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The psychological impacts of post-mastectomy breast reconstruction: a systematic review

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Abstract

Background: While it is often presumed that undergoing breast reconstruction (BR) after mastectomy has positive psychosocial effects, a comprehensive review of current knowledge on the topic is to date absent. The aim of this systematic review is to summarize the available literature on the effects of BR on postoperative psychological distress.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Methods: A systematic review of the literature was performed using PubMed, Google Scholar, EMBASE, PSYCinfo, and Web of Science. Inclusion criteria included clinical studies of patients who underwent BR post-mastectomy with psychological distress assessments as primary outcomes. Articles were independently reviewed and assessed for bias and evidence quality. Analyses were performed among patients receiving mastectomy alone (MA) versus mastectomy with breast reconstruction (MBR), immediate versus delayed mastectomy, and implant-based versus autologous reconstruction.

Results: Ninety-nine studies published from 1980–2021 met inclusion criteria and were reviewed. Twenty-six (26.3%) studies compared patients who underwent MBR to those who underwent MA. Of these, 18 (69.2%) found that MBR had superior effects on psychologic outcomes, 6 (23.1%) found no differences, and 2 (7.7%) found negative psychologic effects relative to MA. Fourteen (14.1%) studies compared immediate versus delayed BR, of which 4 (28.6%) found that immediate BR had superior psychologic outcomes while 10 (71.4%) found no significant differences. Sixteen (16.2%) studies compared autologous versus implant-based reconstruction. Eight (50.0%) of these reported patients with autologous BR were more satisfied with breast appearance.

Conclusions: While findings are not uniform, the majority of studies found that BR following mastectomy improves psychologic outcomes, with a possible benefit of immediate over delayed BR. Future studies should determine if BR type has an effect on psychological distress.

Keywords

Breast reconstruction (BR); psychology; postmastectomy

Introduction

Background

Breast cancer is the most common cause of cancer among women and can have a significant impact on both physical and psychological wellbeing (1–3). Treatment for breast cancer typically involves invasive surgical interventions, and in addition to the difficulties intrinsic to experiencing a cancer diagnosis and treatment, undergoing mastectomy can have profound impacts on mental health and self-esteem due to feelings of reduced attractiveness or femininity, changes in self-perception, and negative effects on sexual wellbeing (4). While breast reconstruction (BR) following mastectomy has long been hypothesized to lessen the negative psychological effects of mastectomy by helping to restore a patient's body image and reducing the toll of cancer surgery on overall mental health, studies on this topic have yielded mixed results (5). As the rates of BR after mastectomy are currently rising in the United States (6), it is vital to develop a comprehensive understanding of how BR influences mental health outcomes.

Rationale and knowledge gap

Factors that can differentiate BR include whether surgery is immediate or delayed, and whether an implant or autologous tissues are used. Some studies have suggested autologous methods yielded higher satisfaction with cosmetic results (7), but there is limited literature

that specifically explores the impacts of different reconstruction methods on psychological distress specifically.

Objective

The aim of this systematic review is to explore the effects of BR on postoperative mental health outcomes. We present this article in accordance with the PRISMA reporting checklist (available at https://abs.amegroups.com/article/view/10.21037/abs-23-33/rc).

Methods

Study design and search strategy

A systematic review was conducted on March 10, 2022, using PubMed, Google Scholar, EMBASE, PSYCinfo, and Web of Science databases to identify articles from 1980 to 2022 in accordance with the PRISMA guidelines (8) (Figure 1). An updated search was performed on January 3, 2023, to identify any additional studies. Boolean operators were used to identify articles on BR, and no restrictions were used. The full search strategy may be found in Appendix 1.

Study identification and selection

Articles were included if the full-text article was available, the article was peer-reviewed, all text was written in English, all subjects were humans who underwent BR, and the study used validated instruments to measure psychologic outcomes postoperatively. Articles were excluded if they were non-BR-related, cadaveric/non-human subject studies, commentary/expert opinion/editor's letter, review articles, or duplicate studies.

Data extraction

The literature searches and initial abstract results were imported and automatically de-duplicated by Covidence (Covidence Ltd, Melbourne, Australia). Two independent reviewers (TL, UA) screened titles and abstracts for inclusion. Any conflicts were resolved by an independent reviewer (MD). Next, the full-text articles were retrieved, and articles were further screened by two independent reviewers (MD, ST) to ensure the initial inclusion criteria were met. A separate independent reviewer (NR) resolved any conflicts. Articles were independently reviewed and assessed for bias and evidence quality. The following data were then extracted from the full-text articles: study title, author, year of publication, country of publication, journal of publication, study design, study aim, study groups, number of patients (and numbers of patients in each group), type of BR, stage of breast-reconstruction, number of times surveyed, questionnaire instruments used, psychologic outcomes, and study conclusions.

Outcomes

The primary outcome of interest was evidence of psychological distress, including a diagnosis of depression, anxiety, post-traumatic stress disorder (PTSD) or other psychiatric disorders. Secondary outcomes included method of testing used to evaluate psychological health, medications, and subsequent treatment. Positive effects on psychologic outcomes

were characterized by improved scores on methods of testing, while negative effects on psychologic outcomes were characterized by lower scores on methods of testing.

