and psychosocial outcomes following the different procedures (Corkum

et al., 2020; Pirro et al., 2017; Pusic et al., 2017; Chand et al., 2017; Bailey et al., 2017; Eltahir et al., 2015).

Several studies indicate that various surgical procedures differ in body-image distress outcomes, while others report no significant difference. To complicate things further, other treatments such as chemotherapy, hormonal treatment, and radiotherapy also increase body-image distress through physical alterations such as hair, eyelashes, and weight loss (Morales-Sánchez, 2021). While body-image distress is a prominent concern following surgical treatment, there is currently no consensus as to how each type of surgical treatment impacts body-image distress during long-term survivorship (Morales-Sánchez, 2021). Viewing body-image distress as a multidimensional construct is essential to developing more effective treatments. For example, body-image distress has been frequently assessed as a single item imbedded with measures of quality of life or overall satisfaction, rather than as its own construct. The following section presents the inconclusive findings about the role of cosmetic outcomes and body-image distress post-surgery and reconstruction.

Many studies have examined the effects of surgical treatment on survivors' body-image, and while a majority of them conclude that mastectomy is associated with higher body-image distress (Collins et al., 2011; Curran et al., 1998; Engel et al., 2004; Hartl et al., 2003; Hopwood et al., 2007; Janni et al., 2001; Kiebert et al., 1991; Kissane et al., 1998; Lasry et al., 1987; Mock, 1993; Moyer, 1997; Nano et al., 2005; Noguchi et al., 1993; Poulsen et al., 1997; Rowland et al., 2000), other studies have found no significant difference in body-image by surgery type (Collins et al., 2011; de Haes et al., 2003; Ganz et al., 1992; Goldberg et al., 1992; Langer et al., 1991; Schover et al., 1995; Parker et al., 2007; Kraus, 1999). This begs the question of whether it is the surgery type that impacts body-image distress, or the individuals' experience, role in decision-

making, or other expectations that are associated with the development of body-image distress. The present study argues that all these factors should be evaluated together to provide a comprehensive explanation across individual survivors.

Body-Image Distress Following Reconstruction

Some studies found that the strongest benefits associated with breast reconstruction (i.e., using implants and flaps to restore the size and shape of the breasts) following breast cancer surgery was improved body-image (Schover, 1991, pp. 25-28), while other studies have reported mixed results (Janz et al., 2005; Rowland et al., 2000; Nissen et al., 2001; Arora et al., 2001; Nissen et al., 2002). Again, one reason for the mixed results may be due to a lack of standardized measure for body-image distress and researchers confounding quality of life and overall treatment satisfaction with body-image distress rather than assessing it as a separate construct.

Nano et al. (2005) examined survivor self-reported body-image distress and satisfaction with cosmetic outcomes following mastectomy (n = 78), mastectomy with reconstruction (n = 123), and BCS (n = 109). In this study the mastectomy group included women who underwent aesthetic flat closure, which will be discussed further below. They designed an 11-item body-image questionnaire and asked survivors about overall satisfaction with their surgical treatment outcomes (Nano et al., 2005). They discovered that survivors who received mastectomy with reconstruction reported lower body-image distress than those who received mastectomy-alone (Nano et al., 2005). In addition, satisfaction rates for the breast reconstruction group were higher than that of the BCS group. This may in part be due to findings that up to 30% of breast conservation procedures may still result in significant breast distortion (Nano et al., 2005; Berrino et al., 1987; Clough et al., 1998; D'Aniello et al., 1999; Dewar et al., 1988; Johansen et al., 2002; Olivotto et al., 1989; Noguchi et al., 1999).

Nano et al. (2005) argue that although high levels of satisfaction can be achieved with breast reconstruction, the additional surgery, scars, and complications associated are likely to affect body-image in the short and long-term. Thus, breast reconstruction has the potential to both improve and exacerbate body-image distress, depending on whether optimal cosmetic outcomes are achieved (i.e., limited scarring and no complications).

Other studies have found that patients who received BCS reported lower body-image distress than those who received mastectomy with reconstruction (Janz et al., 2005; Mock, 1993; Rowland et al., 2000; Collins et al., 2011). For instance, Rowland et al. (2000) also examined differences between survivors who had received BCS, mastectomy alone, and mastectomy with reconstruction. Two cohorts were recruited with the first being between the years of 1994 and 1995 and the second between 1996 and 1997 and resulted in 1,957 participants. Women in the mastectomy with reconstruction group were younger than those in the BCS or mastectomy-alone groups. Researchers in this study also used a body-image subscale to assess overall quality of life and level of body-image distress (Rowland et al., 2000). Women in the BCS group reported significantly lower body-image distress than women in either the mastectomy with reconstruction or the mastectomy-alone group; however, body-image distress scores were similar for the mastectomy with reconstructed group and the mastectomy-alone group (Rowland et al., 2000). The authors suggest that women who underwent breast reconstruction may experience more body-image distress, in part, because these women likely hoped for BCS, but were poor candidates (Rowland et al., 2000).

A recent longitudinal study by Dempsey et al. (2022) evaluated the role of breast reconstruction on body-image outcomes at four years post-mastectomy. They compared women who chose immediate (n = 61), delayed (n = 16), or no (n = 23) breast reconstruction. Dempsey

et al. (2022) found that body-image distress significantly worsened in the first 12 months following mastectomy and that mean scores on their body-image distress questionnaire reflected higher levels of stigma, body concern, transparency, and arm concerns. They also found that the timing of breast reconstruction did not have a significant impact on body-image distress (Dempsey et al., 2022). Dempsey et al. (2022) conclude that body-image distress is not only tied to physical, cosmetic outcomes, but individual factors such as patient expectations, role in decision making, and stigma (Beesley et al., 2012).

Aesthetic Flat Closure or "Going Flat"

When women elect to have mastectomy without implant or flap reconstruction it is referred to as a 'flat closure mastectomy,' or 'going flat.' Sometimes, 'going flat' is indicated as an option to "forgo breast reconstruction," but this perspective largely reflects surgeons' ambivalence toward the option and general stigma associated with 'going flat' (Baker et al., 2021). In fact, a flat closure mastectomy is a reconstructive option. In recent years, advocacy groups and online communities developed as part of the Going Flat movement, which aims to increase awareness and acceptance of choosing an aesthetic flat closure as a viable option and provide information and support for survivors who are not interested in reconstruction options aimed at recreating the breast shape (Baker et al., 2021). Many women feel the risk of complications and future health problems associated with breast implant/flap reconstruction are not worthwhile, while for others, the thought of a foreign object, such as a breast implant, serves as a deterrent (Baker et al., 2021). Meanwhile, some women report personal values or motivations as dictating their decision, such that they feel the procedure symbolizes empowerment for overcoming the disease.

Ferguson (2000) argues that breast reconstruction is used to promote conformity to societal norms of beauty and femininity (Crompvoets, 2006). Even within the context of 'going flat,' cosmetic outcomes are still a prominent factor for survivor satisfaction and are reflected by a natural flat chest, rather than a concaved chest that is often produced post-mastectomy (Baker et al., 2021). Surgeons currently often advise against 'going flat' post-mastectomy as it is a challenging procedure, even for experienced surgeons, and typically involves deep dissection to permit a natural chest contour (Djohan et al., 2020). Further research is required to standardize a reproducible surgical approach for flat closure mastectomy (Morrison & Karp, 2022), but increased awareness and acceptance of 'going flat' has women advocating for this option. Tyner (2023) urges that patients may likely benefit from a supportive healthcare team when choosing flat closure and comprehensive information regarding both pre- and post-surgery expectations and outcomes.

Another way to further enhance cosmetic outcomes for women who choose various reconstructive approaches, including those who 'go flat,' involves the use of tattooing to camouflage scarring. Medical tattooing in this context can signify women's agency to reclaim their body and refine concepts of the self, such as self-expression, identity, femininity, sexuality, healing, and transformation (Brown et al., 2004; Reid-de Jong & Bruce, 2020). There is little research surrounding medical tattooing post-mastectomy. Medical tattooing post-mastectomy is often pursued by breast cancer survivors independent of their physicians and surgeons to improve cosmetic outcomes (Reid-de Jong & Bruce, 2020).

Medical Tattooing as a Cosmetic Intervention

Reconstructive breast surgery techniques post-mastectomy have helped decrease the impact of distress and increase overall satisfaction among survivors. There is clearly room for

additional complimentary medical interventions that can further improve cosmetic outcomes (Thompson & Kent, 2001). Whereas many survivors who receive some form of reconstructive procedure such as an implant report satisfaction and increased psychosocial outcomes (Karunanayake et al., 2017), complications following these procedures can produce just the opposite and exacerbate psychological distress (Sherman et al., 2017: Falk et al., 2010).

Skin necrosis is a common complication associated with all reconstructive procedures that may worsen cosmetic outcomes. Necrosis occurs when the skin has been thinned too much when tissue was removed during mastectomy and when there is not enough blood flow to the skin. Mastectomy skin necrosis is a common complication that occurs among 1.5% to 41% of survivors after surgery or breast reconstruction (Sullivan et al., 2008; Hultman & Daiza, 2003; Carlson et al., 1997; Padubidri et al., 2001; Munhoz et al., 2007; Sue & Lee, 2018). Small portions of skin necrosis may heal on its own or can be removed and treated with basic wound care. Larger affected portions may need additional surgery to remove dead tissue, resulting in further scarring or implant/flap removal.

Complications such as these often require additional surgical procedures to correct distortion to the breasts, reconstruct the nipple, and improve symmetry. Even after successful breast reconstruction, some survivors report dissatisfaction when cosmetic outcomes do not match their expectations (Jagsi et al., 2016; McCarthy et al., 2010). Ultimately, cosmetic outcomes play a significant role in survivor satisfaction. Although advancements in breast reconstruction have aided in improving cosmetic correction post-mastectomy, survivors may benefit further from additional complimentary procedures like medical tattooing.

Medical tattooing is emerging as a complementary procedure among breast cancer survivors. Specifically, findings suggest enhanced cosmetic satisfaction, improved body-image,

and benefits to mental health (Becker et al., 2022; Hammond et al., 2021). Historically, medical tattooing has been applied to correct or simulate the nipple areola complex (NAC) among breast cancer survivor's post-mastectomy (Becker et al., 2022). For those who elect for breast reconstruction following mastectomy, medical tattooing can also be used to address complications associated with necrosis, excess scarring, asymmetrical nipple areolas, and complete or partial loss of the nipple due to flap or graft techniques during surgery (Uhlmann et al., 2019; Gould et al., 2013). The use of medical tattooing to address surgical complications is illustrated in Figures 1 and 2 below. Tattooing typically occurs 4 months after surgery to allow for proper healing of the tattoo site (Becker et al., 2022). Some survivors may also have damaged tissue due to radiation therapy, making medical tattooing the only corrective option for those who wish to avoid further surgical intervention (Butler et al., 2019).

Figure 1. *Pre-medical tattooing (left) and post-medical tattooing to correct necrosis and scarring (right). Both NAC correction and decorative applique tattooing techniques were used.*
Source. ©EmpowerTattoo

Figure 2. *Medical tattooing to correct flap failure (right).*
Source. ©EmpowerTattoo

Medical tattooing can also be applied as a decorative applique (see Figures 3 and 4 below), in which the medical tattoo artists consults with the survivor to create a custom design that may camouflage scarring and is especially popular among survivors who do not partake in breast reconstruction surgery following mastectomy. Oftentimes, the resulting design is guided by individual values and motivations.

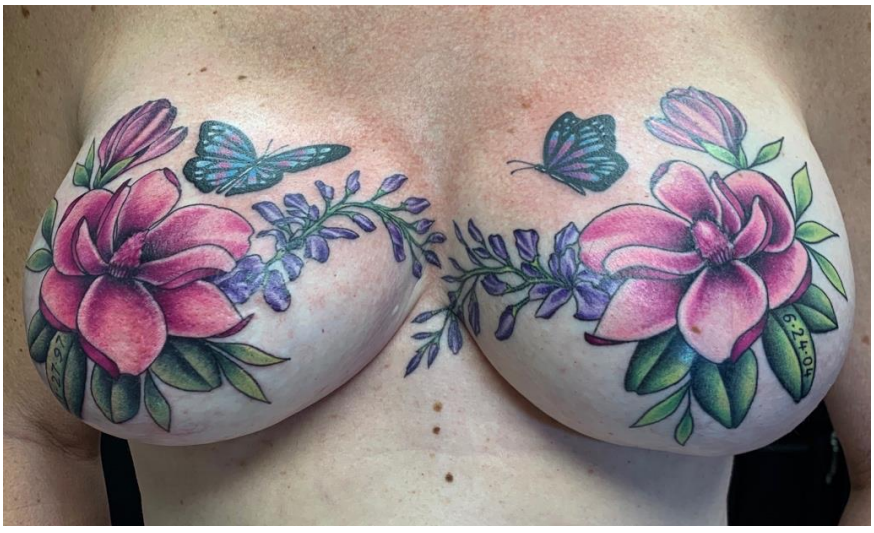


Figure 3. *Decorative medical tattooing following post-mastectomy reconstruction.*
Source. ©EmpowerTattoo

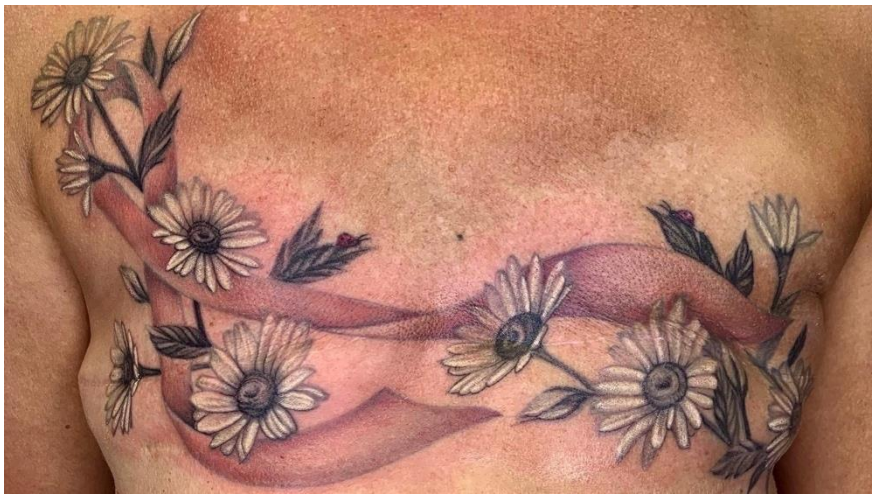


Figure 4. *Decorative medical tattooing following bilateral mastectomy without reconstruction.* Source. ©EmpowerTattoo

Medical tattooing post-mastectomy allows for individualized application of the NAC shape, position, size, texture, color, and addition of sebaceous glands known as Montgomery Tubercules (MTs) (Kandi et al., 2023; Tomita et al., 2021). NAC tattooing has been found to achieve high cosmetic and survivor satisfaction, without serious complication (i.e., infection rates (3.2%) and fading over time), indicating the procedure is highly acceptable and suitable in this context (Becker et al., 2022; Liszewski et al., 2015; Momoh et al., 2012; Satteson et al., 2017). For instance, in a study assessing Japanese patients who received medical tattooing post-reconstruction, Tomita et al. (2021) found that 59 of the 62 patients (95.3%) reported high overall satisfaction rates. Future studies should assess individualized application of and satisfaction with decorative appliques post-breast cancer surgery.

