Screening for sexual dysfunction in women diagnosed with breast cancer: systematic review and recommendations

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Abstract Breast cancer patients are at increased risk of sexual dysfunction. Despite this, both patients and practitioners are reluctant to initiate a conversation about sexuality. A sexual dysfunction screening tool would be helpful in clinical practice and research, however, no scale has yet been identified as a “gold standard” for this purpose. The present review aimed at evaluating the scales used in breast cancer research in respect to their psychometric properties and the extent to which they measure the DSM-5/ICD-10 aspects of sexual dysfunction. A comprehensive search of the literature was conducted for the period 1992–2013, yielding 129 studies using 30 different scales measuring sexual functioning, that were evaluated in the present review. Three scales (Arizona Sexual Experience Scale, Female Sexual Functioning Index, and Sexual Problems Scale) were identified as most closely meeting criteria for acceptable psychometric properties and incorporation of the DSM-5/ICD-10 areas of sexual dysfunction. Clinical implications for implementation of these measures are discussed as well as directions for further research.

Keywords Breast neoplasms · Sexual dysfunction · Psychological · Psychometrics · Questionnaires · DSM-5 · ICD-10

Introduction

Breast cancer is the second most common cancer worldwide and the most commonly diagnosed female cancer [1]. With high 5-year survival rates (76–92 %) there are increasing numbers of breast cancer survivors [2], leading to a focus on aspects of quality of life (QOL) [3], due to the long-term effects of cancer and its treatment [4, 5]. Most women (50–75 %) diagnosed with breast cancer report persistent difficulties with sexual functioning [6–8]. Biological, psychological, and social factors all contribute to the development of this sexual dysfunction [9]. Neglecting to address these issues may contribute to further distress and relationship difficulties, and possibly impact other aspects of women’s lives [10].

Sexual assessment and counseling are not routinely provided in oncological settings [11], with less than one-third of breast cancer patients reporting having discussed sexuality concerns with a healthcare professional [12], of these few report satisfaction with the consultation [12], and generally these discussions only occur if the medical practitioner raises the subject [13]. Practitioners’ reluctance to initiate these conversations may stem from fears of litigation and over-involvement in non-medical issues, embarrassment, and misleading assumptions held about their patients’ priorities for treatment [14].

Considering the barriers to discussing these issues, an easily administered, reliable, and valid scale measuring sexual functioning may be useful as a screening tool and to help facilitate clinic-based conversations. In research, such a scale may be used to quantify treatment outcomes and side effects. It is important that any such measure incorporates all dimensions of sexual dysfunction, as defined by internationally accepted diagnostic criteria, Diagnostic and Statistical Manual of Mental Disorders, DSM-5 [15] and
International Classification of Diseases and Related Health Problems, ICD-10 [16]. These dimensions include desire to have sexual activity, excitement/arousal, orgasm, pain, and distress/dysfunction.

To date, there have been three published reviews of scales measuring sexual functioning in individuals with cancer [10, 17, 18], none of which specifically focused on breast cancer, which requires separate consideration because (1) breasts are considered symbols of sexuality and feminism in Western cultures, which may lead to adverse impact of breast cancer and treatment on women’s feminine and sexual identity [19]; (2) women report reduced sexual arousal from breast stimulation following breast surgery [20]; and (3) women may experience diminished sexual responsiveness due to hormonal treatments used for managing breast cancer [21].

Prior reviews are also limited in that they: do not reflect current research in this area [17]; reviewed a select number of measures [18]; focused on measures used in all cancers, rather than breast cancer specifically [10, 17, 18]; and, neglected to include sexual functioning subscales incorporated within QOL measures [10, 17, 18], which are often used in treatment outcomes research. Additionally, no reviews have delineated the extent to which the scales incorporate the DSM-5/ICD-10 dimensions of sexual dysfunction.