Data analyses

Data were grouped based on surgical characteristics: mastectomy with breast reconstruction (MBR) versus mastectomy alone (MA), immediate versus delayed BR, and autologous versus implant-based reconstruction. The effect of MBR, immediate reconstruction, and autologous reconstruction were compared to the alternative outcome and directionality on mental health outcomes was determined as “Positive”, “Neutral”, or “Negative”.

Results

A total of 1,644 abstracts were identified, of which 1,388 (84.4%) were excluded. Six full-text articles were unable to be retrieved, leaving 250 available articles that were assessed for eligibility criteria. Of these studies, 151 were excluded for not meeting pre-specified inclusion criteria, due to non-qualifying study outcomes (80.0%), study design (9.3%), or intervention (3.6%). This left 99 studies in the final analysis (Figure 1).

Of these 99 studies, 54 were retrospective and 45 were prospective studies. The most common questionnaire instruments used were the 36-item Short Form Survey (SF-36) (32.3% of studies) and the Hospital Anxiety and Depression Scale (HADS) (30.3%) Authors from the United States published the most articles on this topic (23.2%) followed by the United Kingdom (12.1%), Sweden (11.1%) and the Netherlands (9.1%) (Figure 2).

MBR versus MA

In total, 26 studies (26.3%) compared mental health outcomes of patients who had MBR to those who had MA (Table 1). Of these, 18 (69.2%) found that MBR had positive effects on mental health outcomes, 6 (23.1%) found no clear differences, and 2 (7.7%) found negative effects (Figure 3). Of the studies that found women who received MBR to have poorer outcomes, Clark *et al.* analyzed the psychological effects of BR in a cohort of women who had a history of sexual abuse in childhood. They reported that women in the MBR group reported more distress and greater depressive symptoms than the MA group after controlling for prevalence of abuse (32). The other, Adachi *et al.* reported that women in the MBR group had a greater tendency towards negative moods compared to patients receiving MA when measured with the Profile of Moods Scale (POMS), and they also reported that the degree of self-efficacy had a marked influence on patient’s moods after surgery (33).

Immediate versus delayed breast reconstruction (DBR)

Fourteen articles examined the effect on psychologic distress of immediate versus DBR (Table 2). Four of these studies (18,34,36,37) (28.6%) found that patients who underwent immediate breast reconstruction (IBR) had better psychologic outcomes compared to those who underwent DBR. In 1985, Wellisch *et al.* (36) evaluated the psychological differences of women who underwent delayed versus immediate reconstruction and reported women in the IBR group had lower levels of psychological distress and psychological symptoms measured through the Brief Symptom Inventory (BSI). Al-Ghazal *et al.* (18) found that

patients who received IBR had decreased anxiety and depression as well as better scores on body image, self-esteem, and sexual feelings of attractiveness compared to DBR patients. Göktaş *et al.* (37) and Zhong *et al.* (34) both demonstrated that patients in the IBR group had a lower prevalence of anxiety and depression compared to the DBR groups.

However, the ten other studies (71.4%) found that there were no significant differences between delayed versus immediate BR regarding psychologic outcomes. While the majority of the patients in the study of Fernández-Delgado *et al.* (23) reported that they had a postprocedural preference for IBR, no significant differences were found between the proportions of immediate versus DBR who were suffering from anxiety or depression. Similarly, Atisha *et al.* (35) prospectively evaluated 173 patients after mastectomy and found that while there were no significant differences between the delayed and immediate groups, both BR groups had lower anxiety and depression scores compared to the MA group. In contrast, Metcalfe *et al.* (30) compared patients with MA, IBR and DBR and found no significant differences in psychological functioning.

Autologous versus implant-based breast reconstruction

Sixteen studies (16.2%) compared the psychologic outcomes of autologous versus implant-based reconstruction (Table 3). A wide variety of autologous-based methods were used including deep inferior epigastric perforator (DIEP) flaps (31.3%), transverse rectus abdominis muscle (TRAM) flaps (25%), and latissimus dorsi (LD) flaps (18.8%). Several studies also included a mixed variety of autologous-based methods in their autologous study group (25%).

Overall, there were mixed results when comparing the effects of autologous and implant-based methods on psychological distress (Figure 3). While eight studies (40,41,44–47,51,52) (50.0%) reported patients receiving autologous BR were more satisfied with the results of their breast appearance and feel, none of these studies reported that autologous BR had a significantly superior effect on psychological wellbeing compared to implant-based reconstruction. Tønseth *et al.* (51) evaluated 64 women undergoing BR with either DIEP or expandable breast implants and found that those in the DIEP group were more satisfied with appearance, reported improved social relationships and were less concerned with negative body image, but no significant differences in any of the SF-36 measures, including the mental health subscale, were reported. Eltahir *et al.* (46) had similar findings that while women who had autologous BR were more likely to be more satisfied with their breasts, there were no significant differences regarding psychological distress. Interestingly, Pusic *et al.* (44) found that patients who underwent autologous BR had a significantly greater psychosocial wellbeing 1 year postoperatively measured by the BREAST-Q but did not have any significant differences regarding mental health outcomes such as anxiety, depression, or sleep disturbances. The BREAST-Q is a widely used questionnaire to evaluate patients' psychosocial wellbeing after breast reconstruction and is one popular method used to evaluate patient post-operative satisfaction and effect on quality of life. While not used as an overt measure of mental health outcomes, it may be used as a proxy to measure psychological wellbeing. Lastly, Thorarinsson *et al.* (45) compared implant-based BR with three autologous methods (DIEP, LD, lateral thoracodorsal flap) and found that while DIEP

BR patients were the most satisfied with their reconstruction results, none of the groups had significant differences in psychologic outcomes.