The potential for medical tattooing post-mastectomy as a complimentary intervention to improve aesthetic outcomes is evident, yet, across the United States, acceptance of it as a reconstruction related-procedure covered by insurance is inconsistent. While breast reconstruction has been deemed a “gold standard component of comprehensive breast cancer treatment” (Butler et al., 2019), there are inconsistencies in insurance coverage for medical

tattooing. The Women's Health and Cancer Rights Act (WHCRA) is a federal law that requires insurance providers to cover all stages of breast reconstruction in conjunction with or following mastectomy (Centers for Medicare & Medicaid Services, 2023), yet, as Butler et al. (2019) note, the wording of the law lends to some significant grey areas as it pertains to the law's application to NAC tattooing. The wording of the law requires that procedures must be "medically necessary," which in some areas is used as a loophole for insurance companies to avoid coverage of medical tattooing post-breast cancer surgery (Butler et al., 2019; Centers for Medicare & Medicaid Services, 2023). Further, medical tattooing in this context typically only includes NAC tattooing and is often only considered post-mastectomy. There is certainly need for clarification of the statutes described by the WHCRA, but it is important to generally discuss why medical tattooing should be deemed "medical necessary." For instance, there are times when breast reconstruction cannot be pursued by survivors, but medical tattooing is an option.

While breast reconstruction procedures can be sought by many survivors post-breast cancer surgery, it is not always an eligible option for *all* survivors and is dependent on the extent of the disease and the quality of tissue available for reconstruction (Butler et al., 2019). For instance, nipple-areola reconstruction often includes saving the native NAC skin and tissue or rebuilding the NAC with other tissue following removal of the cancer to integrate into reconstruction procedures, but this is not always possible. For those who wish to recreate the NAC, but do not have the option to or wish to avoid doing so through surgical, reconstructive means, a non-surgical option such as medical tattooing is preferred and should be considered in the context of the treatment process (Butler et al., 2019).

Another mandate included in the WHCRA requires that insurance should cover "any physical complications at all stages of mastectomy" (Butler et al., 2019; Centers for Medicare &

Medicaid Services, 2023). As discussed previously, medical tattooing is a viable option to address surgical complications such as necrosis, excess scarring, asymmetrical nipple areolas, and complete or partial loss of the nipple due to flap or graft techniques during surgery (Uhlmann et al., 2019; Gould et al., 2013). This should not only include NAC tattooing, but also decorative tattooing that can help camouflage these complications and can be guided directly by the survivor in conjunction with guidance from the medical tattoo provider.

Furthermore, the WHCRA only stipulates coverage in private group health insurance plans and individual policies, not federal or state programs such as Medicare or Medicaid. The latter of which only covers nipple-areola tattooing when it is performed by a physician rather than a tattoo artist (Butler et al., 2019; Centers for Medicare & Medicaid Services, 2023). Notably, this lack of insurance coverage and flexibility does not apply to all companies and across all states. In fact, according to Butler et al. (2019), BlueCross BlueShield of Rhode Island provides broad coverage for NAC tattooing because it is deemed "medically necessary" and can be performed by either a physician or a tattoo artist (BlueCross BlueShield Association, 2003). Thus, research supporting the potential for medical tattooing in this context to help improve mental health outcomes among survivors is necessary to assist in standardizing the procedure as a complimentary intervention that is covered by all insurance companies across the country.

Purpose

Despite advances in the effectiveness of breast cancer surgical procedures on mortality, cosmetic outcomes have not been studied as extensively in terms of survivor satisfaction, distress, and psychosocial functioning. Medical tattooing is a promising intervention that gives survivors additional options to enhance cosmetic outcomes following surgery. Nonetheless, the use of medical tattooing to reduce body-image distress needs additional research.

The present study aimed to examine body-image distress in participants post-breast cancer surgery with and without medical tattooing. This was accomplished by comparing body-image distress in two groups of participants, 1.) those who received a post-surgical medical tattoo and 2.) those who did not. Next, the study evaluated how participants rated the outcome and decision satisfaction of other patients' surgical and cosmetic intervention choices. This was accomplished by having participants rate the cosmetic outcome and decision satisfaction of three groups of images depicting patients with 1.) mastectomy and reconstruction only, 2.) mastectomy and medical tattooing only, and 3.) mastectomy, reconstruction, and medical tattooing.

Secondary aims were to evaluate the impact of medical tattooing on mental health symptoms, as well as, to assess the participant's relationship between self-endorsed body-image distress and related psychosocial factors such as appearance investment, satisfaction with decision, and cosmetic expectation discrepancy. Ultimately, the present study hopes this research will be of use in guiding breast cancer survivor's decision making for varying cosmetic interventions and to help standardize medical tattooing as a complimentary cosmetic intervention post-breast cancer surgery.

METHODOLOGY

Measures

Demographics

Demographic variables included the participant's age, level of education, racial or ethnic identification, gender identity, annual income, sexual orientation, and relationship status. The Demographics items from the survey are presented in Appendix A.

Self-Reported Breast Cancer History

Information about whether the participant received medical tattooing following surgery was coded along with their surgery type, disease stage (TNM), and time since surgery (calculated in months from the participant's most recent breast cancer surgical procedure and/or reconstruction). The self-reported breast cancer history questions are presented in Appendix B.

Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a questionnaire used to screen for depression symptoms (Kroenke et al., 2001). Items are rated on a 4-point Likert scale (ranging from 0 = not at all to 3 = nearly every day). This measure has extensive psychometric information demonstrating its reliability and validity (Kroenke et al., 2001). An overall mean score was calculated and used in the statistical analyses with higher scores reflecting more depressive symptoms. The PHQ-9 questions are presented in Appendix C.

Generalized Anxiety Disorder Scale (GAD-7)

The GAD-7 is a questionnaire used to screen for anxiety symptoms (Kroenke et al., 2007; Jordan et al., 2017). Items are rated on a 4-point Likert scale (ranging from 0 = not at all to 3 = nearly every day). This measure has extensive psychometric information demonstrating its

reliability and validity (Johnson et al., 2019). An overall mean score was calculated and used in the statistical analyses with higher scores reflecting more anxiety symptoms. The GAD-7 questions are presented in Appendix D.

Perceived Stress Scale (PSS-10)

The Perceived Stress Scale (PSS-10) is a psychological instrument widely used to assess for the perception of stress (Cohen et al., 1983). It is a measure of the degree to which situations in one's life are appraised as stressful. Items are designed to tap into how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes several direct queries about current levels of experienced stress. Items are rated on a 5-point Likert scale (ranging from 0 = never to 4 = very often).

This measure has extensive psychometric information demonstrating its reliability and validity (Lee, 2012). An overall mean score was calculated and used in the statistical analyses with higher scores indicating higher levels of perceived stress. The PSS-10 questions are presented in Appendix E.

Satisfaction with Decision Scale (SWD)

The Satisfaction with Decision scale (SWD) was used to measure participants' self-reported satisfaction with their health care decisions (Holmes-Rovner et al., 1996). The instructions were slightly altered to accommodate the breast cancer treatment context, "The following statements pertain to your role in the decision-making process throughout your course of breast cancer treatment." Items were also altered to indicate plural 'decisions' and were described in the past tense since the participants are answering following their surgery, "I am

satisfied that my decisions were consistent with my personal values." Items are rated on a 5-point Likert scale (ranging from 1 = Strongly disagree to 5 = Strongly agree).

The SWD scale is a reliable and valid instrument (Holmes-Rovner et al., 1996). Correlation of the SWD scale with measures of satisfaction with other aspects of the decision-making process showed the SWD scale was correlated most highly (0.64) with "decisional confidence," and least with "desire to participate in health care decisions" and "satisfaction with provider" (Holmes-Rovner et al., 1996). An overall mean score was calculated and used in the statistical analyses with higher scores reflecting higher satisfaction with their breast cancer-related healthcare decisions. The SWD questions are presented in Appendix F.

Cosmetic Expectation Discrepancy (CED)

Survivors' cosmetic expectation discrepancy was measured by asking the following item, "The following question concerns your pre- and post- expectations about the cosmetic outcomes related to your procedure. How closely did your expectations match your outcome?" The item is rated on a 10-point Likert scale (ranging from 1 = 'did not match expectations at all,' 5 = 'neither did nor did not match expectations,' and 10 = 'exceeded expectations'). This measure currently has no available psychometrics and is being used based on its face validity. Lower scores reflect a higher cosmetic expectation discrepancy.

Body Image After Breast Cancer Questionnaire (BIBCQ)

The Body Image After Breast Cancer questionnaire (BIBCQ) by Baxter et al. (2006) is the critical measure for body-image distress used in the present study. It is a multidimensional self-reported rating of breasts and body image following breast cancer. The BIBCQ consists of 6 subscales: vulnerability (susceptibility to cancer resurgence or illness), stigma (perceived feeling

of stigmatization due to their appearance and a feeling to hide the breast or body), limitations (competence and ability to complete daily tasks), body concerns (satisfaction with appearance and cosmetic outcomes following cancer surgery), transparency (concerns about obviousness of cosmetic), arm concerns (symptoms and appearance). 6 items were removed as they did not pertain to the study's present aims. Items are rated on a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree).

The BIBCQ provides a reliable and valid assessment of the long-term impact of breast cancer and breast satisfaction on body image (Baxter et al., 2006). An overall mean score was calculated and used in the statistical analyses with higher scores reflecting higher body-image distress. The BIBCQ questions are presented in Appendix G.

Appearance Schemas Inventory-Revised (ASI-R)

The Appearance Schemas Inventory-Revised (ASI-R) is designed to assess body-image investment in relation to beliefs or assumptions made about the importance, meaningfulness, and influence of appearance in one's life (Cash et al., 2004; Teo et al., 2018). The measure consists of two subscales vis-a-vis one's cognitive-behavioral investment in one's own appearance—Self-Evaluative Salience and Motivational Salience. Self-Evaluative Salience reflects the extent to which individuals define or measure themselves and their self-worth by their physical appearance, which they deem influential in their social and emotional experiences (Cash, 2002-2012). Motivational Salience pertains to the extent to which persons attend to their appearance and engage in appearance-management behaviors. Items are rated on a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree).

The instrument and subscales have been reported to have high internal consistency and good validity (Cash et al., 2004). An overall mean score was calculated and used in the statistical

analyses with higher scores reflecting higher body-image investment. The ASI-R questions are presented in Appendix H.

Attention Check Questions

Two questions were interspersed in the survey to assess whether participants were attending to the survey questions and not choosing random answers. These instructed response items were “Please select the word ‘BLUE’,” and “For this item, please select 'Strongly agree’.” Correct answers were scored as 0 and incorrect answers given a value of 1. If the sum of participants’ answers to these two items was greater than 1, their responses were omitted from the dataset. This is a common method of assessing for participant attention and has been used in related studies conducted in the Health Psychology Lab (Gummer et al., 2021).

Target Image Measures

Cosmetic Ratings

Participants were asked to view pre- and post-cosmetic intervention target images then rate the cosmetic quality of the intervention by answering the following item, “In the post-[cosmetic intervention] image, the [cosmetic intervention] improved cosmetic outcomes.” The term ‘cosmetic intervention’ was replaced with the appropriate intervention type name referring to the image presented. The item is rated on a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree).

A score was calculated and used in the statistical analyses with higher scores indicating higher cosmetic ratings. This measure currently has no available psychometrics and is being used based on its face validity. The Cosmetic Ratings question from the Qualtrics survey are presented in Appendix I.

Decision Satisfaction Scale (DSS)

This scale was also adapted from the Satisfaction with Decision scale (SWD) by Holmes-Rovner et al. (1996) in order to assess perceptions of another person's decision. This 3-item scale was presented following viewing each target image and after the participant provided a cosmetic rating: 1) "[the patient] made the best possible decision for her situation." 2) "[the patient] should be satisfied with her decision." 3) "I would make this decision if I were in a similar situation." Items are rated on a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree).