Unfortunately very few scales used in breast cancer research have actually been validated on this population. For this reason, our review will delineate the psychometric properties of scales applied within this context. Only self-report measures were considered since they are easy to administer, relatively cost-effective, and may be less intrusive than other modes of assessment [22]. The specific aims were to: (1) evaluate the psychometric properties of available measures; and (2) evaluate the extent to which these measures incorporate DSM-5/ICD-10 sexual dysfunction criteria. The psychometric properties reviewed included reliability, validity and responsiveness to change. The definitions of these terms, methods of measurement and psychometric evaluation criteria are presented in Table 1. As sexual dysfunction is a sensitive subject, the patients’ acceptability of scale questions was also evaluated.

Materials and methods

Search strategy

Literature searching using CINAHL, Embase, MEDLINE, PsycINFO, PubMed from 1992 to 2013 was conducted using the terms “breast cancer,” “breast neoplasms”, “sexual functioning,” and “sexual dysfunction.” The search was limited to empirical studies published in English language peer-reviewed journals.

Inclusion and exclusion criteria

The review inclusion and exclusion criteria are listed in Table 2. Where the title or abstract indicated that exclusion criteria were met, the study was rejected. Full text articles were accessed when: (1) it was not clear from the title or abstract whether the inclusion criteria were met or what sexual functioning scale was used; and, (2) inclusion criteria were met and the empirical studies for scales were reviewed.

Scale evaluation scoring system

Each included scale was assessed using the following criteria: (1) psychometric properties; and (2) coverage of DSM-5/ICD-10 dimensions of sexual dysfunction [15, 16]. A score was assigned to each scale indicating the extent to which it had adequate psychometric properties and covered the dimensions of sexual dysfunction (see Table 1 for scoring system). Additional points were awarded based on the characteristics of the validation sample, where “1” was given to studies where n > 300, as this is recommended for scale validation [23], and “0.5” where sample sizes were between 200 and 299. Since scale psychometric properties are dependent on the population studied [24], “1” was given if the validation sample included women with breast cancer, and “0.5” if it included cancer patients generally. Scores for the extent to which the DSM-5/ICD-10 dimensions of sexual dysfunction were incorporated were: “1” for each time at least one question covered one of the five domains (Desire, Arousal, Orgasm, Pain, Distress), with a maximum score of 5. Scores for all quality criteria were summed, with a maximum score of 17 (i.e., 12 psychometric property points and 5 for DSM-5/ICD-10 criteria). The first author (IB) rated the measures first, followed by the second author (KS). Any disagreements were discussed until an agreement was reached.

Results

Literature search results

The literature search results are presented in Fig. 1. Out of the 2,192 citations initially identified, 129 studies met the inclusion criteria, using 30 different scales, 18 of which were specifically designed to measure sexual functioning, and 12 were subscales within QOL questionnaires. For the latter, only psychometric properties for sexual functioning subscales were reviewed.