Three studies (18.8%) reported that autologous BR methods were associated with worse psychologic outcomes. In 1995, Franchelli *et al.* (39) reported that both autologous and implant-based reconstruction groups indicated lower psychological distress overall, but in comparison, TRAM flap patients had more relevant psychological discomfort than implant BR patients. More recently, Winters *et al.* (49) also found that patients who underwent autologous LD operations had greater levels of anxiety 2 and 3 years postoperatively compared to the implant-assisted group. Gopie *et al.* (43) found that both the autologous and implant groups in their study had less cancer-specific distress. However, while implant BR patients had less anxiety postoperatively, DIEP BR patients exhibited more depressive symptoms. This study also noted that patients with surgical complications had an increased likelihood of both anxiety and depressive symptoms, especially DIEP BR patients, who reported depressive scores of clinical concern. The five other studies (31.3%) found comparable psychologic outcomes when comparing autologous and implant-based BR methods. Gopie *et al.* (43) found that both implant and DIEP groups had comparable scores for both cancer distress and psychologic outcomes.

Early complications worsen psychologic outcomes in short-term follow-ups

Four studies found that early postoperative complications were associated with worse psychologic outcomes (49,53–55). Gopie *et al.* (43) found that the presence of complications in both implant and autologous BR groups increased depressive and anxious symptoms and DIEP BR patients had depressive symptoms of clinical concern when the surgery was followed by complications. Lu *et al.* (55) followed only autologous BR patients and found that 58% of the cohort had postoperative complications and complications were associated with decreased psychologic scores in early follow-ups months after the surgery. However, at the one-year follow up, the psychologic scores returned to baseline. den Heijer *et al.* (54) reported a similar finding that complications worsened depressive outcomes in both implant and autologous groups in short-term follow-ups but at the 21-month follow-up, depressive scores generally declined to normal levels for both groups. Momoh *et al.* (56) compared the complication rates and psychologic outcomes between patients undergoing either bilateral or unilateral breast reconstruction surgeries. They found that despite bilateral reconstruction patients having higher rates of early complications compared to unilateral reconstruction patients, patients who received bilateral surgeries still had lower anxiety scores at the 1-year follow-up.

Discussion

MBR versus MA

Our review identified several studies that demonstrate higher scores on psychologic wellbeing questionnaires following mastectomy and breast reconstruction when compared to mastectomy alone. A recent meta-analysis evaluating the psychological impacts of breast reconstruction found that women who had MBR had significantly decreased incidences of anxiety and depression compared to women who had MA (57). Other studies have

concluded that BR is beneficial in improving perceptions of body image (38) and improving overall mental health postoperatively (13). However, these findings are directly challenged by results of studies evaluated in our analysis, which reported higher levels of distress and negative mood in patients who underwent MBR (32,33). It is important to note the study design and population of the studies which revealed a negative association with wellbeing and MBR. Of the two studies that concluded that MBR was associated with distress and negative moods, the first was conducted in a population of patients who had endured sexual abuses at a young age. This is not a representative sample of the entire population of patients who elect to undergo MBR. The second study utilized the POMS, a scale that measures transient mood states rather than enduring symptoms of mood dysregulation. A lack of standardization of data capture materials across studies and differences in patient selection may contribute to the heterogeneity of the data. Future studies may benefit from conducting a meta-analysis of the available literature.

Immediate versus delayed

Our review identified studies comparing the psychological benefits of immediate versus delayed reconstruction that demonstrated mixed results. Some suggest immediate BR may be more beneficial to protect mental health while others did not report a significant difference in psychological outcomes between IBR and DBR. Our findings in this study echo prior research that concluded that patients who underwent IBR after mastectomy had significantly less recalled distress about their mastectomy than those who underwent delayed reconstruction (58). It is possible that IBR is favorable for reducing psychologic distress, as the patient may not feel that any part of them was removed for a significant period of time. Patients are not subjected to an additional procedure at a later date, meaning there is one less trip to the hospital and any emotional distress or pain that may lead up to it. The option for both immediate versus delayed breast reconstruction is available to patients when evaluating breast reconstructive options, and while post-operative complications are primarily discussed when coming to a decision, patients may benefit from a fuller understanding of the psychosocial effects of either option.

Autologous versus implant

Patients are presented with two reconstructive options following mastectomy: autologous and implant-based breast reconstruction. While patients experienced higher levels of satisfaction with the appearance of their breasts following autologous reconstruction compared to implant-based reconstruction (51), there is no consensus regarding whether one type yielded more psychological benefits or detriments than the other. A multitude of variables influence the operative experience for patients who undergo breast reconstructive procedures following mastectomy. Complications following reconstructive surgery may be a factor that influences patient's wellbeing. While complication rates and characteristics vary among procedures, studies comparing patients who elect to undergo autologous breast reconstruction have a significantly higher odds of developing any complication compared with those undergoing expander-implancbased reconstruction (59). It is a possibility that patients who undergo autologous breast reconstruction are faced with more postoperative challenges, such as flap necrosis or flap loss, that may influence their mental wellbeing for up to several years after their procedures. Further, studies were limited in their analysis of

the type of autologous reconstruction and psychologic outcomes. Sub-analysis of autologous reconstruction type may reveal novel findings.