In a related study, the DSS has been found to have a Cronbach's alpha of .698 which is adequate for research. An overall mean score was calculated and used in the statistical analyses with higher scores indicating higher decision satisfaction toward the target item. The Decision Satisfaction Scale questions are presented in Appendix I.

Procedure

Data was collected through a national online survey. Recruitment involved reaching out to national breast cancer-affiliated organizations, support groups, Facebook, and Instagram. The list of entities (including location [town/city and/or state] for those applicable) that agreed to share information about the study are listed in the table located in Appendix J. A total of 137 entities across 20 different states in the nation agreed to share information about the study. We asked these entities to distribute an IRB-approved flyer (Appendix K) containing information about the study and a link to the Qualtrics survey via newsletter, posting on a website, physical distribution, or through posting on these platforms. Snowball sampling, or chain referral sampling was also employed. This approach encouraged participants to share information about

the study to others they knew who also had breast cancer and who might be interested (Biernacki & Waldorf, 1981).

The online survey, which was constructed using the Qualtrics XM ® software, was approved by The University of Central Florida Institutional Review Board (IRB) as an exempt anonymous study (STUDY00004826; Appendix L). Inclusion criteria were self-reported history of breast cancer with BCS or mastectomy. Exclusion criteria included breast cancer survivors who had not undergone surgical treatment, adults unable to consent, individuals who were younger than 18 years or older than 65 years, pregnant women, and prisoners.

After agreeing to participate in the study, participants were provided with an Explanation of Research (Appendix M). Potential risks to participants included distress due to viewing images of other patients with mastectomy. The Explanation of Research provided this warning to potential participants, and they were also told that they could discontinue or choose not to participate in the study at any time. A potential benefit to participants included psychoeducation about medical tattooing as a cosmetic intervention following breast cancer surgery. Participants also had the opportunity to opt-into a free consultation or information session with a certified medical tattoo artist. Participants were told that results would be expected in 12-15 months, and they could opt-in to receive published study results and report if they wanted. The first part of the survey included measures and questions that asked participants questions about themselves, including demographic, clinical characteristics, and questions regarding psychosocial functioning; the second part of the survey asked participants to provide cosmetic and decision satisfaction ratings while viewing images of other patients' post-mastectomy with differing cosmetic intervention. The survey flow is illustrated in Appendix N.

Procedure for Rating Target Images

All participants were randomly presented with images from 3 different types of surgery and cosmetic intervention which are termed intervention targets (IT):

IT1- Mastectomy and reconstruction only.

IT2- Mastectomy and medical tattooing only.

IT-3 Mastectomy, reconstruction, and medical tattooing.

There were 2 images for each IT type, so that participants viewed a total of 6 images. Before viewing each IT image, participants were provided a description and instructions. One example from each IT type and the cosmetic and DSS questions that followed are displayed below in Figures 5, 6, and 7 (see pages 33, 34, and 35). All other examples can be viewed in Appendix I.

Case #1

The following images show 'Cassie' who has undergone a bilateral mastectomy with immediate silicone implant reconstruction. Please view the below image and answer the following questions **in relation to the POST-Reconstruction image on the right.**

The following are questions concerning your opinion of 'Cassie's' decision to receive breast reconstruction following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

In the post-reconstruction image, the implant reconstruction improves cosmetic outcomes.

__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

'Cassie' made the best possible decision for her situation.

__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

'Cassie' should be satisfied with her decision.

__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

I would make this decision if I were in a similar situation.

__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

Figure 5. *Intervention Target 1 - Mastectomy with Reconstruction only.*
Source. ©2022 American Society of Plastic Surgeons

Instructions:
Please view each case carefully and respond to each of the following questions.

Case #2
'Kelsey' has undergone a bilateral mastectomy with chemotherapy and radiation treatment. 3 years later, she received medical tattooing to recreate the nipple areola complex. Please view the below image and answer the following questions in **relation to the POST-MEDICAL TATTOOING image to the right.**

Please indicate whether you agree with the below statements in **relation to the POST-MEDICAL TATTOOING image on the right.**

In the post-reconstruction image, the implant reconstruction improves cosmetic outcomes.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

'Kelsey' made the best possible decision for her situation.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

'Kelsey' should be satisfied with her decision.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

I would make this decision if I were in a similar situation.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

Figure 6. *Intervention Target 2 - Mastectomy with Medical Tattooing only.*
Source. ©EmpowerTattoo

Instructions:
Please view each case carefully and respond to each of the following questions.

Case #3
'Kim' has undergone a bilateral mastectomy with autologous/flap reconstruction surgery. 4 months following the procedure she received medical tattooing to recreate the nipple areola complex. Please view the below image and answer the following questions in **relation to the POST-MEDICAL TATTOOING image to the right.**

The following are questions concerning your opinion of 'Cassie's' decision to receive breast reconstruction following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

In the post-reconstruction image, the implant reconstruction improves cosmetic outcomes.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

'Kim' made the best possible decision for her situation.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

'Kim' should be satisfied with her decision.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

I would make this decision if I were in a similar situation.
__ Strongly disagree (1)
__ Somewhat disagree (2)
__ Neither agree nor disagree (3)
__ Somewhat agree (4)
__ Strongly agree (5)

Figure 7. I*ntervention Target 3 - Mastectomy with Reconstruction and Medical tattooing.*
Source. ©EmpowerTattoo

RESULTS

The present study aimed to examine body-image distress in participants post-breast cancer surgery with and without medical tattooing. This was accomplished by comparing body-image distress in two groups of participants, 1.) those who received a post-surgical medical tattoo and 2.) those who did not. Next, the study evaluated how participants rated the outcome and decision satisfaction of *other* patients' surgical and cosmetic intervention choices. This was accomplished by having participants rate the cosmetic outcome and decision satisfaction of three groups of images depicting patients with 1.) mastectomy and reconstruction only, 2.) mastectomy and medical tattooing only, and 3.) mastectomy, reconstruction, and medical tattooing.

Secondary aims were to evaluate the impact of medical tattooing on mental health symptoms, as well as, to assess the participant's relationship between self-endorsed body-image distress and related psychosocial factors such as appearance investment, satisfaction with decision, and cosmetic expectation discrepancy. Hypotheses were as follows:

Hypothesis 1: Participants with medical tattooing will exhibit lower body-image distress as measured by the body-image after breast cancer (BIBCQ) mean score after controlling for age, disease staging, surgery type, time since surgery, depressive symptoms (PHQ-9 mean score), and perceived stress (PSS-10 mean score).

Hypothesis 2a: Participants will provide higher cosmetic ratings of images of other patients with medical tattooing as measured by the cosmetic rating mean score.

Hypothesis 2b: Participants will provide higher satisfaction with the other patients' decision to receive medical tattooing as measured by the decision satisfaction scale mean score.

Hypothesis 3a: Participants' body-image distress (BIBCQ) will predict cosmetic ratings of images of other patients with medical tattooing as measured by the cosmetic rating score.

Hypothesis 3b: Participants' body-image distress (BIBCQ) will predict satisfaction with the other patients' decision to receive medical tattooing as measured by the decision satisfaction scale mean score.

Analyses

All statistical analyses were performed in SPSS version 26 and Stata/BE 18.0. A series of linear regressions and multilevel modeling analyses were used to address hypotheses. The advantage of multilevel modelling is that it allows for the nesting of multiple observations within person so that higher-level (L2) units are between-subject variables that are held constant, while the lower level (L1) units are allowed to vary across the higher-level units (Diez Roux, 2002; Gustin & Simons, 2008). Except for demographic variables and analyses of incompletions, observations with missing values were excluded from the analysis via listwise deletion of missing data. Variables were centered to reduce multicollinearity. Level of significance was set at $p < .05$.

Descriptive Statistics

A total of 366 participants completed the survey. A total of 19 participants were removed for not meeting a priori inclusion criteria. Following, the data was reviewed for inattention and 1 participant was removed. The data was then reviewed for completeness and an additional 139 participants were removed because they discontinued the study. There were no significant differences between participants who completed the full survey and those who discontinued in terms of demographic variables or self-reported breast cancer history variables (see Appendix O) and participant attrition is illustrated over the course of the survey in Appendix P. A total of 207

participants were included in the analyses of primary aims. All participants were biologically female and indicated their gender as female. The age range of the sample was 25 to 65 (M = 47.09, SD = 8.81) and 78.3% identified as Caucasian or White, 6.3% as Latino or Hispanic, 1.9% as Asian, 10.1% as African American or Black, and 3.4% as multiracial. Among the sample, 9.2% had undergone BCS, 11.1% had undergone mastectomy, 79.7% had undergone BCS and/or mastectomy with reconstruction. Primary aim analyses assessed between-group differences and indicated that 29.5% of participants had received a medical tattoo following surgery and 70.5% indicated they had not. Complete demographic statistics and clinical characteristics according to the participant's medical tattoo status can be viewed in Table 1.

Preliminary analyses were conducted via Chi-Square Test of Independence (for categorical variables) and one-way ANOVAs (for continuous variables) to determine whether age, relationship status, surgery type, cancer stage, time since surgery, and mental health status (i.e., depression, anxiety, and perceived stress symptoms) significantly differed across participants who had or had not received medical tattooing post-surgical intervention. Findings are indicated in Table 1 below.

Table 1. *Preliminary analyses to determine medical tattoo group differences among demographic and clinical characteristic variables of interest.*

		Medical Tattoo Group								
		No (n = 146)		Yes (n = 61)			Total Sample (n = 207)			
		Mean(SD)	n (%)	Mean(SD)	n (%)	df	X^2	F	η2	p
Demographic Information										
	Age (years)	46.12(8.88)		49.39(8.27)		1		6.07	0.03	0.02
	Relationship Status					1	0.57			0.45
	Single		29(65.9%)		15(34.1%)					
	In Relationship		117(71.8%)		46(28.2%)					
Clinical Characteristics										
	Surgery Type					2	15.48			0.001
	BCS		18(94.7%)		1(5.3%)					
	Mastectomy		22(95.7%)		1(4.3%)					
	Reconstruction		106(64.2%)		59(35.8%)					
	Cancer Stage					4	12.3			0.03
	Stage 0		14(66.7%)		7(33.3%)					
	Stage I		48(62.3%)		29(37.7%)					
	Stage II		53(76.8%)		16(23.2%)					
	Stage III		27(87.1%)		4(12.9%)					
	Stage IV		1(25%)		3(75%)					
	Time Since Surgery	33.92(41.40)		61.58(51.09)		1		15.89	0.07	0.001
	PHQ9	16.15(5.83)		13.92(4.80)		1		6.97	0.03	0.01
	GAD7	14.63(5.78)		13.05(5.48)		1		3.32	0.02	0.07
	PSS	17.43(7.11)		15.30(7.07)		1		3.89	0.02	0.05

Note. BCS = breast conserving surgery. PHQ9 = Patient Health Questionnaire-9. GAD7 = General Anxiety Disorder-7. PSS = Perceived Stress Scale-10. The percentage is the percentage within row.

As indicated in the table above, age, surgery type, cancer stage, time since surgery, depressive symptoms, and perceived stress significantly differed between participants who had or had not received medical tattooing following surgery. As these variables were significantly different, they were controlled for in subsequent primary analyses.

To address hypothesis 1, a linear regression analysis was conducted to assess whether body-image distress was predicted by medical tattooing when controlling for demographic and clinical characteristic variables. After controlling for demographic (i.e., age) and clinical characteristic (i.e., surgery type, disease stage, time since surgery, depressive symptoms, and perceived stress) variables, a significant main effect of medical tattooing on body-image distress (BIBCQ) was found that accounted for approximately 8% of the variance, while the full model accounted for approximately 48%, $F\ (7, 193) = 25.20$, $p = .001$. Specifically, participants with

medical tattooing (β = -.19) had significantly lower levels of body-image distress than those without medical tattooing approaching a medium effect size (Cohen's d = 0.41).

The covariates in this model accounted for approximately 40% of the variance, these covariates were age (β = -.03, p = .60), surgery type (β = .13, p = .02), disease stage (β = .01, p = .80), time since surgery (β = .01, p = .88), depression (PHQ-9) (β = .35, p = .001), and perceived stress (PSS-10) (β = .33, p = .001). Higher depressive symptoms and higher perceived stress were significantly associated with higher levels of body-image distress (BIBCQ). Undergoing reconstruction was also significantly associated with higher levels of body-image distress (BIBCQ). There were no significant interactions found. These results are reported in Table 2 below:

Table 2. *Linear regression results using BIBCQ as the outcome variable and medical tattoo group as the predictor variable with covariates included.*

Variable	*B*	*SE B*	*β*	*t*	*p*
Main Effect					
Medical Tattoo Group	-0.30	0.09	-.19	-3.26	.001
Covariates					
Age	-0.002	0.01	-.03	-0.52	.60
Surgery Type	0.15	0.06	.13	2.45	.02
Disease Stage	0.001	0.001	.01	0.26	.80
Time Since Surgery	0.001	0.001	.01	0.16	.88
PHQ9	0.04	0.01	.35	4.65	.001
PSS	0.03	0.01	.33	4.47	.001

Note. PHQ9 = Patient Health Questionnaire-9. PSS = Perceived Stress Scale-10.

The remaining hypotheses 2(a and b) and 3(a and b) were tested with four multilevel model analyses. The outcome measures were cosmetic and decision satisfaction ratings of each target image type. This series of multilevel analysis specifically evaluated the participant's

ratings of the three groups of images (IT). The second level (L2) was participants' medical tattoo status (i.e., whether they had a medical tattoo or not).