Evaluation of sexual functioning scales

The evaluation of the sexual functioning scales is presented in Tables 3 and 4. Where multiple validation studies for the
| Psychometric property          | Definition                                                                 | Method of measurement                                                                 | Psychometric evaluation criteria                                                                 | Scoring       |
|-------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------|
| Reliability                   |                                                                           |                                                                                      |                                                                                                |               |
| Internal consistency          | Extent to which all scale items are measuring the same construct          | Cronbach’s $\alpha$                                                                   | 0.70–0.90 [24, 46]                                                                                  | “1”: $\geq$ 0.7 |
|                               |                                                                           | Item total correlation                                                                | $\geq$ 0.40 [47]                                                                                   | “0”: <0.7    |
| Test–retest reliability       | Degree of consistency in scores obtained by the same people on two different occasions, assuming no real change in the construct has occurred | Correlation coefficient between scores obtained on two occasions some time apart (maximum 2–4 weeks) | $\geq$ 0.70 [46, 48]                                                                                  | “1”: $\geq$ 0.7 |
|                               |                                                                           |                                                                                      |                                                                                                | “0”: <0.7    |
| Validity                      |                                                                           |                                                                                      |                                                                                                |               |
| Content                       | Extent to which items in a scale cover the construct adequately           | Based on theory, existing scales, expert opinion and clinical observation, qualitative feedback from professionals, researchers and participants | N/A                                                                                              | “1”: evidence of the measure being based on theory, literature review, or examined by patients, professionals and experts in the field |
| Criterion                     | How well the scale relates to the “true value” or a “gold standard” for measuring the construct | Correlation coefficient between survey and criterion scores | The higher the correlation the more valid the instrument. Acceptable values include significant moderate ($r > 0.30$) to high ($r > 0.50$) correlations [48–51] | “0.5” if correlation coefficient is between $0.30$ and $0.49$ and “1” if the correlation coefficient is above $0.50$ between the scale and the “gold standard” measure either taken at the same time (concurrent) or in the future (predictive) |
| Construct                     | Extent to which hypothesized relationships with similar (convergent) or different (discriminant) constructs are confirmed | Correlation coefficient between survey scores and hypothesized variables | Moderate correlations with similar constructs $\geq$ 0.3 (convergent) and low correlations $<0.30$ with different constructs (discriminant) [50–52] | “1”: evidence of convergent validity |
|                               |                                                                           | Known groups comparisons                                                              | Significant difference in scores between known groups [50]                                      | “1”: evidence of discriminant validity         |
|                               |                                                                           | Factor analysis                                                                      | Factor analysis confirms hypothesized structure [50]                                           | “1”: factor analysis confirms hypothesized factor structure |
| Responsiveness to change      | Sensitivity to change over time                                           | No widely accepted method of measuring responsiveness to change exists (e.g., ANOVA comparing scores over period where change is hypothesized to have occurred; correlation with people’s perceptions of change) [53] | Significant differences in scores over a period of time when the change in sexual functioning is hypothesized to have occurred (e.g., due to treatment); significant correlation between scale scores’ and respondent’s or other professionals’ perceptions of change [53] | “1”: evidence of sensitivity to change over time |
|                               |                                                                           | Guyatt Responsiveness Statistic: the ability of the scale to capture clinically meaningful change | $\geq$ 0.2: acceptable responsivity $>$1.00: high responsivity [54]                               |               |
same scale existed, the results were differentiated by assigning a number in their subscript (e.g., \( n_1, n_2 \), denotes sample sizes in two different studies).

Validation sample characteristics

Only four scales (13 %) met the criteria of having adequate sample size and containing women diagnosed with breast cancer (BCPT-SCL [25], CARES [26] Sexual Problem Scale [27], WHOQOL-100 [28]).

Reliability

Seven scales (23 %) met the reliability criteria, that is, having both adequate internal consistency and temporal stability: ASEX [29], FSFI [30], Sexual Self-Schema Scale

Table 2  Study inclusion and exclusion criteria

| Criterion                        | Included                                      | Excluded                                                                 |
|----------------------------------|-----------------------------------------------|--------------------------------------------------------------------------|
| Type of study                    | Original study                                | Review paper                                                             |
| Type of scales                   | Quantitative                                  | Qualitative                                                              |
| Population studied              | Self-report                                   | Other                                                                    |
| Study reporting on experiences of | Women diagnosed with breast cancer            | Other populations, including women at risk of developing breast cancer and women diagnosed with Ductal Carcinoma in Situ |
|                                  | Women diagnosed with breast cancer            | Partners, care providers and professionals                                |

![Fig. 1 Flowchart of the systematic review](image)
and the sexual functioning subscales of the CARES [26], MRS [32], QLACS [33], and WHOQOL-100 [28].

Validity

No scales were awarded full scores (6) for their validity studies, but those with the greatest validity evidence (≥4) included: CSDS [58], FSFI [30], Heatherington Intimate Relationship Scale [34], Sexual Self-Schema Scale [31], SQoL-F [67], MRS [32], and WHOQOL-100 [28].