Limitations of review

In this study, it is possible that relevant questionnaires were excluded from the inclusion criteria or the screening processes. Furthermore, the scope of this systematic review is restricted by the limited number of widely accepted and validated questionnaires that address patient psychologic health directly and appropriately. As a limiting factor of this systematic review, it is important for further studies to utilize specific tools that directly assess patient psychologic health in patients undergoing breast reconstruction.

Finally, this review included only articles written in English. While some of the validated surveys included in this systematic review are validated in other languages, some are not. This has the potential to exclude data that could have impacted results in a meaningful way due to the fact that different cultures using different languages may have variations in the way that mental health is understood or would be expressed in a survey (60). Excluding for English-only studies, however, allowed homogeneity in studies that were considered for inclusion.

Culturally competent survey interpretation

It is important to understand the results of this systematic review using a lens of cultural competency. The different countries from which each of the studies included in this systematic review are from all have their own unique cultures. These individual cultures can contribute to variations in the way that the patients completing these surveys regarding their mental health following breast reconstruction chose not only how to communicate their symptoms but also which to report. Each individual country has a culture that is imbued with specific meanings, values, and understandings of mental health and wellbeing. In this way, culture and the geographic makeup of the studies included in this study may serve as potential confounders in our systematic review. However, while there is heterogeneity in the country of origin in which the studies included in this systematic review were conducted, the inclusion of studies from 22 different countries suggests that the results of this systematic review are more representative of a broader range and demographic of patients.

Selection bias

As this systematic review analyzes studies that use patient-based and patient-reported instruments to measure mental health outcomes, there is the potential that these studies, and therefore, this systematic review, selected only for patients who were likely to complete these mental health questionnaires. Research involving survey has continuously been challenged because of issues of selection bias and gaining results from non-responders (61,62). Future research should work to either minimize the potential of selection bias or better account for this potential confounder in order to optimize studies utilizing surveys as a primary source of data collection (62). This selection bias, however, could potentially reflect similar patterns that are seen in the biased patterns of individuals seeking out mental healthcare. Multiple studies have shown that mental healthcare utilization and treatment seeking behaviors differ greatly between varying patient populations for many reasons

(63,64). It is therefore possible that those who seek out mental health care would be more likely to complete surveys regarding the same topic.

Implications and actions needed

Given the findings of this study, the authors propose that healthcare practitioners can play a role in preventing negative mental health outcomes in patients who elect to undergo breast reconstruction after mastectomy. A thorough assessment of the psychological status of a patient prior to breast reconstruction using a clinically validated tool is a first step toward understanding how to address mental health needs in patients who receive such a life-altering procedure.

Conclusions

Breast reconstruction has been found to be more often beneficial than detrimental to the patient in improving psychologic distress after surgery. This is the first systematic review to date that analyzes the psychological wellbeing of patients undergoing breast reconstruction after mastectomy by subdividing studies based on reconstruction type and temporality of the reconstruction procedure. Future work is needed to discern if the specific type of BR influences postoperative psychological wellbeing.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlight box

Key findings

- Breast reconstruction (BR) has been found to be more often beneficial than detrimental to the patient in improving psychologic distress.
- Findings suggest that immediate BR after mastectomy confers greater psychological benefit when compared to delayed BR.

What is known and what is new?

- It is known that BR is a common component of breast cancer treatment.
- Limited literature specifically explores the impacts of different reconstruction methods on psychological distress. This systematic review identifies the impact of various forms of post-mastectomy BR.

What is the implication, and what should change now?

- This study identifies a need for healthcare providers to work to prevent negative mental health outcomes in patients who elect to undergo BR after mastectomy.
- Breast cancer care teams may elect to integrate psychological questioning into their practice in order to assess patient need and promote mental wellbeing throughout the breast cancer journey.

