The Impact of Physical Activity Levels on Sexual Function in Breast Cancer Survivors: An Integrative Review

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Abstract

Breast cancer is the second most common cancer in women in the US. With advancements in treatments, the life expectancy of breast cancer survivors (BCSs) continues to increase. Sexual dysfunction is a lasting effect of treatment and can impact BCSs' quality of life. This review examined the impact of different levels (none/low, moderate, and high) of physical activity on sexual outcomes in BCSs. A literature review of PubMed and Scopus restricted to articles published within the last 10 years yielded a total of 326 articles, with nine selected based on inclusion and exclusion criteria. Compared with no physical activity, low, moderate, or high levels of physical activity are effective in improving sexual outcomes in BCSs. Findings were particularly pertinent to sexual pleasure and sexual function. Advanced practice providers (APPs) should recommend physical activity to BCSs and other cancer survivors who are experiencing sexual dysfunction. This paper contributes to the current body of knowledge by offering a unique intervention to address certain aspects of sexual functioning in BCSs.

Breast malignancies are the second most common cancer in females and account for 30% of all new cancer diagnoses in the US female population (American Cancer Society, 2025). Due to advancements in research and development of various treatment modalities, the life expectancy and survival rate of those with breast cancer continue to increase (Vegunta et al., 2022). The 5-year survival rate is 91%, regardless of the type and stage of breast cancer (Centers for Disease Control and Prevention [CDC], 2025). Of the 4,652,885 cases of breast cancer reported from 2001 to 2021, 1,163,274 breast cancer survivors (BCSs) who were diagnosed with breast cancer between 2017 and 2021 were still alive on January 1, 2022 (CDC, 2025).

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272,454 females were diagnosed with breast cancer in 2021, and 42,211 females died from breast cancer in 2022 (CDC, 2025).

Management of breast cancer typically involves a combination of treatment modalities, such as surgery, radiation therapy, chemotherapy, targeted therapy, and hormonal treatments. Survivors may experience a variety of chronic changes related to their treatments. Approximately 50% to 70% of women experience unfavorable changes to their sexual function due to breast cancer treatments (Zdenkowski et al., 2016). These sexual function changes can include painful intercourse, vaginal dryness, poor body image, decreased sexual desire, muted orgasms, and vaginal atrophy (Zdenkowski et al., 2016). An estimated 75% of breast cancers are hormone receptor positive and require women to be on a hormone-blocking therapy with a selective estrogen receptor modulator (SERM), which includes tamoxifen or an aromatase inhibitor (AI; Carraça et al., 2023; Vegunta et al., 2022). Breast cancer survivors on these treatments have an increased risk of experiencing sexual dysfunction. Selective estrogen receptor modulators can cause symptoms of menopause, such as low libido and vaginal dryness, due to their effects of binding to estrogen receptors and blocking estrogen. Approximately 30% to 40% of women on tamoxifen reported negative sexual experience and functioning, while more than 50% of women on AI therapy reported loss of sexual well-being (Boswell & Dizon, 2015).

Sexual dysfunction is one of the greatest and most often unaddressed challenges that BCSs face (Boswell & Dizon, 2015). Sexual functioning in BCS is a concern considering that many patients and providers may feel uncomfortable addressing this matter; additionally, it may not be a part of standard of care (Boswell & Dizon, 2015; Vegunta et al., 2022; Zdenkowski et al., 2016). One survey reported that 46% of cancer survivors experienced sexual health needs, and 71% reported that they received no medical care for sexual dysfunction (Higano et al., 2016). Sexual dysfunction contributes to lower quality of life, depression, medication noncompliance, and relational conflicts (Boswell & Dizon, 2015; Vegunta et al., 2022).