Responsiveness to change

Only five (17%) scales included evidence of responsiveness to change (ASEX [29], BIRS [36] (GRISS) [37] BCPT-SCL [25], MENQOL [35]). ASEX and BIRS were able to detect improvements in sexual functioning due to treatment (positive change), BCPT-SCL deterioration of functioning due to breast cancer treatment (negative change), and MENQOL and GRISS clinically meaningful change, regardless of direction.

Acceptability to participants

Only four (13%) of the scales included information on the degree to which the scale questions are acceptable to the participants (GRISS [37], SAQ [38], CARES [26], QLACS [33]).

DSM-IV-TR/ICD-10 aspects

No scales assessed all five aspects of DSM-IV-TR/ICD-10 female sexual dysfunction. FSFI [30], MFSQ [39], SHF [40], Sexual Problem Scale [27] assessed four aspects, while ASEX [29], MOS-SF [41], SAQ [38], Watt’s Sexual Functioning Scale [42], WSBQ-F [43] assessed three.

Overall scores

The overall scores ranged from 2 to 11. The three scales with the highest scores included: FSFI [30] (11), Sexual Problem Scale [27] (10.5), and ASEX [29] (10).

Discussion

Our review has indicated that no one scale obtained full score, indicating superior psychometric properties and coverage of all DSM-5/ICD-10 areas of sexual dysfunction (desire, arousal, orgasm, pain, distress), which is consistent with previous reviews in oncology [10, 17] and general populations [44, 45]. Three highest scoring scales included ASEX, FSFI and Sexual Problems Scale. While FSFI has previously been identified as a good quality scale [10, 18], our review also identified two other scales of similar quality (ASEX, Sexual Problems Scale). In the absence of a “gold standard” sexual dysfunction measure, we recommend that any of these three scales are suitable for use in the breast cancer context, with specific caveats outlined below.

When selecting a measure of sexual dysfunction to use in clinical practice or research, there are three considerations: (1) psychometric properties, to ensure that the variability in scores observed is reflective of the variability in the underlying construct, rather than measurement error [24]; (2) how well the scale measures the construct of interest (DSM-5/ICD-10 aspects of sexual dysfunction); and (3) practical issues (administration, scoring, interpretation).

Only the Sexual Problems Scale has been validated on an adequate-sized breast cancer sample, where it demonstrated good internal consistency and evidence of validity. However, no test–retest data are available, making it less useful for repeated measures. ASEX has been validated on general and psychiatric populations. The FSFI has been validated on community, sexual dysfunction, and gynecologic cancer samples. Hence, for one-off measurement of sexual dysfunction we recommend the Sexual Problems Scale, and for repeated measures the ASEX or FSFI may be more useful.

DSM-5/ICD-10 criteria incorporate when women experience distress due to painful sexual encounters, or disruption in desire, arousal or orgasm. None of the three preferred scales include items measuring distress, and ASEX also does not include items measuring pain; hence, FSFI and the Sexual Problems Scale are recommended as they have the greatest coverage of the DSM-5/ICD-10 dimensions of sexual dysfunction. Additional information about the levels of distress may need to be collected to supplement these scales.

All three scales are relatively brief (ASEX-5, FSFI-19, and Sexual Problems Scale-9 items, respectively) and readily accessible. As yet, these scales do not have electronic versions for ease of administration and scoring. To obtain a total score, ASEX and the Sexual Problems Scale have individual items summed, whereas FSFI’s scoring algorithm is more complex with six subscales being summed to yield a total score. All scales can be interpreted to identify potential areas of sexual dysfunction, and the Sexual Problems Scale also takes into account partner variables (i.e., lack of interest in sex). Additionally, FSFI can only be validly interpreted for individuals experiencing sexual activity in the past month. Therefore, the Sexual Problems Scale is considered most practical, as it is relatively short to administer and score, and it can identify when dysfunction is due to partner difficulties.