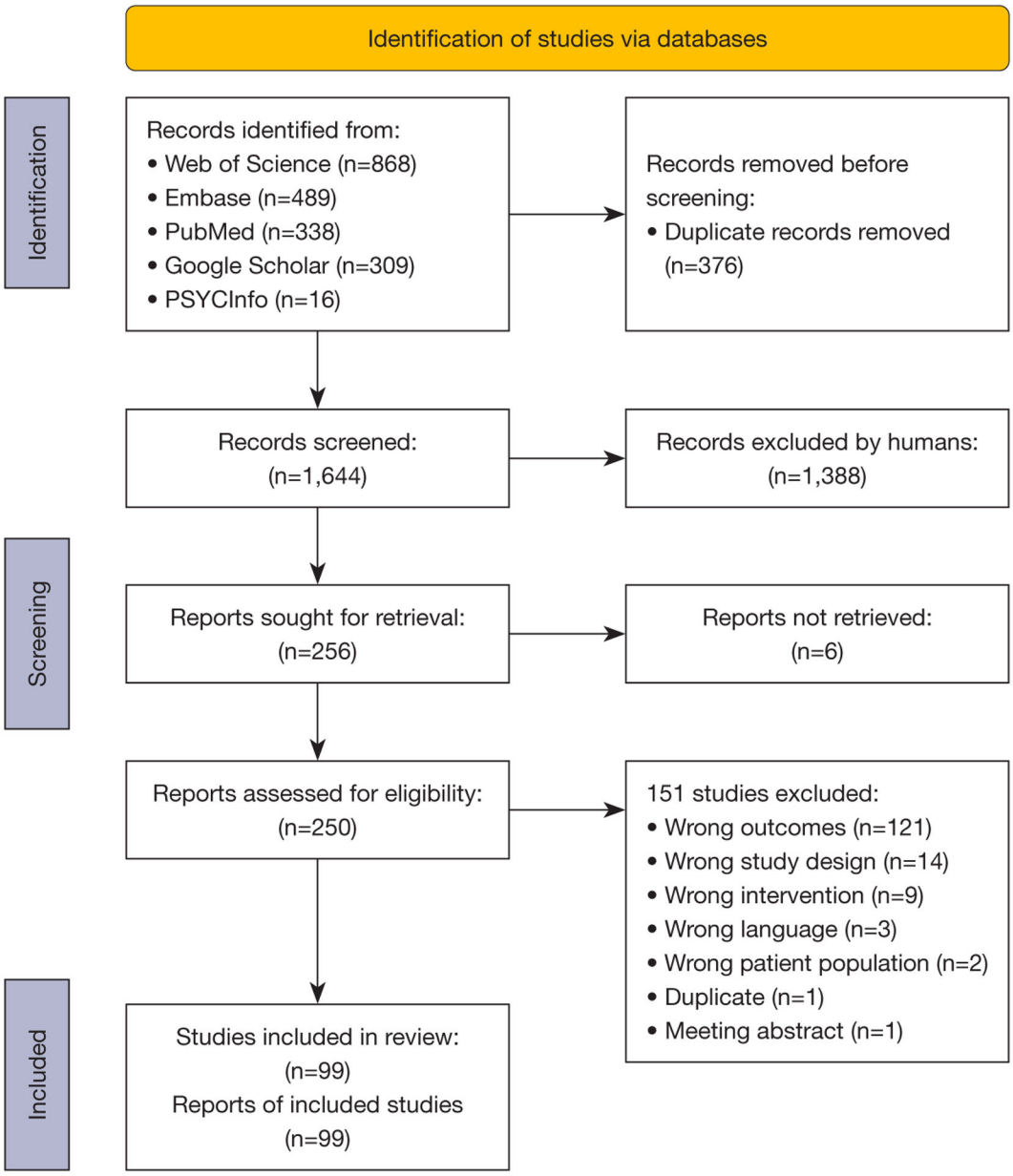

Figure 1.
PRISMA flow diagram of study eligibility.

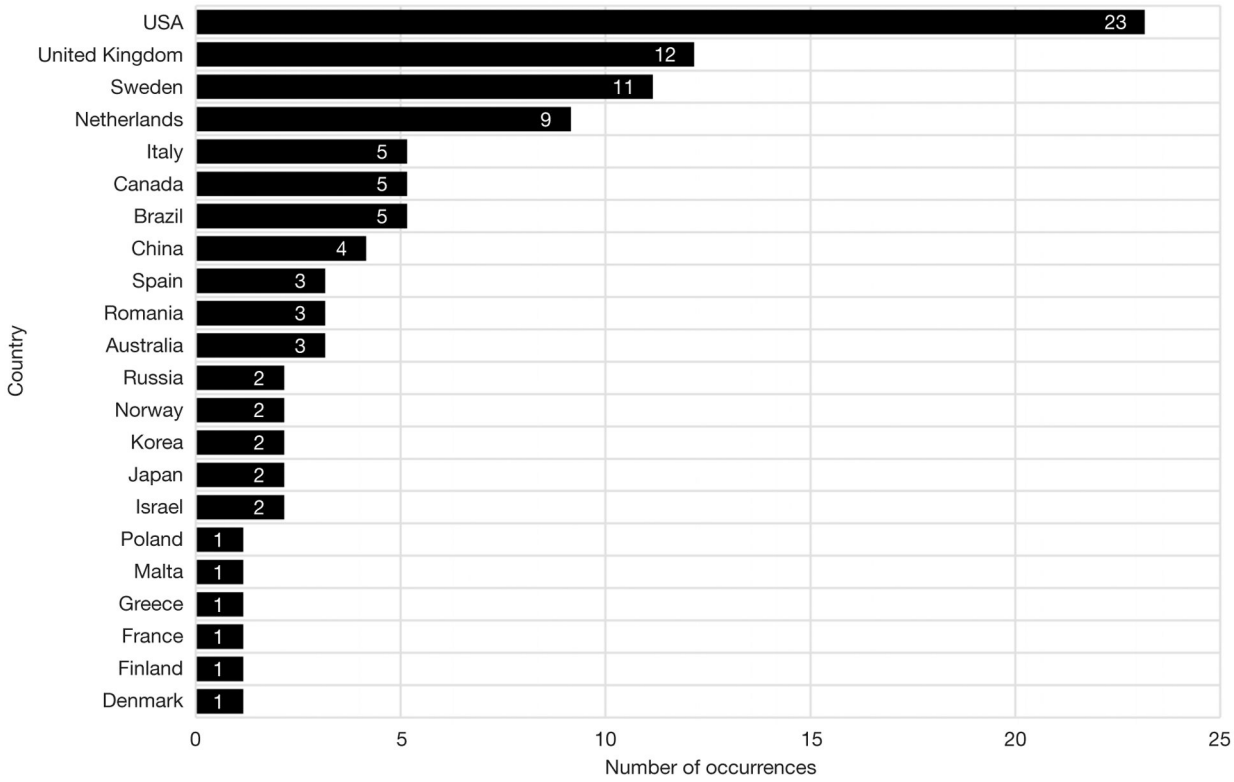

Figure 2.
Geographic distribution of studies by country.