Current literature supports how physical activity and exercise positively affect cancer survivors. Exercise is known to be safe and well tolerated for all survivors of different types of cancers during and after treatment. The American College of Sports Medicine (ACSM; 2019) encourages those who have survived cancer to avoid being sedentary and to stay active as much as possible. There is evidence that engagement in weekly physical activity reduces feelings of anxiety, decreases depressive symptoms, improves fatigue, prevents and improves lymphedema, improves physical function, improves overall health-related quality of life (HRQOL), and improves outcomes in those who survived cancer (ACSM, 2019). The ACSM convened in 2018 with the goal to update the 2010 physical activity guide for cancer survivors. The 2010 roundtable advised for survivors to engage in a minimum of 150 minutes of moderate aerobic exercises weekly, muscle-strengthening exercises twice weekly, and stretching large and primary muscle groups daily; modifications were adjusted depending on the health status of the cancer survivor. They concluded that particular amounts of strength training, resistance exercises, and different aerobic exercises can benefit cancer survivors who suffer from common cancer-related symptoms (Campbell et al., 2019). The authors pointed out that there is insufficient evidence of exercise being beneficial in improving sexual function, which is a common cancer-related health outcome. There is a clear gap in the literature related to the benefits of exercise in improving sexual function. There is substantial literature on how BCSs experience sexual dysfunction; however, there are few studies that evaluate the impact of varying levels of physical activity on sexual functioning. This integrative review bridges this gap and provides an analysis of how different levels of physical activity impact sexual outcomes and functioning in cisgender women BCSs who experience sexual dysfunction.

METHODS

A search was conducted using PubMed and Scopus using keywords including exercise, breast cancer, breast cancer survivor, sexual function, yoga, sexuality, Pilates, and dance to identify articles for this review. The search was restricted to articles within the last 10 years that focused on the effect of physical activity on sexual function in BCS. Studies were

excluded if the participants did not include BCSs, if the study did not discuss how physical activity impacted sexual outcomes, and if the study did not utilize some form of physical activity as an intervention. A total of 326 articles were retrieved. After duplicates (n = 44) were removed, 282 articles were selected for the title and abstract screening, resulting in additional exclusions (n = 262). Full-text screening was completed on 20 articles. A total of 11 articles were then excluded based on being a trial protocol (n = 1), having no discussion on how physical activity impacts sexual outcomes (n = 6), and four were systematic reviews (n = 4). Nine articles were included in the final analysis (Figure 1).

RESULTS

The nine studies reviewed discussed sexual outcomes after involvement in physical activity in BCSs. Three of the studies were conducted as randomized clinical trials (Boing et al., 2023; Chang, 2023; Denig et al., 2022), one was a randomized controlled pilot trial (Anderson et al., 2015), three were cross-sectional observational studies (Paiva et al., 2016; Shin et al., 2017; Smedsland et al., 2022), one was a prospective randomized exercise intervention study (Roine et al., 2020), and one was a prospective, double-phase longitudinal trial (Joaquim et al., 2023). Physical activity was not universally defined across the studies. Variation in levels of physical activity (none/low physical activity, some/moderate level of physical activity, and high level of physical activity) served as the organizing framework for this review. Table 1 summarizes characteristic findings of the nine studies.

None/Low Physical Activity

Only one study (Smedsland et al., 2022) reported on physical inactivity and sexual function. Individuals were considered inactive if they engaged in less than 150 minutes of moderate level activity, less than 75 minutes of high level of activity, or an equivalent combination of both weekly. The cross-sectional study utilized a questionnaire to investigate the sexual health of Norwegian breast cancer survivors. The participants were divided into "sexually inactive BCSs" (n = 679) and "sexually active BCSs" (n = 628). They reported that physical inactivity was negatively linked to sexual pleasure (B, −0.61, 95% CI = −1.21, −0.02) in sexually active BCSs.

Chang (2023) reported on the outcomes of a mindfulness-based fitness training (MBFT) intervention that included low levels of physical activity. The aim of the study was to determine the impact of MBFT on alleviating symptoms of urinary incontinence and frequency, concerns of cancer returning, and sexual functioning in 58 female Taiwanese BCSs. In this randomized clinical trial, participants were BCSs who were diagnosed with breast cancer (stages I–III) within the last 5 years, between the ages of 20 and 65 years, who had received at least one adjuvant therapy within the past 2 years and had new-onset urinary incontinence. The intervention group received 8 consecutive weeks of MBFT training, which consisted of education on mind-body connection, relaxation, meditation, peer-support, and home-based exercises that included glute bridges and Kegel exercises, as well as a variety of other muscle-strengthening exercises. Since these exercises target the pelvic floor and focus on improving strength, tone, tension, and coordination, MBFT is considered a low-intensity physical activity for the purposes of this integrative review. The control group did not participate in any mind-body training; they were provided a guide focused on addressing symptoms and education on practicing good hygiene and health maintenance. Sexual function was assessed by utilizing the Female Sexual Function Index (FSFI). FSFI is a self-assessment questionnaire that includes 19 items that are assessed on a 5-point Likert scale, with six domains: desire, arousal, lubrication, orgasm, satisfaction, and pain. Chang (2023) reported that across the six domains of female sexual function, there were no notable variations, but there was a significant difference in the item evaluating overall sexual satisfaction over the past 4 weeks within the satisfaction subscale (p = .013), with the intervention group demonstrating higher satisfaction.