Hypothesis 2a predicted that participants will provide higher cosmetic ratings of images of patients with medical tattooing as measured by the cosmetic rating mean score. The participant's medical tattoo status (i.e., whether they had a medical tattoo or not) was held constant and the results are illustrated separately in Figures 8 and 9 since there were differences at the L2 level. Participants without a medical tattoo rated images of mastectomy and reconstruction only (IT1) (b = -.35, p = .001) and mastectomy and medical tattooing only (IT2) (b = -.33, p = .001) as having significantly lower cosmetic ratings when compared to images of mastectomy, reconstruction, and medical tattooing (IT3), Wald Chi-Square Test (5) = 43.84, p = .0001. There were no significant interactions. See Figure 8 below:

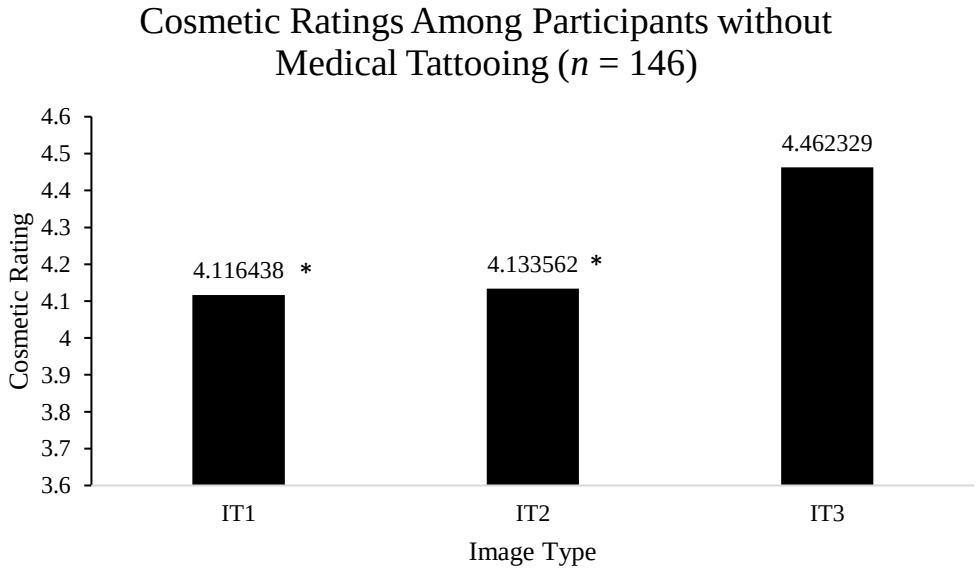


Figure 8. *Differences in cosmetic ratings among participants without medical tattooing across image types.*

Note. Cosmetic Rating ranges from 0 to 5. Higher ratings indicate higher cosmetic outcome.
IT = Image Type. IT1 = Mastectomy with reconstruction only. IT2 = Mastectomy with medical tattoo only. IT3 = Mastectomy with reconstruction and medical tattooing.
* Indicates significantly lower ratings than IT3 (p = .001).

Participants with a medical tattoo rated images of mastectomy and reconstruction only (IT1) (b = -.24, p = .02) as having significantly lower cosmetic ratings than images of mastectomy, reconstruction, and medical tattooing (IT3); there was no significant difference in cosmetic ratings for images of mastectomy and medical tattooing only (IT2) compared to those of mastectomy, reconstruction, and medical tattooing (IT3). There were no significant interactions. See Figure 9 below:

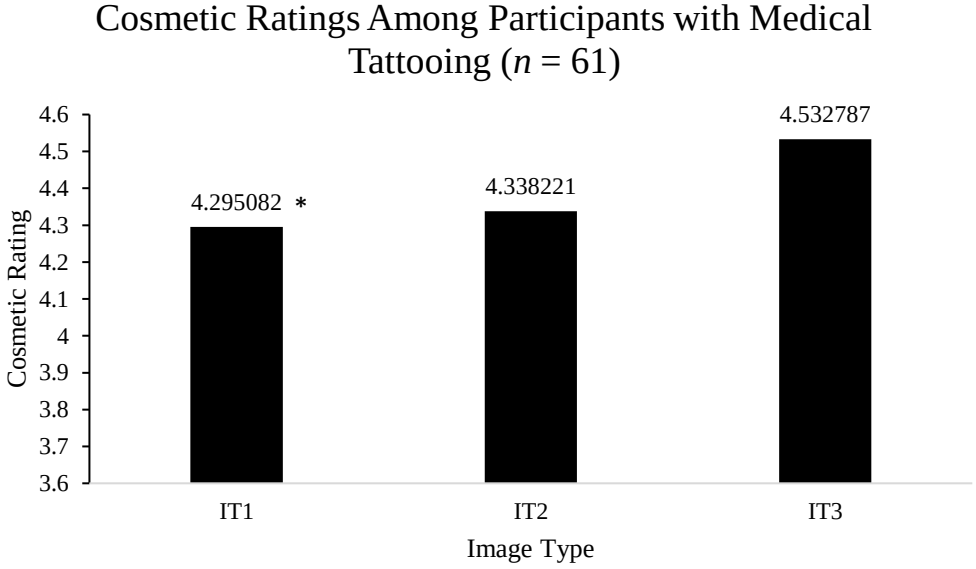


Figure 9. *Differences in cosmetic ratings among participants with medical tattooing across image types.*

Note. Cosmetic Rating ranges from 0 to 5. Higher ratings indicate higher cosmetic outcome.
IT = Image Type. IT1 = Mastectomy with reconstruction only. IT2 = Mastectomy with medical tattoo only. IT3 = Mastectomy with reconstruction and medical tattooing.
* Indicates significantly lower ratings than IT3 (p < .05). There was no significant difference between IT2 and IT3.

Hypothesis 2b predicted that participants will provide higher satisfaction with the other patients' decision to receive medical tattooing as measured by the decision satisfaction scale mean score. The participant's medical tattoo status (whether they had a medical tattoo or not) was held constant and the results are illustrated separately in Figures 10 and 11 since there were

differences at the L2 level. Participants without a medical tattoo rated images of mastectomy and reconstruction only (IT1) (b = -.14, p = .01) and mastectomy and medical tattooing only (IT2) (b = -.19, p = .001) as having significantly lower decision satisfaction ratings than images of mastectomy, reconstruction, and medical tattooing (IT3), Wald Chi-Square Test (5) = 29.99, p = .0001. There were no significant interactions. See Figure 10 below:

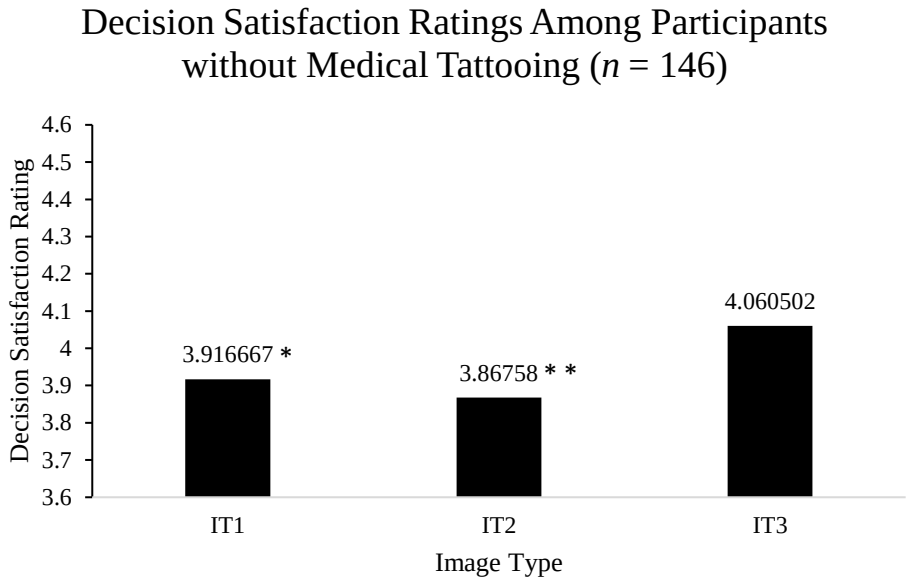


Figure 10. *Differences in decision satisfaction ratings among participants without medical tattooing across image types.*

Note. Decision Satisfaction Rating ranges from 0 to 5. Higher ratings indicate higher decision satisfaction.
IT = Image Type. IT1 = Mastectomy with reconstruction only. IT2 = Mastectomy with medical tattoo only. IT3 = Mastectomy with reconstruction and medical tattooing.
** Indicates significantly lower ratings than IT3 (p = .01).*
*** Indicates significantly lower ratings than IT3 (p = .001).*

Participants with a medical tattoo rated images of mastectomy and medical tattoo only (IT2) (b = -.35, p = .001) as having significantly lower decision satisfaction ratings than images of mastectomy, reconstruction, and medical tattooing (IT3); there was no significant difference in decision satisfaction ratings for images of mastectomy and reconstruction only (IT1)

compared to those mastectomy, reconstruction, and medical tattooing (IT3). There were no significant interactions. See Figure 11 below:

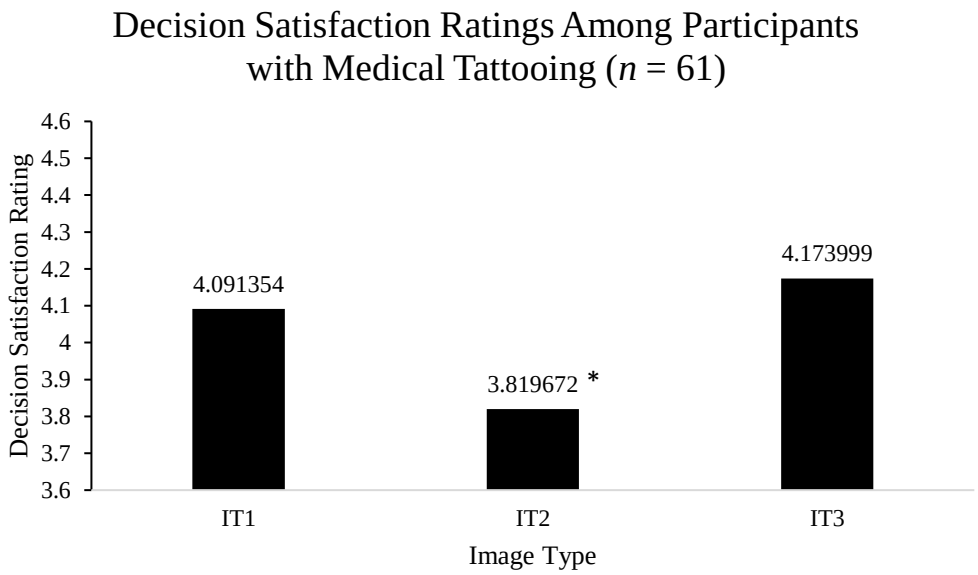


Figure 11. *Differences in decision satisfaction ratings among participants with medical tattooing across image types.*

Note. Decision Satisfaction Rating ranges from 0 to 5. Higher ratings indicate higher decision satisfaction.
IT = Image Type. IT1 = Mastectomy with reconstruction only. IT2 = Mastectomy with medical tattoo only. IT3 = Mastectomy with reconstruction and medical tattooing.
** Indicates significantly lower ratings than IT3 (p = .001). There was no significant difference between IT1 and IT3.*

Hypothesis 3a stated that participants' body-image distress (BIBCQ) will predict higher cosmetic ratings of images of patients with medical tattooing. The participant's medical tattoo status (whether they had a medical tattoo or not) and level of body-image distress (BIBCQ) were both held constant (L1). There was no main effect of the participants' body-image distress on cosmetic ratings and no interactions.

Hypothesis 3b stated that participants' body-image distress (BIBCQ) will predict higher satisfaction with the other patients' decision to receive medical tattooing as measured by the decision satisfaction scale mean score. The participant's medical tattoo status (whether they had a medical tattoo or not) and level of body-image distress (BIBCQ) were both held constant (L1).

There was no main effect of body-image distress on decision satisfaction ratings and no interactions.

Secondary Analyses

Secondary analyses were exploratory and did not directly address hypotheses. Linear regression analyses were used to evaluate the relationship between medical tattoo group and the participant's self-reported depressive symptoms (PHQ-9), anxiety symptoms (GAD-7), and level of perceived stress (PSS-10). Depressive symptoms (PHQ-9) accounted for approximately 3% of the variance and was significantly associated with having a medical tattoo $F(1, 205) = 6.97$, $\beta = -.18$, $p = .01$). Perceived stress (PSS-10) accounted for approximately 5% of the variance and was significantly associated with having a medical tattoo, $F(1, 205) = 3.89$, $\beta = -.14$, $p = .05$). Anxiety (GAD-7) was not significantly associated with having a medical tattoo.

Linear regression analyses were also conducted to assess how body-image distress (BIBCQ) was associated with related psychosocial factors such as appearance investment (ASI-R), satisfaction with decision (SWD), and cosmetic expectation discrepancy (CED). Appearance investment (ASI-R) accounted for approximately 25% of the variance and was significantly associated with body-image distress (BIBCQ), $F(1, 205) = 68.49$, $\beta = .50$, $p = .001$. Satisfaction with decision (SWD) accounted for approximately 14% of the variance and was significantly associated with body-image distress (BIBCQ), $F(1, 205) = 33.20$, $\beta = -.37$, $p = .001$. Cosmetic expectation discrepancy (CED) accounted for approximately 29% of the variance and was significantly associated with body-image distress (BIBCQ), $F(1, 205) = 82.82$, $\beta = -.54$, $p = .001$. Participants with higher appearance investment were significantly associated with higher body-image distress, while participants with higher satisfaction with their decisions and lower cosmetic expectation discrepancy were significantly associated with lower body-image distress.