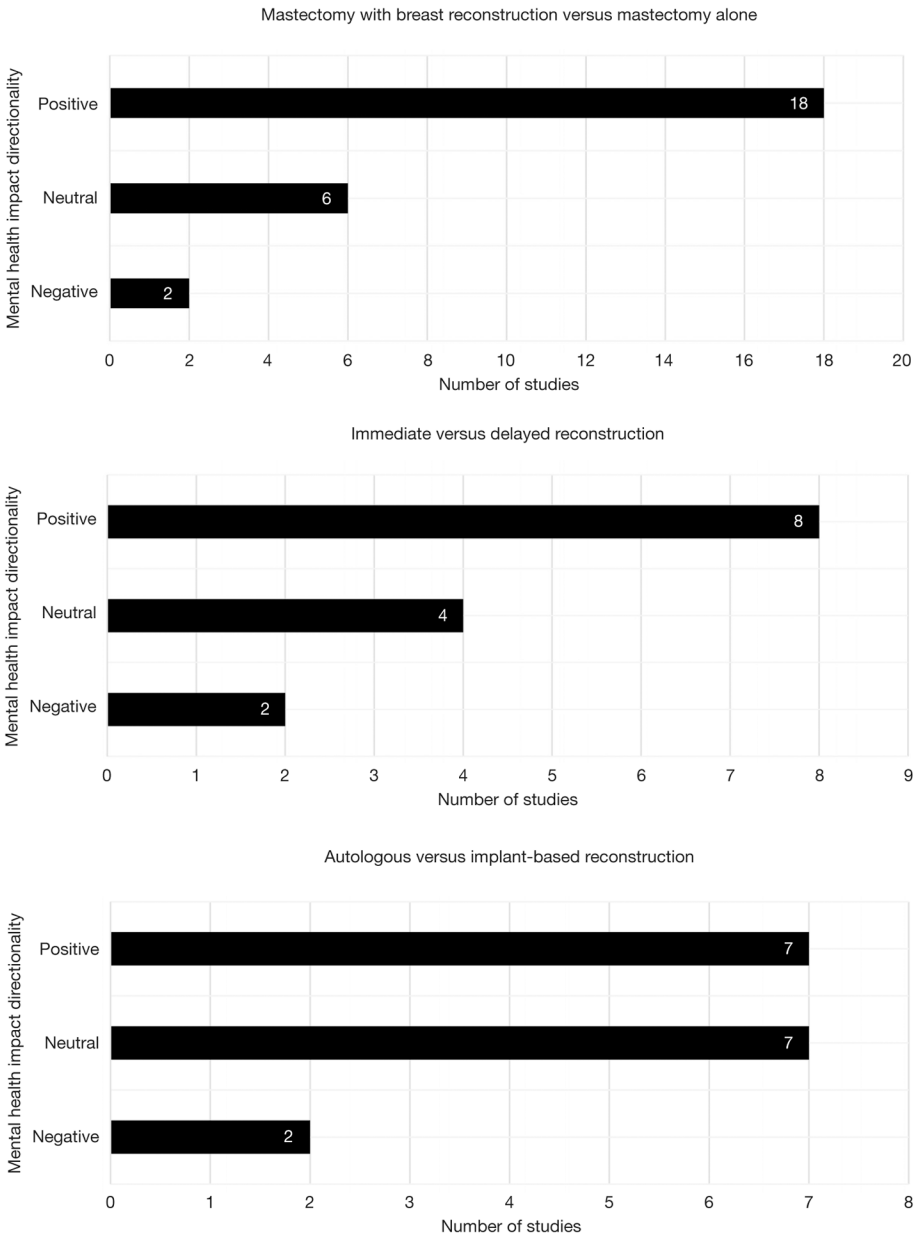

Figure 3.
Mental health impact directionality of studies by comparison group.