This review also highlighted ways in which existing measures can be improved. To make these scales more
Table 3 Evaluation of scales that were designed to assess primarily sexual functioning

| Scale                                                    | Validation sample | Reliability | Content validity | Criterion validity | Construct validity | Responsiveness to change | Acceptability | DSM-5/ICD-10                 | Total score |
|----------------------------------------------------------|-------------------|-------------|------------------|--------------------|--------------------|--------------------------|---------------|------------------------------|-------------|
| Arizona Sexual Experience Scale (ASEX) [30]              | n₁ = 134 O [29]   |      Cₓ₁ = 0.9 [29] |      LR, EF       | ✓  ✓  ✓            | ✓                  | Improvement in scores after 12 week intervention [56] | ✓            | Desire, Arousal, Orgasm      | 3 10        |
|                                                          | n₂ = 247 O [55]   |      Cₓ₂ = 0.91 [55] | TRR r₁ > 0.80    | (1–2 weeks) [29]  |        |                          |               |                              |             |
| Score                                                    | 0.5               |      Cₓ = 0.94 |      PF           |  x  ✓  ✓  ✓        | ✓  x  ✓  ✓  ✓  ✓  ✓ | Sensitive to treatment effects [57] | x            | Nil                          | 5           |
| Score Image and Relationships Scale (BIRS) [36]          | n = 96 BC         |      Cₓ ≥ 0.94 |      TRR r = 0.41–0.80 | (2 weeks)         |        |                          |               |                              |             |
| Score                                                    | 1                 |      Cₓ > 0.78 |      PF, TH       |  3  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓        | Nil                      |               |                              |             |
| Cues for Sexual Desire Scale (CSDS) [58]                 | n = 874 O         |      Cₓ ≥ 0.56–0.94 |      LR, CE       |  x  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
| Score                                                    | 1                 |      Cₓ ≥ 0.56–0.94 |      TRR r = 0.42–0.93 | (2 weeks)         |        |                          |               |                              |             |
| Derogatis Sexual Functioning Inventory (DSFI) [59]       | n = 325, 380 O    |      Cₓ ≥ 0.56–0.94 |      LR, CE       |  x  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
| Score                                                    | 1                 |      Cₓ ≥ 0.56–0.94 |      TRR r = 0.42–0.93 | (2 weeks)         |        |                          |               |                              |             |
| Female Sexual Functioning Index (FSFI) [30]              | n₁ = 259 O [30]   |      Cₓ₁ ≥ 0.89–0.97 |      LR           |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
|                                                          | n₂ = 186 O [60]   |      Cₓ₂ ≥ 0.58–0.95 |      [30, 60]     |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
|                                                          | n₃ = 568 O [61]   |      Cₓ₃ ≥ 0.84–0.98 |      [30, 60, 61] |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
|                                                          | n₄ = 217 CA [62]  |      Cₓ₄ ≥ 0.85–0.94 |      [30, 60, 62] |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
| Score                                                    | 1                 |      Cₓ ≥ 0.56–0.94 |      TRR r = 0.42–0.93 | (2–4 weeks) [30]  |        |                          |               |                              |             |
| The Golombok Rust Inventory of Sexual Satisfaction (GRISS) [37] | 62 couples—O     |      Cₓ ≥ 0.61–0.83 |      LR, EF       |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Moderate correlations between therapists’ and patients’ ratings of change | x            | Orgasm                       | 4 11        |
| Score                                                    | 0                 |      Cₓ ≥ 0.61–0.83 |      TRR r = 0.47–0.84 |                   |        |                          |               |                              |             |
| Heatherington Intimate Relationship Scale [34]           | n₁: 192, 165 O [34] |      Cₓ > 0.85 [34, 63] |      LR, TH       |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
|                                                          | n₂: 194 couples O [63] |      Cₓ > 0.85 [34, 63] |      [34, 63]     |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
| Score                                                    | 0                 |      Cₓ > 0.85 [34, 63] |      [34, 63]     |  ✓  ✓  ✓  ✓  ✓  ✓  ✓ | ✓  x  ✓  ✓  ✓  ✓  ✓ | Nil                      |               |                              |             |
Table 3 continued