DISCUSSION

There is limited knowledge regarding the utilization of medical tattooing following mastectomy among women within the U.S. healthcare system. Currently, there exists no published data about the percentage of women that receive medical tattooing after mastectomy, the specific types of tattooing procedures they undergo, and the practitioners responsible for performing these procedures. In this study, out of the total 207 participants, 29.5% (n = 61) reported having undergone medical tattooing while 70.5% (n = 146) did not. By the end of the survey, 82.6% of the sample indicated that they were interested in pursuing medical tattooing as a cosmetic intervention. It is important to note that this survey did not meet the stringent sampling criteria required to establish the incidence or prevalence of medical tattooing. However, this dataset likely provides the most comprehensive and objective estimates of medical tattooing use in this context. The evidence suggests that medical tattooing as a complimentary cosmetic intervention is something that, once survivors are presented with information about it, want and can potentially benefit from.

The benefit of medical tattooing is supported because participants who underwent medical tattooing reported significantly lower levels of body-image distress in comparison to those who did not undergo this procedure. Thus hypothesis 1 is supported. This finding was observed after controlling for age, disease stage, surgery type, time since intervention, depression symptoms, and perceived stress. This significant discovery represents an early effort to investigate the impact of medical tattooing on body-image distress among breast cancer survivors. While previous research has found high levels of patient satisfaction in the context of

medical tattooing, no studies have explored its association with lower adverse consequences, specifically body-image distress, following breast cancer surgery.

Hypothesis 2a, which predicted that participants' cosmetic ratings of images of individuals with medical tattoos would be higher than those without, also received substantial support. Notably, there were significant differences in the responses between participants with medical tattoos and those without them. Consequently, separate analyses were conducted for these two distinct participant groups. However, regardless of the participants' medical tattoo status, the highest ratings were consistently given to images of mastectomy, reconstruction, and medical tattooing. Ratings diverged for images portraying mastectomy and reconstruction only, and mastectomy and medical tattooing only, depending on whether participants themselves had a medical tattoo. For participants without a medical tattoo, images of mastectomy and reconstruction only, and those of mastectomy and medical tattooing only, received significantly lower ratings than those of mastectomy, reconstruction, and medical tattooing. Among participants with a medical tattoo, images of mastectomy and reconstruction only received significantly lower ratings than those of mastectomy, reconstruction, and medical tattooing. Within this group, no significant differences emerged between images of mastectomy and medical tattooing only and those of mastectomy, reconstruction, and medical tattooing.

Hypothesis 2b, which predicted that participants' decision satisfaction ratings of images of individuals with medical tattoos would be higher than those without, received partial support. In fact, for participants without a medical tattoo, the results for the decision satisfaction ratings mirrored the findings reported above for the cosmetic ratings. Among participants with a medical tattoo, images of mastectomy and medical tattooing only received significantly lower ratings than those of mastectomy, reconstruction, and medical tattooing. Within this group, no

significant differences emerged between images of mastectomy and reconstruction only and those of mastectomy, reconstruction, and medical tattooing. Taken together, the results of the cosmetic ratings and the decision satisfaction ratings indicate that participants thought that patients with mastectomy who received reconstruction *and* medical tattooing produced a superior outcome than reconstruction or medical tattooing alone.

The results presented thus far have evaluated the impact of medical tattooing as a predictor variable. Hypotheses 3a and 3b examined the influence of participants' own body-image distress as a predictor variable for their assessments of others' cosmetic outcomes and decision satisfaction. No significant associations were observed between the participants' level of body-image distress and their ratings of cosmetic outcomes or decision satisfaction in others. This implies that participants were able to make objective aesthetic ratings with minimal influence of their own distress.

Secondary analyses indicated that participants who had undergone medical tattooing reported significantly fewer subjective depressive symptoms and lower levels of perceived stress. These findings suggest that medical tattooing may offer potential benefits for mental health symptoms in survivors. Additionally, appearance investment, self-reported decision satisfaction, and cosmetic expectations were identified as factors significantly associated with body-image distress. Specifically, participants with higher levels of appearance investment reported greater body-image distress in themselves. Conversely, those with higher self-reported decision satisfaction and lower discrepancies in cosmetic expectations reported lower levels of body-image distress in themselves. These results align with previous research; however, this study uniquely examined these factors within a single study. It is evident that these factors play

significant roles as predictors of body-image distress and should be taken into consideration as covariates in future studies.

The literature review and the results presented here highlight the importance of body-image distress to a patient-centered approach and its impact on outcomes for breast cancer survivors. This approach also recognizes the importance of cosmetic goals and involvement of patients with the medical decision-making process from the moment of diagnosis throughout the entire treatment journey. It is important to acknowledge that certain decisions may fall beyond a patient's control. As discussed earlier, achieving an optimal balance between a patient's preferred and actual role in decision-making is crucial to enhance the likelihood of favorable patient-reported outcomes.

Enhancing our understanding of how breast cancer treatment and surgery affects survivors' body-image distress may aid healthcare professionals in offering additional psychoeducation and recommendations. Furthermore, presenting information about medical tattooing as a complementary cosmetic option early in the treatment process allows patients the opportunity to consider it within the context of their overall treatment plan. This requires surgeons to compile a referral list of qualified medical tattoo artists to provide to patients (Becker & Cassisi, 2021).

Strengths and Weaknesses of the Study

This study has several strengths. The participants were recruited from multiple sources, and they represented a large National sample of survivors from multiple cities and at least 20 states. Importantly, the survey was conducted outside participants' medical setting, and it was independent of surgical practices and hospitals. Thus, the participants were less likely to be

influenced by their sense of loyalty and wanting to please their physicians with their responses (Klitzman, 2007).

This study had several important limitations. While the sample size was sufficiently powered to test for main effects, it was underpowered to test for additional comparisons and interactions. For example, the BIBCQ provides 6 subscales, and the study would have benefited from closer examination of surgery with and without medical tattooing on these dimensions separately. In addition, these dimensions of body-image distress may have been predictive of other outcomes in the secondary analyses.

Attrition was relatively high and likely caused by several factors. The survey was relatively long, and it took approximately 20 minutes to complete for most participants, but some took as long as 60 to 90 minutes. Many survivors started the survey and discontinued. The attrition rate was relatively consistent throughout the entire survey.

The explanation of research given prior to the survey warned participants that they would be viewing images of mastectomy with and without cosmetic intervention and they may find these images disturbing. They were informed that they may discontinue at any time with no penalty. Analyses of attrition did not indicate that this was the case. Future studies containing a similar image pool and design may consider suggesting that participants reach out to their medical or surgical provider for post-surgical psychosocial support services.

Further, future studies should consider adding a captcha to the start of the survey to discourage fraudulent attempts or bots from completing the survey (Loebenberg et al., 2023). The present survey screened for fraudulent attempts and did not provide financial compensation, so the present authors had no reason to suspect such attempts or threat of bots (Chen et al., 2023).

The study would have benefitted from having a larger pool of images presented to the participant. Two examples were provided to rate for each intervention type. Differences in the appearance of the patients depicted such as general physical attractiveness or age might have influenced cosmetic ratings along with the intervention type. With a larger set of target images these variables could also be counterbalanced. For example, equal numbers of older and younger patients could be depicted for each type of intervention, allowing the influence of that demographic variable on ratings to be factored out. Further, it is important to include images of patients that depict diversity, specifically women of color. The present study sought to incorporate images of patients of different races and ethnicities but was constrained due to the inability to find both the pre- and post-mastectomy and cosmetic intervention images with written permission and consent. However, there are several constraints to having a larger set of images to rate. As discussed before, the duration of this survey was already burdensome and possibly leading to attrition. Nonetheless, future studies should seek to expand the pool of images for each intervention type and perhaps include incentives to make a larger time commitment more acceptable.

A notable limitation of this study is its sample's lack of diversity. This is particularly problematic given the significant disparities in health outcomes observed between white and nonwhite individuals, especially in the context of breast cancer, one of the most prevalent cancer types in our society. Disparities in the outcomes for breast cancer between women who are white and women of color are deeply troubling. For instance, black women are less likely to receive a breast cancer diagnosis compared to their white counterparts, and their mortality rates from the disease are approximately 40 percent higher (Giaquinto et al., 2022; Atlanta: American Cancer Society, 2022). It's crucial to acknowledge that disparities in health outcomes among people of

color are often rooted in systemic issues, such as limited access to high-quality healthcare and the presence of structural racism within the U.S. healthcare system (Giaquinto et al., 2022; Atlanta: American Cancer Society, 2022). An additional systemic issue that may influence these disparities, is their underrepresentation in clinical research.

In this new age of successful cancer treatments, research participation is often a good way to learn about the latest approaches and interventions. Various patient factors related to lower participation by minorities in clinical research have been suggested (Awidi & Al Hadidi, 2021). These include a lack of comfort with research processes including fear of being treated unequally or as 'guinea pigs,' financial constraints (e.g., having to work more hours and having less time to volunteer), health care literacy, and less access to support networks. While a concerted effort was made to identify ethnically-diverse support networks for this study, only few agreed to share the study's flyer and information. Future research should consider their approaches to maintain ethical inclusivity and be aware of health disparities that are prevalent among this population.

In conclusion, since medical tattooing is increasingly being considered an essential element of restoration following mastectomy, it is gradually being covered by health insurance. This research provides evidence to support this trend. Medical tattoo providers also need to respond to this trend by developing professional organizations to regulate and credential providers to ensure the highest level of care (Becker and Cassisi, 2021). Ultimately, the results from this study suggest that medical tattooing as a complimentary cosmetic intervention can help mitigate body-image distress and negative mental health outcomes following breast cancer surgery.

APPENDIX A: DEMOGRAPHICS

D0 How did you hear about our study?

_____

D1 What is your age?

_____

D2 What is the highest level of school you have completed or the highest degree you have received?

__Less than high school degree (1)
__High school graduate (high school diploma or equivalent including GED) (2)
__Some college but no degree (3)
__Associate degree in college (2-year) (4)
__Bachelor's degree in college (4-year) (5)
__Master's degree (6)
__Doctoral degree (7)
__Professional degree (JD, MD) (8)

D3 What is your racial or ethnic identification?

__American Indian or Alaska Native (Examples: Navajo Nation, Blackfeet Tribe, Muscogee (Creek) Nation, Mayan, Doyon, Native Village of Barrow Inupiat Traditional Government, and so on) (1)
__Asian or Asian American (Examples: Chinese, Filipino, Asian Indian, Vietnamese, Korean, Japanese, and so on) (2)
__Black or African American (Examples: African American, Jamaican, Haitian, Nigerian, Ethiopian, Somalian, and so on) (3)
__White (Examples: German, Irish, English, Italian, Lebanese, Egyptian, and so on) (4)
__Hispanic, Latino, or Spanish origin (Examples: Mexican or Mexican American, Puerto Rican, Cuban, Dominican, Salvadoran, Colombian, and so on) (5)
__Native Hawaiian or Other Pacific Islander (Examples: Native Hawaiian, Samoan, Guamanian or Chamorro, Tongan, Fijian, Marshallese, and so on) (6)
__Multi-racial (7)

Display This Question: If D3 = 7

D3b If you selected Multi-racial, check all the racial/ethnic groups that you identify with:

__American Indian or Alaska Native (Examples: Navajo Nation, Blackfeet Tribe, Muscogee (Creek) Nation, Mayan, Doyon, Native Village of Barrow Inupiat Traditional Government, and so on) (1)

__Asian or Asian American (Examples: Chinese, Filipino, Asian Indian, Vietnamese, Korean, Japanese, and so on) (2)

__Black or African American (Examples: African American, Jamaican, Haitian, Nigerian, Ethiopian, Somalian, and so on) (3)

__White (Examples: German, Irish, English, Italian, Lebanese, Egyptian, and so on) (4)

__Hispanic, Latino, or Spanish origin (Examples: Mexican or Mexican American, Puerto Rican, Cuban, Dominican, Salvadoran, Colombian, and so on) (5)

__Native Hawaiian or Other Pacific Islander (Examples: Native Hawaiian, Samoan, Guamanian or Chamorro, Tongan, Fijian, Marshallese, and so on) (6)

D4 What is your biological sex?

__Male (1)

__Female (2)

D5 What gender do you identify as?

__Male (1)

__Female (2)

D6 Information about income is very important to understand. Would you please give your best guess?Please indicate the answer that includes your entire household income in (previous year) before taxes.

__Less than $10,000 (1)

__$10,000 to $19,999 (2)

__$20,000 to $29,999 (3)

__$30,000 to $39,999 (4)

__$40,000 to $49,999 (5)

__$50,000 to $59,999 (6)

__$60,000 to $69,999 (7)

__$70,000 to $79,999 (8)

__$80,000 to $89,999 (9)

__$90,000 to $99,999 (10)

__$100,000 to $149,999 (11)

__$150,000 or more (12)

D7 Which of the following best describes your sexual orientation?

__Heterosexual (straight) (1)
__Homosexual (gay) (2)
__Bisexual (3)
__Other (4) _____
__Prefer not to say (5)

D8 Are you currently single or in a relationship?

__Single (1)
__In a relationship (2)

APPENDIX B: BREAST CANCER HISTORY

BCH_1 Which type of procedure(s) have you undergone because of your breast cancer? Select all that apply.

__Surgery to Remove Cancer (i.e., Mastectomy, Lumpectomy/Breast-Conserving) (1)

__Chemotherapy (2)

__Radiation Therapy (3)

__Hormone Therapy (4)

__Immunotherapy (5)

__Targeted Drug Therapy (If so, which kind): (6) _____

__Other: (998) _____

BCH_2 What type of surgical procedure did you undergo because of your breast cancer?

__Mastectomy (1)

__Lumpectomy/ Breast Conserving Surgery (2)

__None (0)

Skip To: End of Block If BCH_2 = 0
Skip To: BCH_4 If BCH_2 = 2
Display This Question: If BCH_2 = 1

BCH_3 If you received a mastectomy, which type did you receive?