Moderate Physical Activity

Four of the nine articles included in this review discussed the effects of moderate-intensity physical activity on sexual functioning in BCS (Boing et al., 2023; Denig et al., 2022; Paiva et al., 2016; Roine et al., 2020). Moderate-intensity physical activity is defined as exercise that causes one's heart to

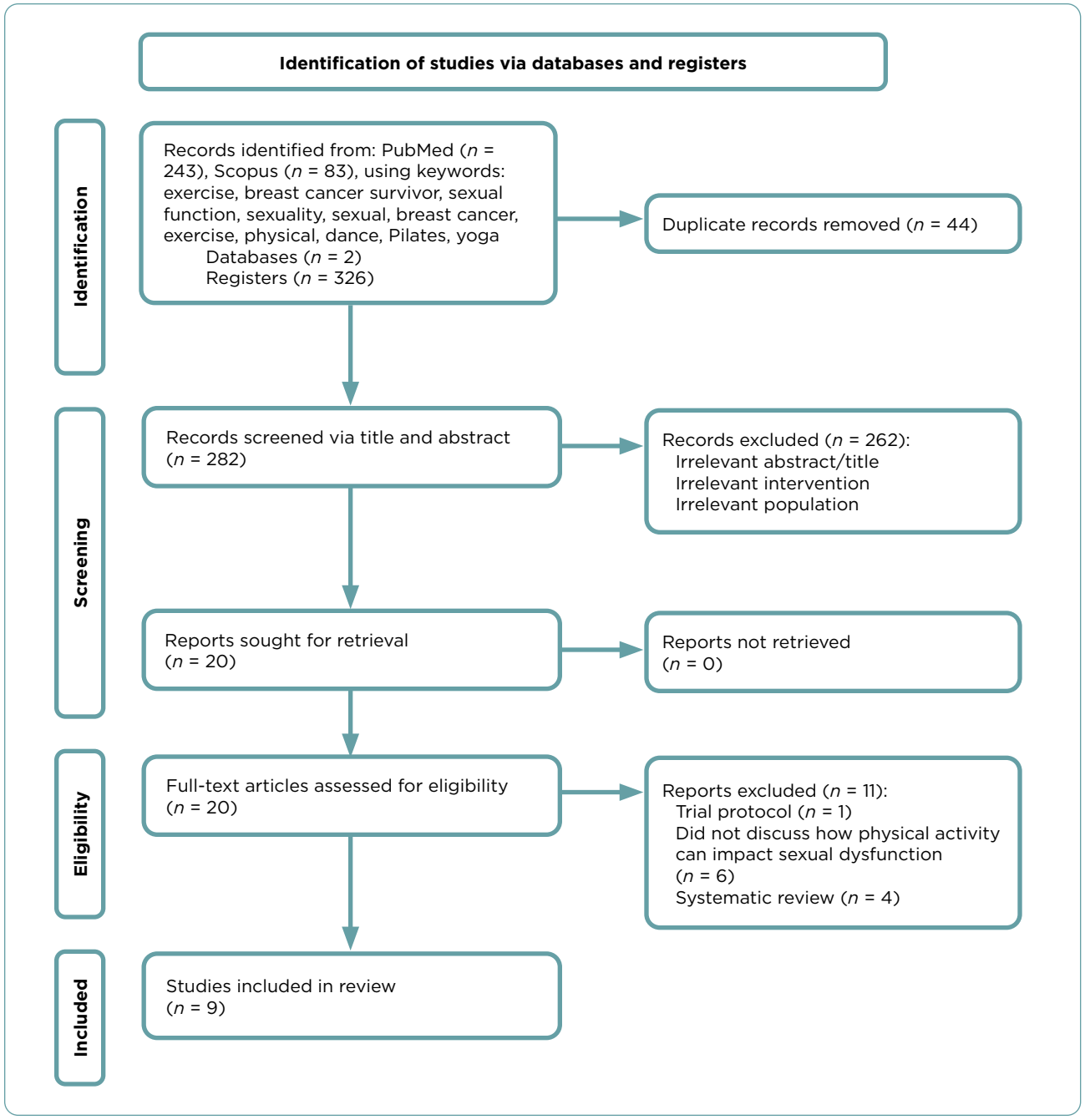

Figure 1. PRISMA flow diagram. Adapted from Moher et al. (2009).

Table 1. Evidence Summary

Author and study design	Sample, intervention, and outcome measures	Findings	Limitations
Boing et al., 2023 Three-arm randomized clinical trial	17 patients in each group of the three arms. Mat Pilates and belly dance FSFI (desire, arousal, lubrication, orgasm, satisfaction, pain)	Orgasm decreased for women from all groups (mat Pilates, belly dance, and control) between baseline and post intervention (p = .021) and from baseline to 6 months ($p \leq .001$) Belly dance group improved pain/discomfort from baseline to post-intervention (p = .001), from baseline to 6 months (p < .001), and from baseline to 12 months (p = .005).	Reduced sample size due to inclusion of only sexually active women, loss to follow-up, and inability to blind participants and researchers to group allocation.
Chang, 2023 Randomized clinical trial with cross-sectional approach	58 participants were included, 29 in the intervention group and 29 in the control group. Integrated mindfulness-based program with fitness training FSFI	A significant difference was found in the item "assessing overall sexual satisfaction over the past 4 weeks" (p = .013) within the satisfaction subscale.	Use of self-reported questionnaires resulted in measurement errors. Composite intervention measures that included mindfulness-based exercise made it difficult to ascertain which intervention had a more substantial effect in study outcomes. The self-administered measures were only applicable to those with breast cancer.