| Scale | Validation sample | Reliability | Content validity | Criterion validity | Construct validity | Responsiveness to change | Acceptability | DSM-5/ICD-10 | Total score |
|-------|------------------|-------------|------------------|--------------------|--------------------|--------------------------|--------------|-------------|-------------|
| The McCoy Female Sexuality Questionnaire (MFSQ) [39] | \( n = 318 \) O | \( \alpha = 0.76-0.80 \) | EF \( \times \) | No studies conducted on the whole 19 item scale, the studies cited were based on subsets of items | \( \times \) | \( \times \) | Desire Arousal Orgasm Pain |
| Score | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 7 |
| Medical outcomes Study Sexual Functioning Scale (MOS-SF) [41] | \( n = 1,234 \) O | \( \alpha = 0.92 \) | LR \( \times \) | | | | | | |
| Score | 1 | 1 | 1 | 0 | 1 | 0 | | | 0 | 3 | 7 |
| Relationship and Sexuality Scale [64] | \( n = 293 \) BC | \( \alpha > 0.77 \) (not reported for one factor) | \( \times \) | \( \times \) \( \times \) \( \times \) \( \checkmark \) \( \times \) \( \times \) \( \checkmark \) | | | | | |
| Score | 1.5 | 1 | 0 | 0 | 1 | 0 | | | 0 | 2 | 5.5 |
| Sexual Activity Questionnaire (SAQ) [38] | \( n = 447, 81 \) O | TRR \( r = 0.65-1.00 \) (2 weeks) | LR \( \times \) \( \checkmark \) \( \times \) \( \times \) \( \times \) | | | Acceptable rate of item completion | Desire Arousal Pain |
| Score | 1 | 0.5 | 1 | 0 | 1 | 0 | | | 1 | 3 | 7.5 |
| Sexual Dissatisfaction Scale [65] | \( n = 113, 37 \) O | \( \alpha = 0.63-0.82 \) | \( \times \) | \( \times \) \( \checkmark \) \( \times \) \( \times \) \( \times \) \( \times \) | | | | |
| Score | 0 | 0 | 0 | 0 | 1 | 0 | | | 0 | 1 | 2 |
| Sexual History Form (SHF) [40] | \( n = 27-45 \) [66] | ITC \( r = 0.18-0.85 \) \( \text{[66]} \) | LR, TH, CE \( \times \) \( \checkmark \) \( \times \) \( \checkmark \) \( \times \) \( \times \) | | | | | |
| Score | 0 | 1.5 | 1 | 0 | 2 | 0 | | | 0 | 4 | 8.5 |
| Sexual Problem Scale [27] | 179 DCIS, 345 BC 509 O | \( \alpha = 0.74-0.87 \) | LR \( \checkmark \) \( \checkmark \) \( \times \) \( \times \) \( \checkmark \) \( \times \) | | | | | |
| Score | 2 | 1 | 1 | 0.5 | 2 | 0 | | | 0 | 4 | 10.5 |
| Sexual Self-Schema Scale [31] | 387 O | \( \alpha = 0.82 \) | EF, CE \( \checkmark \) \( \checkmark \) \( \checkmark \) \( \checkmark \) \( \times \) \( \times \) | | | | | Nil |
| Score | 1 | 2 | 1 | 0.5 | 3 | 0 | | | 0 | 0 | 7.5 |
Table 3 continued

| Scale                                      | Validation sample | Reliability | Content validity | Criterion validity | Construct validity | Responsiveness to change | Acceptability | DSM-5/ICD-10 | Total score |
|--------------------------------------------|-------------------|-------------|------------------|--------------------|--------------------|--------------------------|---------------|--------------|-------------|
| Sexual Quality of Life Female (SQoL-F) Questionnaire [67] | n = 730, 60, 65, 25 O | Cα = 0.95 | TRR₃ = 0.85 | LR, EF, PF | ✔ ✔ × ✔ × | × | 30 % did not answer sexuality questions | Distress |             |
| Watts Sexual Functioning Scale [42]        | n = 52, 17 O | Cα = 0.55–0.65 | TRR r = 0.83 (72 h) | EF | × × ✔ ✔ | × | × | Desire | Arousal | Orgasm |
| Wilmoth Sexual Behaviors Questionnaire-Female (WSBQ-F) [43] | n = 145 O, 165 BC | Cα = 0.94 (total scale), Cα = 0.52–0.94 (subsubscales) | TRR r = 0.73–0.88 (period unknown) | LR, PF | × × ✔ ✔ | × | × | Desire | Arousal | Orgasm |