__Bilateral Total Mastectomy (Both Breasts) (3)

__Unilateral Total Mastectomy (One Breast) (4)

__Modified Radical Mastectomy (5)

__Nipple-Sparing Mastectomy (6)

__Skin-Sparing Mastectomy (7)

__Radical Mastectomy (8)

__Prophylactic Mastectomy (9)

__I don't know (999)

Display This Question: If BCH_2 = 2

BCH_4 If you received a lumpectomy/ breast conserving surgery, which type did you receive?

__Excisional Biopsy (10)

__Quadrantectomy (11)

__Re-Excision Lumpectomy (12)

__Sentinel Lymph Node Biopsy (13)

__Auxiliary Lymph Node Dissection (14)

__Oncoplastic Lumpectomy (15)

__I don't know (999)

BCH_5 When did you receive your procedure(s)? If multiple, please specify which procedure and dates.

_____

BCH_6 Please indicate which stage of breast cancer you were when you underwent surgery:

__Stage 0 (0)

__Stage I (1)

__Stage II (2)

__Stage III (3)

__Stage IV (4)

__I don't know (999)

BCH_7 Did you opt for reconstruction surgery following your mastectomy or lumpectomy/breast conserving surgery? If so, which type?

__Yes- Implant (1)

__Yes- Autologous or 'Flap' (2)

__No (0)

Skip To: BCH_12 If BCH_7 = 0

Display This Question: If BCH_7 = 1

BCH_8 If you received breast implant reconstruction, which type?

__Silicone (3)

__Saline (4)

__I don't know (999)

Display This Question: If BCH_7 = 2

BCH_9 If you received breast autologous or 'flap' reconstruction, which type?

__Body Lift Perforator Flap (1)

__DIEP Flap (2)

__Fat Grafting (3)

__Latissimus Dorsi Flap (4)

__PAP Flap (5)

__SGAP Flap/Hip Flap (6)

__SIEA Flap (7)

__Stacked DIEP Flap (8)

__Stacked/"Hybrid" GAP Flap (9)

__TRAM Flap (10)

__TUG Flap (11)

__I don't know (999)

BCH_10 Did you opt for immediate or delayed reconstruction surgery following your mastectomy or lumpectomy/breast conserving surgery?

__Immediate (1)

__Delayed (2)

Display This Question: If BCH_10 = 2

BCH_11 How long after your mastectomy or lumpectomy/breast conserving surgery did you receive breast reconstruction?

__Within 3 Months (1)

__3-6 Months (2)

__6-12 Months (3)

__12-24 Months (4)

__24-36 Months (5)

__+36 Months (6)

Display This Question: If BCH_7 = 0

BCH_12 Do you intend on receiving reconstruction surgery in the future? If so, which type?

__Yes- Implant Breast Reconstruction (1)

__Yes- Autologous or 'Flap' Breast Reconstruction (2)

__No (0)

__I don't know (999)

BCH_13 Where there any complications with your procedure? If so, please choose all applicable below.

__None (1)

__Necrosis (2)

__Seroma (3)

__Infection (4)

__Loss of Sensation (5)

__Scars or Indentation (6)

__Uneven Breasts (7)

__Nerve Pain (8)

__Lymphedema (9)

__Flap Failure (10)

__Distorted Breast(s) (11)

__Implant Rupture (12)

__Other: (998) _____

BCH_14 Prior to this study, have you ever heard of medical tattooing (tattooing to conceal scarring or recreate the nipple areola complex)?

__Yes (1)

__No (0)

BCH_15 Have you received medical tattooing (tattooing to conceal scarring or recreate the nipple areola complex)?

__Yes (1)

__No (0)

__I don't know (999)

Skip To: End of Block If BCH_15 = 0

BCH_16 Who did your medical tattooing (tattooing to conceal scarring or recreate the nipple areola complex)?

__Surgeon (1)

__Nurse (2)

__Traditional Tattoo Artist (3)

__Restorative/ Medical Tattoo Artist (4)

__I don't know (999)

BCH_17 Which type of medical tattooing did you receive?

__Decorative Applique (a design used to place over scarring) (1)

__Nipple Areola Complex (NAC) Reconstruction (tattooing to simulate the nipple areola complex) (2)

__Both (3)

__Other: (998) _____

APPENDIX C: PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

PHQ_Instructions Over the last two weeks, how often have you been bothered by any of the following problems?

PHQ_1 Little interest or pleasure in doing things.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_2 Feeling down, depressed, or hopeless.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_3 Trouble falling or staying asleep, or sleeping too much.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_4 Feeling tired or having little energy.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_5 Poor appetite or overeating.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_6 Feeling bad about yourself—or that you are a failure or have let yourself or your family down.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_7 Trouble concentrating on things, such as reading the newspaper or watching television.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_8 Moving or speaking so slowly that other people could have noticed. Or the opposite— being so fidgety or restless that you have been moving around a lot more than usual.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

PHQ_9 Thoughts that you would be better off dead or of hurting yourself in some way.

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

APPENDIX D: GENERALIZED ANXIETY DISORDER (GAD-7)

GAD_Instruct Over the last two weeks, how often have you been bothered by the following problems?

GAD_1 Feeling nervous, anxious, or on edge

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_2 Not being able to stop or control worrying

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_3 Worrying too much about different things

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_4 Trouble relaxing

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_5 Being so restless that it is hard to sit still

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_6 Becoming easily annoyed or irritable

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_7 Feeling afraid, as if something awful might happen

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

GAD_8 If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people?

__Not at all (0)

__Several days (1)

__More than half the days (2)

__Nearly every day (3)

APPENDIX E: PERCEIVED STRESS SCALE (PSS-10)

PSS_Instruct For each question choose from the following alternatives:
0 - Never 1 - Almost Never 2 - Sometimes 3 - Fairly Often 4 - Very Often

PSS_1 In the last month, how often have you been upset because of something that happened unexpectedly?

__Never (0)

__Almost Never (1)

__Sometimes (2)

__Fairly Often (3)

__Very Often (4)

PSS_2 In the last month, how often have you felt that you were unable to control the important things in your life?

__Never (0)

__Almost Never (1)

__Sometimes (2)

__Fairly Often (3)

__Very Often (4)

PSS_3 In the last month, how often have you felt nervous and stressed?

__Never (0)

__Almost Never (1)

__Sometimes (2)

__Fairly Often (3)

__Very Often (4)

PSS_4 In the last month, how often have you felt confident about your ability to handle your personal problems?

__Never (4)

__Almost Never (3)

__Sometimes (2)

__Fairly Often (1)

__Very Often (0)

PSS_5 In the last month, how often have you felt that things were going your way?

__Never (4)

__Almost Never (3)

__Sometimes (2)

__Fairly Often (1)

__Very Often (0)

PSS_6 In the last month, how often have you found that you could not cope with all the things that you had to do?

__Never (0)

__Almost Never (1)

__Sometimes (2)

__Fairly Often (3)

__Very Often (4)

PSS_7 In the last month, how often have you been able to control irritations in your life?

__Never (4)

__Almost Never (3)

__Sometimes (2)

__Fairly Often (1)

__Very Often (0)

PSS_8 In the last month, how often have you felt that you were on top of things?

__Never (4)

__Almost Never (3)

__Sometimes (2)

__Fairly Often (1)

__Very Often (0)

PSS_9 In the last month, how often have you been angered because of things that happened that were outside of your control?

__Never (0)

__Almost Never (1)

__Sometimes (2)

__Fairly Often (3)

__Very Often (4)

PSS_10 In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

__Never (0)

__Almost Never (1)

__Sometimes (2)

__Fairly Often (3)

__Very Often (4)

APPENDIX F: SATISFACTION WITH DECISION SCALE (SWD)

SWD The following statements pertain to your role in the decision making process throughout your course of breast cancer treatment. Answer the following statements about your decision. **Please indicate to what extent each statement is true for you AT THIS TIME.**

SWD_1 I am satisfied that I was adequately informed about the issues important to my decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

SWD_2 The decision I made was the best decision possible for me personally.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

SWD_3 I am satisfied that my decision was consistent with my personal values.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

SWD_4 I expected to successfully carry out (or continue to carry out) the decision I made.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

SWD_5 I am satisfied that this was my decision to make.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

SWD_6 I am satisfied with my decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

APPENDIX G: BODY-IMAGE AFTER BREAST CANCER QUESTIONNAIRE (BIBCQ)

BIBCQ_Instructions The following questions contain statements about how people might think, feel, or behave after developing breast cancer. You are asked to indicate the way each statement pertains to you personally over the past month. Please read each statement carefully and decide how it applies to you. When answering, consider how you have been feeling over the past month.

BIBCQ_1 I try to hide my body.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_3 I avoid looking at my scars from breast surgery.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_4 I feel there is a time bomb inside me.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_5 I am sleepy during the day.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_6 I am happy with my level of energy.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_7 I feel prone to cancer.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_8 I am satisfied with the shape of my body.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_9 I feel less feminine since cancer.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_10 I like my body.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_11 I feel comfortable about the way I look when I exercise.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_12 I would feel comfortable changing in a public change-room.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_13 I feel my body has been invaded.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_15 I feel my own body has let me down.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_16 I like my looks the way just the way they are.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_17 Others have had to take over my duties.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_18 I feel that part of me must remain hidden.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_19 I am afraid of touching the scars from breast surgery.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_20 I am satisfied with the appearance of my hips.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_21 I avoid close physical contact such as hugging.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_22 I feel that something is taking over my body.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

BIBCQ_23 I am satisfied with the shape of my buttocks.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

BIBCQ_INSTRUCTb The following questions pertain to your feelings about your breast or mastectomy site.

If you are missing a breast(s) (if you have had a mastectomy without breast reconstruction), please answer the following question.

If you are not missing a breast (if you have had a lumpectomy, a mastectomy with breast reconstructions, or no surgical treatment to your breasts), please skip the following question and answer questions the next two as instructed.

BIBCQ_24 **Women who are missing one or both breasts should answer the following item.**

I feel comfortable looking at my mastectomy.

__Strongly Disagree (5)

__Somewhat Disagree (4)

__Neither agree nor disagree (3)

__Somewhat Agree (2)

__Strongly Agree (1)

__N/A (999)

BIBCQ_25 **Women who are not missing a breast should answer the following items.**
I am happy with the position of my nipple.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

__N/A (999)

BIBCQ_26 **Women who are not missing a breast should answer the following items.**
I am satisfied with the size of my breast.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

__N/A (999)

BIBCQ_27 **Women who are not missing a breast should answer the following items.**
I feel comfortable when others see my breasts.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

__N/A (999)

BIBCQ_28 **Women who are not missing a breast should answer the following items.**
The appearance of my breasts could disturb others.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

__N/A (999)

BIBCQ_INSTRUCT_C Please answer the following statements according to how it pertains to you personally over the past month.

BIBCQ_29 I feel that people are looking at my chest.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_30 I avoid physical intimacy.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_31 I feel that people are looking at me.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_32 I hide my body when changing clothes.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_33 I worry that the cancer is spreading.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_34 I need to be reassured about the appearance of my bust.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_35 I think about breast cancer.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_36 Being tired interferes with my life.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_37 I feel sexually attractive when I am nude.

__Never/Almost Never (5)

__Infrequently (4)

__Sometimes (3)

__Often (2)

__Always/Almost Always (1)

BIBCQ_39 I worry about my body.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_40 I would keep my chest covered during sexual intimacy.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_41 I feel angry at my body.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_42 I need reassurance about my health.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_43 I can participate in normal activities.

__Never/Almost Never (5)

__Infrequently (4)

__Sometimes (3)

__Often (2)

__Always/Almost Always (1)

BIBCQ_44 I have problems concentrating.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_45 My body stops me from doing things I want to do.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_46 I think my breasts appear uneven to others.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_48 I worry about minor aches and pains.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

BIBCQ_49 I feel normal.

__Never/Almost Never (5)

__Infrequently (4)

__Sometimes (3)

__Often (2)

__Always/Almost Always (1)

BIBCQ_50 I feel people can tell my breasts are not normal.

__Never/Almost Never (1)

__Infrequently (2)

__Sometimes (3)

__Often (4)

__Always/Almost Always (5)

APPENDIX H: APPEARANCE SCHEMAS INVESTMENT-REVISED (ASI-R)

ASI-R_Instructions Please indicate your beliefs about the items below.

ASI-R_1 When I see good-looking people, I wonder how my own looks measure up.

__Strongly Disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_2 I seldom compare my appearance to that of other people I see.

__Strongly disagree (5)

__Somewhat disagree (4)

__Neither agree nor disagree (3)

__Somewhat agree (2)

__Strongly agree (1)

ASI-R_3 When something makes me feel good or bad about my looks, I tend to dwell on it.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_4 If somebody had a negative reaction to what I look like, it wouldn't bother me.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_5 My physical appearance has had little influence on my life.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_6 When I meet people for the first time, I wonder what they think about how I look.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_7 If I dislike how I look on a given day, it's hard to feel happy about other things.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_8 I fantasize about what it would be like to be better looking than I am.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_9 If I like how I look on a given day, it's easier to feel happy about other things.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_10 In my everyday life, lots of things happen that make me think about what I look like.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_11 What I look like is an important part of who I am.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_12 By controlling my appearance, I can control many aspects of the social and emotional events in my life.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_13 My appearance is responsible for much of what's happened to me in my life.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_14 I spend little time on my physical appearance.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_15 I try to be as physically attractive as I can be.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_16 I have never paid much attention to what I look like.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_17 I often check my appearance in a mirror just to make sure I look okay.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_18 When it comes to my physical appearance, I have high standards.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

ASI-R_19 Dressing well is not a priority for me.