Denig et al., 2022 Two-arm randomized clinical trial	24 women were randomized: 11 in the intervention group and 13 in the control group. Belly dance FSFI	In sexual function, no significant differences were found.	60% of participants did not have a partner and the mean age of the participants were 60 ± 10.4 years. Starting at this age, there may be already impaired sexual function, lack of opportunity for sex, and decreased libido.
Joaquim et al., 2023 Single-center, prospective, double phase trial	82 women were enrolled and 37 completed the intervention. Group class physical exercise program EORTC QLQ-C30 and its breast module (BR-23)	Sexual functioning improved during the intervention phase (p = .017), whereas no changes during the control phase (p = .602). Sexual functioning increased from T3 to T5 (p = .040).	Trial was affected by COVID-19, which led to an increased dropout rate. There was no use of a validated questionnaire to assess participants' prior activity level, which led to inclusion of participants that were already physically active.
Smedsland et al., 2022 Cross-sectional questionnaire study	1,307 women returned questionnaires. Multidimensional SAQ. First part: sexually active. Second part: eight reasons for eventual sexual inactivity (for the participants who were sexually inactive). Third part: SAQ-F with subscales: pleasure (SAQ-P), discomfort (SAQ-D), habit (SAQ-H), and tiredness.	Physical inactivity (B, −0.61; 95% CI = −1.21, −0.02) was negatively associated with sexual pleasure. Physical inactivity was associated with lower sexual pleasure. Treatment with AI (B, 0.61; 95% CI = 0.20, 1.01); positively associated with sexual discomfort. Endocrine therapy (OR, 1.98; 95% CI = 1.21, 3.25) positively associated with less sexual activity. Treatment with aromatase inhibitor (OR, 1.73; 95% CI = 1.23, 2.43) and poor body image (OR, 0.99; 95% CI = 0.99, 0.995) were associated with sexual inactivity.	The study did not include a control group. There was a lack of information on menopausal status. SAQ had a narrow definition of sexuality restricted to partnered sex and did not capture all elements of sexual activity. Questionnaires about sexual health issues may have had a bias.