Validation sample: BC breast cancer, CA cancer, O other; Reliability: Cα Cronbach’s Alpha, TRR test–retest reliability, ITC item–total correlations; Content validity: TH theory, LR literature review, EF expert’s feedback, PF participants’ feedback, CE clinical experience; Construct validity: C convergent validity, D divergent validity, KG known groups, FA factor analysis; ✔ evidence cited in paper, × no evidence cited, I inconsistent evidence cited (with hypotheses or research)
Table 4 Evaluation of scales that were part of the QOL measures

| Scale | Validation sample | Reliability | Content validity | Criterion validity | Construct validity | Responsiveness to change | Acceptability | DSM-5/ICD-10 Total score |
|-------|-------------------|-------------|------------------|-------------------|-------------------|--------------------------|---------------|-------------------------|
| Breast Cancer Prevention Trial Eight Symptom Scale (BESS) Vaginal Problems Subscale [68] | n = 11,064 | × | × | × | × | × | × | Pain |
| Breast Cancer Prevention Trial Symptom Checklist (BCPT-SCL) Vaginal Problems [25] | n = 278/196 BC [25] | × | × | × | × | × | × | Pain |
| | n = 208–863 BC [69] | × | × | × | × | × | × | Pain |
| Cancer Rehabilitation Evaluation System (CARES) Sexual Subscale [26] | n = 479/1047 CA [26] | × | × | × | × | × | × | Desire |
| | n = 779 CA/109 BC [70] | × | × | × | × | × | × | Desire |
| European Organization for Research and Treatment of Breast Cancer (EORTC-BR 23) Sexual Functioning Subscale [71] | n = 170 (Dutch), 168 (Spanish), 158 (American) BC | × | × | × | × | × | × | Desire |
| European Organization for Research and Treatment of Breast Cancer (EORTC) Patient Reported Outcomes (PRO) Sexual Functioning Scale [72] | BC | × | × | × | × | × | × | Desire |
| Long-Term Quality of Life Breast Cancer (LTQOL-BC) Sexual Function Subscale [73] | n = 285 BC | × | × | × | × | × | × | Desire |

Note: DSM-5/ICD-10, Total score, and other specifications are not provided in the table.
Table 4 continued