__Strongly disagree (5)

__Mostly disagree (4)

__Neither agree nor disagree (3)

__Mostly agree (2)

__Strongly agree (1)

ASI-R_20 Before going out, I make sure I look as good as I possibly can.

__Strongly disagree (1)

__Mostly disagree (2)

__Neither agree nor disagree (3)

__Mostly agree (4)

__Strongly agree (5)

APPENDIX I: INTERVENTION TYPE + COSMETIC RATING + DECISION SATISFACTION SCALE (DSS)

IT_INSTRUCT The following portion of this survey will ask you to view images of patients who have undergone mastectomy with varying cosmetic interventions and answer questions pertaining to those images. The names of each patient have been changed to protect their identity.

Cosmetic interventions following mastectomy include breast reconstruction (implant or autologous/flap) and/or medical tattooing. Medical tattooing is emerging as a complimentary cosmetic intervention among breast cancer survivors. It can be applied to:

1) correct or simulate the Nipple Areola Complex (NAC)

2) address or conceal complications such as necrosis, excess scarring, asymmetrical nipple areolas, and complete or partial loss of the nipple due to flap or graft techniques during surgery

3) or as a custom designed decorative applique, which is often guided by individual values and motivations

Please view each case carefully and respond to each of the following questions.

IT1_A_Description The following images show 'Cassie' who has undergone a bilateral mastectomy with immediate silicone implant reconstruction. Please view the below image and answer the following questions **in relation to the POST-reconstruction image on the right.**

IT1_A_Image Pre- & Post-Implant Reconstruction

IT1_A_Instruct Please indicate whether you agree with the below statement **in relation to the POST-RECONSTRUCTION image on the right.**

IT1_A_2 In the post-reconstruction image, the implant reconstruction improves cosmetic outcomes.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS1_A_Instruct The following are questions concerning your opinion of 'Cassie's' decision to receive breast reconstruction following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

DSS1_A_1 'Cassie' made the best possible decision for her situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS1_A_2 'Cassie' should be satisfied with her decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS1_A_3 I would make this decision if I were in a similar situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

IT2_A_Description 'Suzanne' has undergone a bilateral mastectomy with radiation treatment. 1 year and 5 months later, she received medical tattooing to conceal the scarring with a customized decorative applique. Please view the below image and answer the following questions in **relation to the POST-MEDICAL TATTOOING image to the right.**

IT2_A_Image Pre- & Post-Medical Tattooing

IT2_A_Instruct Please indicate whether you agree with the below statement in **relation to the POST-MEDICAL TATTOOING image on the right.**

IT2_A_2 In the post-reconstruction image, the medical tattooing improved cosmetic outcomes.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS2_A_Instruct The following are questions concerning your opinion of 'Suzanne's' decision to receive medical tattooing following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

DSS2_A_1 'Suzanne' made the best possible decision for her situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS2_A_2 'Suzanne' should be satisfied with her decision.

Strongly disagree (1)

Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

DSS2_A_3 I would make this decision if I were in a similar situation.

Strongly disagree (1)

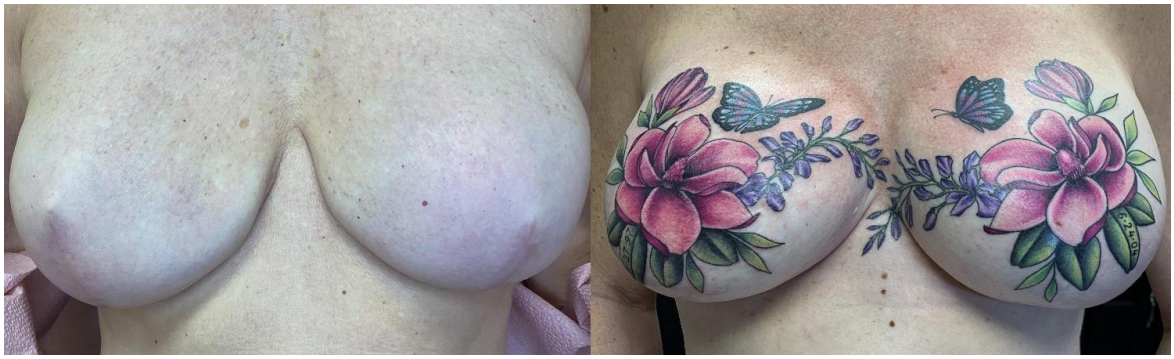
Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

IT3_A_Description 'Alex' has undergone a bilateral mastectomy with implant reconstruction surgery. 3 years following the procedure she received medical tattooing to conceal scarring using a customized decorative applique. Please view the below image and answer the following questions in **relation to the POST-RECONSTRUCTION & MEDICAL TATTOOING image to the right.**



IT3_A_Image Pre- & Post-Medical Tattooing

IT3_A_Instruct Please indicate whether you agree with the below statement in **relation to the POST-RECONSTRUCTION & MEDICAL TATTOOING image on the right.**

IT3_A_2 In the post-reconstruction image, the implant reconstruction and medical tattooing improved cosmetic outcomes.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS3_A_Instruct The following are questions concerning your opinion of 'Alex's' decision to receive breast reconstruction and medical tattooing following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

DSS3_A_1 'Alex' made the best possible decision for her situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS3_A_2 'Alex' should be satisfied with her decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS3_A_3 I would make this decision if I were in a similar situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

IT1_B_Description 'Amie' has undergone a bilateral mastectomy and delayed free TRAM flap breast reconstruction. Please view the below image and answer the following questions **in relation to the POST-reconstruction image on the right.**

IT1_B_Image Pre- & Post-TRAM Flap Reconstruction

IT1_B_Instruct Please indicate whether you agree with the below statement **in relation to the POST-RECONSTRUCTION image on the right.**

IT1_B_2 In the post-reconstruction image, the TRAM Flap reconstruction improved cosmetic outcomes.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS1_B_Instruct The following are questions concerning your opinion of 'Amie's' decision to receive cosmetic intervention following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

DSS1_B_1 'Amie' made the best possible decision for her situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS1_B_2 'Amie' should be satisfied with her decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS1_B_3 I would make this decision if I were in a similar situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

IT2_B_Description 'Kelsey' has undergone a bilateral mastectomy with chemotherapy and radiation treatment. 3 years later, she received medical tattooing to recreate the nipple areola complex. Please view the below image and answer the following questions in **relation to the POST-MEDICAL TATTOOING image to the right.**

IT2_B_Image Pre- & Post-Medical Tattooing

IT2_B_Instruct Please indicate whether you agree with the below statement in **relation to the POST-MEDICAL TATTOOING image on the right.**

IT2_B_2 In the post-reconstruction image, the medical tattooing improved cosmetic outcomes.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS2_B_Instruct The following are questions concerning your opinion of 'Kelsey's' decision to receive cosmetic intervention following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

DSS2_B_1 'Kelsey' made the best possible decision for her situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS2_B_2 'Kelsey' should be satisfied with her decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS2_B_3 I would make this decision if I were in a similar situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

IT3_B_Description 'Kim' has undergone a bilateral mastectomy with autologous/flap reconstruction surgery. 4 months following the procedure she received medical tattooing to recreate the nipple areola complex. Please view the below image and answer the following questions in **relation to the POST-RECONSTRUCTION & MEDICAL TATTOOING image to the right.**

IT3_B_Image Pre- & Post-Flap Reconstruction and Medical Tattooing

IT3_B_Instruct Please indicate whether you agree with the below statement in **relation to the POST-RECONSTRUCTION & MEDICAL TATTOOING image on the right.**

IT3_B_2 In the post-reconstruction image, the flap reconstruction and medical tattooing improved cosmetic outcomes.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS3_B_Instruct The following are questions concerning your opinion of 'Kim's' decision to receive cosmetic intervention following her mastectomy. Please indicate how strongly you agree or disagree with the following questions.

DSS3_B_1 'Kim' made the best possible decision for her situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS3_B_2 'Kim' should be satisfied with her decision.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

DSS3_B_3 I would make this decision if I were in a similar situation.

__Strongly disagree (1)

__Somewhat disagree (2)

__Neither agree nor disagree (3)

__Somewhat agree (4)

__Strongly agree (5)

APPENDIX J: LIST OF ENTITIES THAT SHARED THE STUDY'S INFORMATION

Table 3. *List of breast cancer affiliated entities that agreed to share the study's flyer and information by name and location and according to type of entity*

Name of Breast Cancer Affiliated Entity	Town/City	State
Organizations & Support Groups (n = 45)		
Libby's Legacy Breast Cancer Foundation	Orlando	FL
Sylvester Comprehensive Cancer Center/Support group	Miami	FL
Breast Cancer Network of WNY	Depew	NY
Breast Cancer Support Group - African American	Long Beach	CA
Texas Wings	San Antonio	TX
Winship Cancer Institute - Metastatic Breast Cancer Support Group	Atlanta	GA
Ocean University Medical Center	Brick	NJ
JFK University Medical Center	Edison	NJ
I Will Survive	Atlanta	GA
ABCD: After Breast Cancer Diagnosis	Milwaukee	WI
Links for Life	Bakersfield	CA
Charlotte Maxwell Clinic	Oakland	CA
Adelphi NY Statewide Breast	Garden City	NY
Northwell Health - Breast cancer support group II	Huntington	NY
Breast Cancer Angels	Los Alamitos	CA
Las Vegas Breast Cancer Warriors	Las Vegas	NV
My Sister My Friend - Breast Cancer Support	Los Angeles	CA
Women of Color Breast Cancer Survivors	Inglewood	CA
Breast Cancer Resource Center (BCRC)	Austin	TX
Regarding Cancer	Austin	TX
Rio Grande Cancer Foundation	El Paso	TX
South Jersey Breast Cancer Coalition	Berlin	NJ
Penn Highlands Breast Cancer Support group	Brookville	PA
Breast Cancer Alliance	Greenwich	CT
Cancer Lifeline	Seattle	WA
Facing Hereditary Cancer Empowered	Tampa	FL
Equal Hope Breast Cancer	Chicago	IL
Breast Friends	Hendersonville	NC
Breast Connect	Knoxville	TN
Empowered Mastectomy	Portland	OR
Young Survival Coallition	New York	NY
Friedman Center Breast Reconstruction	Miami	FL
Think Outside the Boob	San Francisco	CA
Cancer for Breakfast Podcast	Portland	OR

Name of Breast Cancer Affiliated Entity	Town/City	State
DiepCFoundation	Duvall	WA
onetoughcookie_83	Boulder	CO
My Sister My Friend Breast Cancer Support	Long Beach	CA
Step Sisters	Ashburn	VA
Created Hair	Los Angeles	CA
Here For The Girls	Williamsburg	VA
Penguin Cold Caps	-	FL
Breast Cancer Confidence Project	-	NY
Breast Cancer Foundation of Central Florida	-	FL
Know Your Lemons	-	Nation Wide
Sharsheret - A Jewish Breast Cancer Organization	-	Nation Wide
Facebook Support & Advocacy Groups (n = 34)		
Orlando - Breast Cancer Support Group	Orlando	FL
Central Brevard FL Breast Cancer Support Group	Brevard	FL
Making Strides Against Breast Cancer of Tampa	Tampa	FL
Jacksonville YSC F2F	Jacksonville	FL
Sister Strong Osceola County Breast Cancer Warriors	Osceola	FL
Chicago Breasties	Chicago	IL
St Louis Breast Cancer Warriors and Survivors	St. Lois	MO
Breast Cancer Awareness	Boone County	AR
New York Breasties	-	NY
Minnesota Breasties	-	MN
Pennsylvania Breast Cancer Support Group	-	PA
Breast Cancer Support for Young Women	-	-
Holistic Health & Wellness for Breast Cancer Survivors	-	-
The Empowered Mindset Group	-	-
Metastatic Breast Cancer - Information Sharing and Support	-	-
Breast Cancer Survivors And Warriors	-	-
Pink Strong For Breast Cancer Awareness	-	-
Breast Cancer Inspiration and Support	-	-
Breast Cancer Foodies	-	-
The Path of Breast Cancer - A Safe Place Support Group	-	-
Pink The Towns For Breast Cancer Awareness And Research	-	-
Families Who Support Breast Cancer Survivors,Inc. FB	-	-
October is Breast Cancer Awareness Month. How can we help?	-	-
Thriving & Surviving Breast Cancer Support Group!	-	-

Name of Breast Cancer Affiliated Entity	Town/City	State
Pink Heels Society - Breast Cancer Support	-	-
Breast Cancer Healing & Support Community	-	-
Survivor's Guilt After Breast Cancer	-	-
Fight Club Survivor - Breast Cancer	-	-
Sharing & Caring: Breast Cancer Education and Support	-	-
Breast Cancer Tattoos	-	-
The Pink & White Breast Cancer Awareness Page	-	-
Pink Fire Inc - Breast Cancer	-	-
SISTERS THRIVE despite Breast Cancer	-	-
Peloton Breast Cancer Survivors	-	-
Instagram Support & Advocacy Platforms (n = 58)	-	-
theboobiedocs	-	-
thewigfactory21	-	-
cindyslegacy	-	-
pocketsofhope	-	-
treschemochic	-	-
survivor_rn	-	-
cancerforbreakfastpod	-	-
twistedpinkorg	-	-
flyagainfoundation	-	-
asksewcancercoach	-	-
youngandasurvivor	-	-
strongblackboobs	-	-
breastfriendspdx	-	-
pinkbeyondscarsandremission	-	-
itsrosa.lina	-	-
themissingpinkbca	-	-
tyftspodcast	-	-
casadanu	-	-
acrue.life	-	-
medicaltattoonyc	-	-
ineverlikedpink	-	-
Just Like A Woman	-	-
breastcancermentalhealth	-	-
natashaaftercancer	-	-
loreleicolbert	-	-
resilienttogether.love	-	-

Name of Breast Cancer Affiliated Entity	Town/City	State
getintouchfoundation	-	-
theshellpillow	-	-
cancertines	-	-
fireflysisterhood	-	-
amys_raysofsunshine	-	-
tickingoffbreastcancer	-	-
breastandchestbuddy	-	-
do.cancer	-	-
canceractuallysuckspod	-	-
as.we.are.now	-	-
thriving4morelife	-	-
mermaidwithcancer	-	-
weareperky	-	-
anjscancerjourney	-	-
forthebreastofus	-	-
mycancerchic	-	-
chemodivas	-	-
helen_beeley	-	-
afropinkinc	-	-
stridesforsurvivors	-	-
alettertomysisters2022	-	-
titsdeepforbreastcancer	-	-
lesleykailani	-	-
millennial_cancer	-	-
mydear_laila	-	-
brcastrong	-	-
darlainehoney	-	-
brooklyn_style	-	-
flat_out_love	-	-
breastiesofcolor	-	-
breastcancerblessings	-	-
thrive.nd	-	-

Note. - indicates the information was not provided.