Table 1

Studies that compared mastectomy with breast reconstruction and mastectomy alone

Study authors	Year	Country	Study type	Groups	Total (n)	MBR (n)	MA (n)	Mental health scales used	Mental health impact: directionality of MBR vs. MA
de Raaff *et al.* (9)	2016	Netherlands	Retrospective cross-sectional	MBR *vs.* MA	139	34	105	Beck	Positive
Li *et al.* (10)	2021	China	Prospective cohort	MBR *vs.* MA	152	102	50	FACT-B, SAS, SDS	Positive
Szadowska-Szlachetka *et al.* (11)	2013	Poland	Retrospective cross-sectional	MBR *vs.* MA	241	108	133	Beck, EORTC	Positive
Tønseth *et al.* (12)	2007	Norway	Retrospective cross-sectional	MBR *vs.* MA	58	34	24	SF-36	Positive
Fanakidou *et al.* (13)	2018	Greece	Retrospective cross-sectional	MBR *vs.* MA	81	35	46	DASS-21	Positive
Fortunato *et al.* (14)	2021	Italy	Retrospective cross-sectional	MBR *vs.* MA	328	172	156	EORTC	Positive
Gardikiotis *et al.* (15)	2016	Romania	Retrospective cross-sectional	MBR *vs.* MA	50	23	27	SF-36	Positive
Ismagilov *et al.* (16)	2011	Russia	Retrospective cross-sectional	MBR *vs.* MA	374	132	242	SF-36	Positive
Bredicean *et al.* (17)	2020	Romania	Prospective cohort	MBR *vs.* MA	64	36	28	DASS-21	Positive
Al-Ghazal *et al.* (18)	2000	UK	Retrospective cross-sectional	MBR *vs.* MA *vs.* BCS	577	121	202	HADS, RSE	Positive
Retrouvey *et al.* (19)	2019	Canada	Prospective cohort	MBR *vs.* MA *vs.* BCS	303	70	78	HADS, IES	Positive
Archangelo *et al.* (20)	2019	Brazil	Retrospective cross-sectional	MBR vs. MA *vs.* normal population	90	30	30	Beck	Positive
Rubino *et al.* (21)	2007	Italy	Prospective cohort	IBR *vs.* MA *vs.* normal pop	99	33	33	HAM-A, HAM-D	Positive
Hunsinger *et al.* (22)	2016	France	Retrospective cross-sectional	MBR *vs.* MA *vs.* normal population	3,513	70	135	SF-36	Positive
Fernández-Delgado *et al.* (23)	2008	Spain	Retrospective cross-sectional	IBR *vs.* MA *vs.* normal pop	377	263	114	HADS, RSE	Positive
Pusic *et al.* (24)	1999	USA	Retrospective cross-sectional	MBR *vs.* MA *vs.* BCS	267	102	71	SF-36	Positive
Kovačević *et al.* (25)	2020	Russia	Retrospective cross-sectional	MBR *vs.* MA *vs.* BCS	425	54	256	WHOQoL-Bref, FACT-B	Positive
Pérez-San-Gregorio *et al.* (26)	2013	Spain	Retrospective cross-sectional	MBR *vs.* MA *vs.* organ transplant *vs.* normal population	706	36	36	HADS	Positive

Study authors	Year	Country	Study type	Groups	Total (n)	MBR (n)	MA (n)	Mental health scales used	Mental health impact: directionality of MBR vs. MA
Holly *et al.* (27)	2003	UK	Retrospective cross-sectional	MBR *vs.* MA	64	30	34	HADS, RSE	Neutral
Wehrens *et al.* (28)	2005	Netherlands	Retrospective cross-sectional	MBR *vs.* MA	222	67	155	POMS	Neutral
Nicholson *et al.* (29)	2007	UK	Retrospective cross-sectional	MBR *vs.* MA *vs.* BCS	99	39	46	HADS, SF-36, DAS-59	Neutral
Harcourt *et al.* (5)	2003	UK	Prospective cohort	Immediate BR *vs.* delayed BR *vs.* MA	103	56	47	HADS, EORTC	Neutral
Metcalfe *et al.* (30)	2012	Canada	Prospective cohort	Immediate BR *vs.* delayed BR *vs.* MA	190	81	109	BSI, IES	Neutral
Nano *et al.* (31)	2005	Australia	Retrospective cross-sectional	MBR *vs.* MA *vs.* BCS	310	123	78	FACT-B	Neutral
Clark *et al.* (32)	2011	UK	Prospective cohort	MBR *vs.* MA	133	29	104	HADS	Negative
Adachi *et al.* (33)	2007	Japan	Retrospective cross-sectional	MBR *vs.* MA *vs.* BCS	102	11	25	POMS	Negative

MBR, mastectomy with breast reconstruction; MA, mastectomy alone; FACT-B, Functional Assessment of Cancer Therapy – Breast; BSI, brief symptom inventory; SAS, Self-rating Anxiety Scale; SDS, Self-rating Depression Scale; EORTC, European Organization for Research and Treatment of Cancer Quality of Life Instruments; SF-36, Short Form – 36 items; DASS-21, Depression, Anxiety, and Stress Scale – 21 items; BCS, breast-conserving surgery; HADS, Hospital Anxiety and Depression Scale; RSE, Rosenberg Self Esteem Scale; IES, Impact of Events Scale; IBR, immediate breast reconstruction; HAM-A, Hamilton Anxiety Ranking Scale; HAM-D, Hamilton Depression Rating Scale; WHOQoL-Bref, World Health Organization Quality of Life Scale Brief Version; POMS, Profile of Mood States; DAS-59, Derriford Appearance Scale 59.