Note. AI = aromatase inhibitor; B = beta coefficient; BCS = breast cancer survivors; BREX = Breast Cancer and Exercise Study; EORTC = European Organization for Research and Treatment of Cancer; EORTC QLQ-C30 = EORTC Quality of Life Questionnaire Core 30; FSFI = Female Sexual Function Index; FACT-B = Functional Assessment of Cancer Therapy–Breast; FACT-G = Functional Assessment of Cancer Therapy–General; GCS = Greene Climacteric Scale; HRQOL = health-related quality of life; OR = odds ratio; SAQ = Sexual Activity Questionnaire; SAQ-D = Sexual Activity Questionnaire–Discomfort; SAQ-F = Sexual Activity Questionnaire–Function; SAQ-H = Sexual Activity Questionnaire–Habit; SAQ-P = Sexual Activity Questionnaire–Pleasure.

Table 1. Evidence Summary (cont.)

Author and study design	Sample, intervention, and outcome measures	Findings	Limitations
Roine et al., 2020 Prospective randomized exercise intervention study	537 patients were randomized. BREX exercise 15-dimensional generic HRQOL instrument and EORTC-QLQC30	When compared to the general population, BCSs score less on the dimension of sexual activity. Sexual activity (p = .009) improved significantly over 5 years. In comparison to the general female population, sexual activity was still below in BCSs ($p \leq .001$).	The BCSs recruited for the exercise program were younger and healthier compared with BCSs in the general population. The 15-dimensional questionnaire at baseline was given only to a subgroup of patients.
Shin et al., 2017 Cross sectional study	231 breast cancer survivors were included in this analysis. Korean version of the EORTC QLQ-C30 and Quality of Life Questionnaire Breast Cancer Module 23 (QLQ-BR23)	BCSs in the high physical activity group (3rd tertile) were more likely to have higher scores of sexual functioning (p = .007) compared with those in the low physical activity group (1st tertile). Stage II to III BCSs had higher scores of sexual functioning in the 3rd tertile (p = .001) compared with those in the 1st tertile of physical activity levels. High level physical activity after diagnosis was associated with lower scores of fatigue and pain and higher scores of sexual functioning.	HRQOL levels after physical activity were not assessed, information on pre-diagnostic levels of physical activity were not collected, small sample size, possible information bias by interviewer or interviewee, and sampling for this study was not random.
Paiva et al., 2016 Cross sectional study	216 participants were included in the study. FSFI, EORTC QOL-C30, and its breast module BR-23	Mild-moderate physical activity associated with lower risk of sexual dysfunction (p = .063). Mild-moderate physical activity associated with lower risk of hypo-active sexual desire disorder (p = .013).	Measurements regarding the changes in sexuality of women before and after treatment for breast cancer were not performed. There was no control group, no intervention group, and low statistical power.
Anderson et al., 2015 Randomized controlled pilot trial	55 participants: intervention group (n = 26) and control group (n = 29). Lifestyle intervention (The Pink Women's Wellness Program) Menopausal symptoms using the GCS, a 21-item scale instrument used to assess climacteric symptoms associated with the menopausal transition. Secondary outcomes: FACT-B, a 44-item self-reported instrument designed to measure multidimensional quality of life. FACT-G	Women in the intervention group reported moderate improvement in sexual dysfunction (d = 0.65). Around 19.0% (n = 5) of women in the intervention group who reported being sedentary at baseline were doing at least 150 minutes of hard exertion exercise weekly post-intervention compared to the control group (8%). The differences were not statistically significant (p = .143). 12% (n = 3) had undertaken 30 minutes or more of hard exertions exercise in the past month compared to control group (4%, n = 2) but this still was not statistically significant (Cochran's Q test, p = .239). Women in the intervention group reported clinically significant reductions in menopausal symptoms, including sexual dysfunction (d = 0.65).	Small sample size, lack of blinding of participants and researchers, and self-reported nature of GCS.