Total Shared = 137
States Included = AR, CA, CO, CT, FL, GA, IL, MN, MO, NC, NJ, NV, NY, OR, PA, TN, TX, VA, WA, WI

Total Number of States Represented = 20

APPENDIX K: RECRUITMENT FLYER

Project MTFM

Medical Tattooing Following Mastectomy

We are seeking breast cancer survivors for an important research study exploring how medical tattooing may improve mental health outcomes following breast cancer surgery.

Participation Includes:

- An anonymous 45-minute online survey conducted by the Health Psychology Laboratory at the University of Central Florida
- Optional information session with medical tattoo artist
- Access to study results & summary report

Inclusion Criteria:

- Must have been diagnosed with breast cancer and received surgical treatment (i.e., mastectomy, lumpectomy/breast conserving surgery)

To participate contact Primary Investigator:
Miranda Proctor: mirandaproctor@knights.ucf.edu
Or use the following link:
https://ucf.qualtrics.com/jfe/form/SV_1MJlnojbihpPc4m

This research study has been reviewed and approved by University of Central Florida Institutional ReviewBoard. If you have concerns regarding this study or questions regarding your rights as a study participant, please contact , Compliance Administrator -IRB, at UCF. Email: irb@ucf.edu or by telephone at (407) 823-2901

APPENDIX L: IRB LETTER OF EXEMPTION

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138, IRB00012110
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

November 23, 2022

Dear Miranda Proctor:

On 11/23/2022, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study
Title:	Body-Image Distress In Breast Cancer Survivors and Their Evaluation of Medical Tattooing Following Mastectomy
Investigator:	Miranda Proctor
IRB ID:	STUDY00004826
Funding:	Name: University of Central Florida
Grant ID:	
Documents Reviewed:	• CHECKLIST HIPAA Waiver of Authorization - HRP-251- FORM - Faculty Advisor Scientific-Scholarly Review fillable form.pdf, Category: Faculty Research Approval; • Images shown to participants.docx, Category: Other; • Project MTFM (Facebook Post).png, Category: Recruitment Materials; • Project MTFM (Instagram Post).png, Category: Recruitment Materials; • Project MTFM (Logo).png, Category: Recruitment Materials; • Project MTFM.png, Category: Recruitment Materials; • Qualtrics Survey_FINAL(1).docx, Category: Survey / Questionnaire; • Study 4826 HRP254_Explanation of Research.pdf, Category: Consent Form; • Study 4826 HRP-255-FORM - Request for Exemption.docx, Category: IRB Protocol; • Study 4826 Recruitment scripts.docx, Category: Recruitment Materials;

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please submit a modification request to the IRB. Guidance on submitting Modifications and Administrative Check-in are detailed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Tamiko Fukuda
UCF IRB

APPENDIX M: EXPLANATION OF RESEARCH

EOR_Introduction
Please complete this survey on a desktop or laptop computer.
You won't be able to see it on a Smartphone.

Title of Project: **Body-Image Distress in Breast Cancer Survivors and Their Evaluation of Medical Tattooing Following Mastectomy**

Principal Investigator: Miranda Proctor, Clinical Psychology Ph.D. Student
Other Investigators: Jeffrey E. Cassisi, Ph.D.
Faculty Supervisor: Jeffrey E. Cassisi, Ph.D.

You are being invited to take part in a research study. Whether you take part is up to you. You must have been diagnosed with breast cancer and received surgical treatment (i.e., mastectomy, lumpectomy/breast conserving surgery) to participate.

This study aims to explore attitudes towards and ratings of different cosmetic interventions following mastectomy by breast cancer survivors. The purpose of this study is not to prescribe one reconstructive approach or another for women, but to understand the variables associated with the different preferences. Moreover, we hope to generate information about the incremental value each procedure may have for improving body-image distress. While many survivors report satisfaction following their mastectomy, some survivors may benefit further from complimentary cosmetic interventions to enhance cosmetic outcomes.

This study also aims to provide further evidence to indicate medical tattooing as a cosmetic intervention following mastectomy. Increasingly medical tattooing is being applied as a complimentary cosmetic procedure. Medical tattooing is used for Nipple Areola Complex (NAC) simulation and scar concealment.

Please be aware that this study contains images of survivors' breasts before and after receiving a mastectomy with and without cosmetic intervention. (The patients are anonymous, names have been changed, and can't be identified.) The images included will depict a range of procedures pre- and post- mastectomy–some with more scarring or alterations to the chest region than others. If you do not wish to view these images, or if you think they may cause you discomfort, please do not participate. Once you begin the study, if you change your mind, you may choose to discontinue at any time.

This research project is administered via an online survey. This survey should take approximately 45 minutes to 1 hour to complete. Following participation in this study, an optional information session with a medical tattoo specialist is available (online via zoom or in-person).

Results from this study will be published in approximately 12-16 months. If you are interested in viewing the report, please contact: mirandaproctor@knights.ucf.edu

Your participation in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty. No identifying information is recorded. The only individuals that will have access to the data are the research personnel listed on this application. The anonymous data will be downloaded and entered in a database that is also stored on a secure server that is only accessible to members of the lab.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, please contact:

Dr. Jeffrey E. Cassisi, Faculty Supervisor, Department of Psychology by email at Jeffrey.Cassisi@ucf.edu

Miranda Proctor, Clinical Psychology Ph.D. Student, Department of Psychology by email at mirandaproctor@knights.ucf.edu

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu

EOR_1 Do you wish to participate in this study?

__No (1)

__Yes (2)

APPENDIX N: SURVEY FLOW

Body-image Distress in Breast Cancer Survivors and Their Evaluation of Medical Tattooing

Survey Flow
Standard: Explanation of Research (2 Questions)
Self: Demographics (9 Questions)
Self: Breast Cancer History (17 Questions)
Self: Patient Health Questionnaire (PHQ9) (9 Questions)
Self: Generalized Anxiety Disorder (GAD7) (9 Questions)
Self: Perceived Stress Scale (PSS) (11 Questions)
Self: Satisfaction with Decision Scale (7 Questions)
Self: Cosmetic Expectation Discrepancy (1 Question)
Self: Body Image After Breast Cancer (BIBCQ) (50 Questions)
Self: Appearance Schemas Investment-Revised (ASI-R) (21 Questions)
Other Ratings: Intervention Type Instructions (1 Question)
BlockRandomizer: 6 - Evenly Present Elements
Other Ratings: Intervention Type 1_A (10 Questions)
Other Ratings: Intervention Type 2_A (10 Questions)
Other Ratings: Intervention Type 3_A (10 Questions)
Other Ratings: Intervention Type 1_B (10 Questions)
Other Ratings: Intervention Type 2_B (10 Questions)
Other Ratings: Intervention Type 3_B (10 Questions)

APPENDIX O: PARTICIPANTS WHO COMPLETED THE SURVEY VERSUS THOSE WHO DISCONTINUED

Table 4. *Preliminary analyses to determine survey completion group differences among demographic and clinical characteristic variables of interest.*

		Completion Group								
		No		Yes				Total Sample (N = 266)		
		Mean(SD)	N(%)	Mean(SD)	N(%)	*df*	X^2	*F*	η2	*p*
Demographic Information										
	Age (years)	47.62(8.94)		46.97(8.93)		1,263		0.24	0.001	0.63
	Relationship Status					1	0.75			0.39
	Single		16(26.2%)		45(73.8%)					
	In Relationship		43(21%)		162(79%)					
Breast Cancer History										
	Surgery Type					2	3.72			0.16
	BCS		9(32.1%)		19(67.9%)					
	Mastectomy		10(30.3%)		23(69.7%)					
	Reconstruction		40(19.5%)		165(80.5%)					
	Cancer Stage					4	1.58			0.81
	Stage 0		5(19.2%)		21(80.8%)					
	Stage I		17(18.3%)		76(81.7%)					
	Stage II		17(19.8%)		69(80.2%)					
	Stage III		12(27.3%)		32(72.7%)					
	Stage IV		1(20%)		4(80%)					
	Time Since Surgery	37.08(46.52)		41.83(46.02)		1,263		0.43	0.002	0.51
	Medical Tattoo					1	0.48			0.49
	No		37(20.2%)		146(79.8%)					
	Yes		12(16.4%)		61(83.6%)					
Mental Health Symptoms										
	PHQ9	15.57(6.21)		15.55(5.64)		1,263		0.001	0.001	0.98
	GAD7	13.10(5.90)		14.22(5.73)		1,263		1.3	0.005	0.26
	PSS	16.83(7.52)		16.86(7.12)		1,263		0.001	0.001	0.98

Note. Completion Group Status indicates, Yes = fully completed the survey, and No = started the survey but did not fully complete it. Mental Health Symptoms includes the Patient Health Questionnaire-9 (PHQ-9), the Generalized Anxiety Scale-7 (GAD-7), and the Perceived Stress Scale-10 (PSS-10). SWD = Satisfaction with Decision Scale. ED = Expectation Discrepancy. BIBCQ = Body-Image After Breast Cancer Questionnaire.

APPENDIX P: RATE OF ATTRITION THROUGHOUT SURVEY

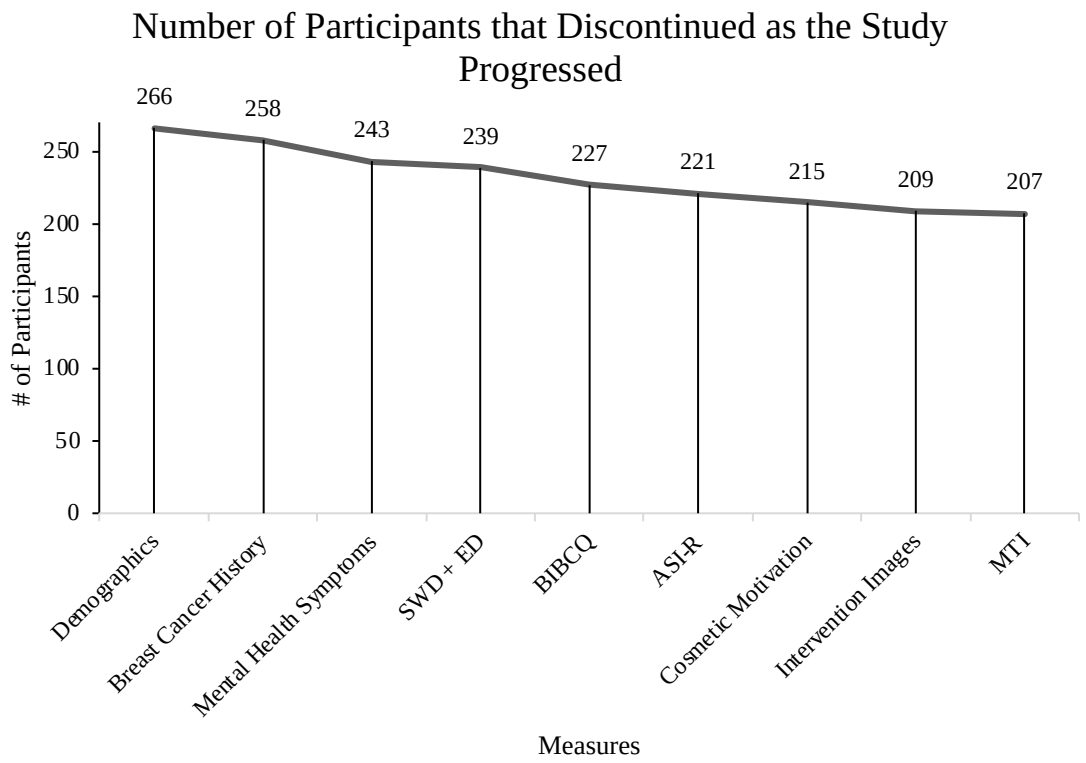


Figure 12. *A depiction of the amount of participants that discontinued the study at the end of each measure presented.*

Note. # = Number. Mental Health Symptoms includes the Patient Health Questionnaire-9 (PHQ-9), the Generalized Anxiety Scale-7 (GAD-7), and the Perceived Stress Scale-10 (PSS-10). SWD = Satisfaction with Decision Scale. ED = Expectation Discrepancy. BIBCQ = Body-Image After Breast Cancer Questionnaire. Cosmetic Motivation includes the Acceptance of Cosmetic Surgery Scale and the Tattoo Attitudes and Motivation Scale. Intervention Images includes all intervention image blocks with the cosmetic and decision satisfaction ratings presented after each image. MTI = Medical Tattoo Information.

REFERENCES

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