Table 2

Studies that compared immediate versus delayed breast reconstruction

Study authors	Year	Country	Study type	Groups	Total (n)	Immediate (n)	Delayed (n)	Mental Health scales used	Mental health impact: directionality of immediate vs. delayed
Zhong *et al.* (34)	2016	Canada	Prospective cohort	Immediate *vs.* delayed	106	30	76	HADS, SF-36	Positive
Atisha *et al.* (35)	2008	USA	Prospective cohort	Immediate *vs.* delayed	173	116	57	SF-36, FACT-B	Positive
Wellisch *et al.* (36)	1985	USA	Retrospective cross-sectional	Immediate *vs.* delayed	63	25	38	BSI	Positive
Fernández-Delgado *et al.* (23)	2008	Spain	Retrospective cross-sectional	Immediate *vs.* delayed *vs.* MA	375	194	110	HADS, RSE	Positive
Al-Ghazal *et al.* (18)	2000	UK	Retrospective cross-sectional	Immediate *vs.* delayed	121	38	83	HADS, RSE	Positive
Göktaş *et al.* (37)	2011	Israel	Retrospective cross-sectional	Immediate *vs.* delayed	51	28	23	SCL-R90	Positive
Wilkins *et al.* (38)	2000	USA	Prospective cohort	Compared both immediate *vs.* delayed, and autologous *vs.* implant	273	161	89	SF-36, FACT-B	Positive
Franchelli *et al.* (39)	1995	Italy	Retrospective cross-sectional	Compared both immediate *vs.* delayed, and autologous *vs.* implant	102	34	68	PDI, STAI	Positive
Metcalfe *et al.* (30)	2012	Canada	Prospective cohort	Immediate *vs.* delayed *vs.* MA	190	24	57	BSI, IES	Neutral
Agius *et al.* (40)	2016	Malta	Retrospective cross-sectional	Compared both immediate *vs.* delayed, and autologous *vs.* implant	42	NA	NA	SF-36	Neutral
Rubino *et al.* (21)	2007	Italy	Prospective cohort	Compared both immediate *vs.* delayed, and autologous *vs.* implant	33	21	12	HAM-A, HAM-D	Neutral
Juhl *et al.* (41)	2017	Denmark	Retrospective cross-sectional	Immediate *vs.* delayed	144	27	117	BDI, IES	Neutral
Harcourt *et al.* (5)	2003	UK	Prospective cohort	Immediate *vs.* delayed *vs.* MA	103	37	10	HADS, EORTC	Negative
Roth *et al.* (42)	2005	USA	Prospective cohort	Immediate *vs.* delayed	238	151	87	SF-36, BSI, FACT-B	Negative

HADS, Hospital Anxiety and Depression Scale; SF-36, Short Form – 36 items; FACT-B, Functional Assessment of Cancer Therapy – Breast; BSI, Brief Symptom Inventory; RSE, Rosenberg Self Esteem Scale; SCL-R90, Symptom Checklist-90-Revised; PDI, psychological distress inventory; STAI, State Trait Anxiety Inventory; MA, mastectomy alone; IES, Impact of Events Scale; HAM-A, Hamilton Anxiety Ranking Scale; HAM-D, Hamilton Depression Rating Scale; BDI, Beck's Depression Inventory; EORTC, European Organization for Research and Treatment of Cancer Quality of Life Instruments.

Table 3

Studies included that compared autologous versus implant-based breast reconstruction

Study authors	Year	Country	Study design	Total (n)	Implant (n)	Autologous (n)	Type of autologous	Mental health scales used	Mental health impact: directionality of autologous vs. implant-based
Gopie *et al.* (43)	2014	Netherlands	Prospective cohort	98	25	73	DIEP	SF-36, IES	Positive
Pusic *et al.* (44)	2017	USA	Prospective cohort	1,632	1,139	493	Mixed	GAD-7, PHQ-9	Positive
Thorarinsson *et al.* (45)	2017	Sweden	Retrospective cross-sectional	459	253	206	DIEP, LD	SF-36, PGWB	Positive
Franchelli *et al.* (39)	1995	Italy	Retrospective cross-sectional	102	52	50	TRAM	PDI, STAI	Positive
Eltahir *et al.* (46)	2015	Netherlands	Retrospective cross-sectional	92	45	47	Mixed	HADS, SF-36	Positive
Cederna *et al.* (47)	1995	USA	Retrospective cross-sectional	22	14	8	TRAM	FSQ	Positive
Winters *et al.* (48)	2016	UK	Prospective cohort	206	93	113	LD	HADS, FACT-B, EORTC	Positive
Winters *et al.* (49)	2013	UK	Prospective cohort	182	82	100	LD	HADS, FACT-B, EORTC	Neutral
Wilkins *et al.* (38)	2000	USA	Prospective cohort	250	56	194	TRAM	SF-36, FACT-B	Neutral
Honkanen *et al.* (50)	2021	Finland	Retrospective cross-sectional	115	10	105	Mixed	HADS, SF-36, BDI	Neutral
Agius *et al.* (40)	2016	Malta	Retrospective cross-sectional	42	NA	NA	Mixed	SF-36	Neutral
Juhl *et al.* (41)	2017	Denmark	Retrospective cross-sectional	144	49	68	Abdominal flap	BDI, IES	Neutral
Tønseth *et al.* (51)	2008	Norway	Retrospective cross-sectional	64	30	34	DIEP	SF-36	Neutral
Rubino *et al.* (21)	2007	Italy	Prospective cohort	33	16	17	TRAM	HAM-A, HAM-D	Neutral
Timman *et al.* (52)	2017	Netherlands	Prospective cohort	114	69	75	DIEP	HADS, IES	Negative
Gopie *et al.* (53)	2013	Netherlands	Retrospective cross-sectional	150	64	86	DIEP	HADS, IES	Negative

DIEP, Deep inferior epigastric perforator flap; SF-36, Short Form – 36 items; IES, Impact of Events Scale; GAD-7, Generalized Anxiety Disorder 7-Item Scale; PHQ-9, Patient Health Questionnaire-9; LD, latissimus dorsi flap; PGWB, Psychological General Well-Being Index; TRAM, transverse rectus abdominis muscle flap; PDI, Psychological Distress Inventory; STAI, State Trait Anxiety Inventory; HADS, Hospital Anxiety and Depression Scale; FSQ, Functional Status Questionnaire; FACT-B, Functional Assessment of Cancer Therapy – Breast; EORTC, European Organization For Research and Treatment of Cancer Quality of Life Instruments; BDI, Beck's Depression Inventory; HAM-A, Hamilton Anxiety Ranking Scale; HAM-D, Hamilton Depression Rating Scale.