| Scale                                                                 | Validation sample | Reliability | Content validity | Criterion validity | Construct validity | Responsiveness to change | Acceptability | DSM-5/ICD-10 | Total score |
|----------------------------------------------------------------------|-------------------|-------------|------------------|--------------------|--------------------|--------------------------|---------------|--------------|-------------|
| Menopause specific quality of life questionnaire (MENQOL) Sexual Domain [35] | n₁ = 107 O [35]  | Cα₁ = 0.68 [35] | EF, LR, CE, PF | ✓                  | ✓                 | ✓                       | Guyatt statistic | ✓            | Desire      |
|                                                                      | n₂ = 108 BC       | Cα₂ = 0.673 [75] |                  |                    |                    |                          |                |              |             |
|                                                                      | n₃ = 148 O [75]   | TRR r₂ = 0.451–0.688 (5–9 weeks) [75] |                  |                    |                    |                          |                |              |             |
| Sexual Domain                                                       | Score 1           | 0.5         | 1                | 0.5                | 2                 | 1                        | 0             |              | Desire      |
|                                                                      | Score n > 1,000 O | Cα = 0.7    | EF, CE           | ✓                  | ✓                 | ✓ x x x x               | x             |              | Arousal     |
|                                                                      | TRR r = 0.82 (2 weeks) |                 |                    |                    |                    |                          |                |              |             |
| Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR) Sexual Relationship Domain [76] | Score 1           | 2           | 2                | 1                  | 1                 | 2                        | 0             |              | Desire      |
|                                                                      | n₁ = 331 CA/ BC   | Cα₁ = 0.92 [77] |                    |                    |                    |                          |                |              |             |
|                                                                      | n₂ = 280 O; 41 BC | Cα₂ = 0.86 [78] |                    |                    |                    |                          |                |              |             |
|                                                                      | Score: 1.5        | 1           | 0                | 0                  | 2                 | 0                        | 0             |              | 3.2 % missing data |
| Quality of Life in Adult Cancer Survivors (QLACS) Sexual Problems Scale [33] | Score 1           | 2           | 0                | 0                  | 0                 | 0                        | 1             |              | Desire      |
|                                                                      | n = 94 BC         | Cα = 0.72–0.95 (data not shown) |                    |                    |                    |                          |                |              | Distress    |
|                                                                      | TRR r = 0.89      |                 |                    |                    |                    |                          |                |              |             |
| Women’s Health Questionnaire (WHQ) Sexual Behaviors Factor [79]      | Score 1           | 2           | 0                | 0                  | 0                 | 0                        | 1             |              | Desire      |
|                                                                      | n₁ = 682 O        | Cα₁ = 0.68 [79] |                    |                    |                    |                          |                |              |             |
|                                                                      | n₂ = 737 O        | TRR r₂ > 0.78 (2 weeks) [80] |                    |                    |                    |                          |                |              |             |
|                                                                      | n₃ = 850 O        | r₃ > 0.69 (1 week) [81] |                    |                    |                    |                          |                |              |             |
|                                                                      | Score 1           | 1           | 1                | 0                  | 2                 | 0                        | 0             |              | 1           |
| World Health Organization Quality of Life Assessment Instrument (WHOQOL-100) Sexual Activity Scale [28] | Score 2           | 2           | 2                | 1                  | 1                 | 2                        | 0             |              | 1           |

Validation sample: BC breast cancer, CA cancer, O other; Reliability: Cα Cronbach’s Alpha, TRR test–retest reliability; Content validity: TH theory, LR literature review, EF expert’s feedback, PF participants’ feedback, CE clinical experience; Construct validity: C convergent validity, D divergent validity, KG known groups, FA factor analysis; ✓ evidence cited in paper, x no evidence cited, I inconsistent evidence cited (with hypotheses or research)
psychometrically meaningful for breast cancer population, they would benefit from replication of validation studies in this context. Future research should focus on demonstrating concurrent validity, as many validation studies did not report these data. Demonstrating concurrent validity is more difficult when there is no acceptable “gold standard,” but researchers are encouraged to use the three scales identified above for this purpose. Generally, all scales can be further improved by additional items to ensure adequate coverage of all dimensions aspects of sexual dysfunction [15, 16], in particular distress. Although the evaluation of the cultural suitability and sensitivity of scales was beyond the scope of this review, some scales have validation data for different languages and cultures (e.g., FSFI, MFSQ, SAQ, EORTC-BR-23, WHOQOL-100). Future studies should continue to investigate cross-cultural properties of these sexual dysfunction scales.

In conclusion, this comprehensive systematic review builds upon and extends prior work concerning sexual dysfunction in oncology [10, 17, 18], by focusing specifically on the breast cancer context. Strengths of the research are that it was based on a rigorous psychometric evaluation of measures and an assessment of the extent to which existing measures meet the diagnostic criteria for sexual dysfunction [15, 16]. The scoring system provided a systematic way to summarize the extent to which the scales met the psychometric and DSM-V/ICD-10 criteria. The limitation of the review is that it focused only on studies published in the English language, leading to possible bias.

Our conclusions are of equal importance to clinicians and researchers alike, for whom the selection of appropriate measures of sexual dysfunction will facilitate clinical consultation and discussion with patients, or as critical outcomes and endpoints of clinical trials.

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