Note. AI = aromatase inhibitor; B = beta coefficient; BCS = breast cancer survivors; BREX = Breast Cancer and Exercise Study; EORTC = European Organization for Research and Treatment of Cancer; EORTC QLQ-C30 = EORTC Quality of Life Questionnaire Core 30; FSFI = Female Sexual Function Index; FACT-B = Functional Assessment of Cancer Therapy–Breast; FACT-G = Functional Assessment of Cancer Therapy–General; GCS = Greene Climacteric Scale; HRQOL = health-related quality of life; OR = odds ratio; SAQ = Sexual Activity Questionnaire; SAQ-D = Sexual Activity Questionnaire–Discomfort; SAQ-F = Sexual Activity Questionnaire–Function; SAQ-H = Sexual Activity Questionnaire–Habit; SAQ-P = Sexual Activity Questionnaire–Pleasure.

beat faster, heavier breathing, and perspiration; it is measured by engaging in the activity for at least 150 minutes weekly (CDC, 2023). According to the American Heart Association (2024), dancing is considered a moderate-intensity exercise. For the purposes of this review, belly dance and mat Pilates are categorized as moderate-intensity physical activity, due to the intensity and duration of the activity.

Boing et al. (2023) conducted a randomized control trial in Brazilian BCSs that utilized a 16-week exercise program of belly dance and mat Pilates to examine the impact on sexual function, body image, and self-esteem in BCSs receiving hormone therapy. The intervention groups were randomly assigned to either belly dance or mat Pilates and were stratified by age. The interventions were conducted three times weekly in 60-minute sessions. The control group participated in three education sessions. Sexual function was measured utilizing the FSFI, which included categories such as desire, lubrication, orgasm, satisfaction, and pain over four time periods (baseline, post-intervention, and follow-ups at 6 and 12 months). The authors reported that orgasm decreased in women from the mat Pilates and belly dance groups and control group from baseline to post-intervention ($p = .021$), and at baseline and 6 months ($p < .001$). In the pain/discomfort category, participants in the belly dance group reported improvement from baseline to post-intervention ($p = .001$), at 6 months ($p < .001$), and at 12 months ($p = .005$).

Denig et al. (2022) conducted a randomized controlled trial that utilized belly dance alone as an intervention. Belly dance involved body movements to the rhythm of music from 120 to 150 beats per minute. The researchers implemented a 16-week program of belly dance to determine the impact on body image and sexual function in BCSs in Brazil on hormonal therapy. The control group was asked to maintain their normal activities. Like the Boing et al. (2023) study, the FSFI was utilized as the measurement tool. The authors concluded that there were no significant differences in sexual functioning between the intervention and control groups. There was no significant improvement in the FSFI domain of pain/discomfort in the intervention group.

Paiva et al. (2016) conducted a cross-sectional study that explored the impact of moderate-intensity physical activity on sexual functioning in BCS in Brazil. Participants reported the physical activity they engaged in (walking, running, cycling, swimming, etc.) and the weekly frequency of the activity. Participants who engaged in some form of physical activity at least twice a week were categorized as having mild to moderate physical activity. As with the previous two studies, sexual functioning was measured using the FSFI. The authors reported that mild to moderate physical activity was associated with a lower risk of sexual dysfunction ($p = .063$). Mild to moderate physical activity was also linked to lower risk of hypoactive sexual desire disorder (HSDD; $p = .013$).

Roine et al. (2020) conducted a 5-year follow-up on HRQOL in Finnish BCSs who took part in a prospective randomized exercise intervention called the BREX (BReast cancer and EXercise) study. The BREX study was an open, prospective, multicenter phase III randomized clinical trial that examined how a 12-month group-led exercise intervention of aerobic exercises impacted HRQOL and bone health in BCS. The authors did not report the intensity or type of physical activity. For the purposes of this integrative review, the aerobic exercises are categorized as moderate intensity. This study also compared outcomes to Finnish women in the same age group as the participants. Enrolled in this study were 573 Finnish female BCSs ages of 35 to 68 years with a new diagnosis of invasive breast cancer, received recent treatment with adjuvant chemotherapy, or were on hormonal treatment and/or radiation therapy. Information about the quantity and intensity of physical activity were collected over 2-week periods using a diary that participants completed at baseline and at six follow-up points over a 5-year period. After the baseline visit, the participants were randomized into the intervention group or the control group. The control group was instructed to continue their normal fitness routine throughout the duration of the study. The intervention group participated in weekly aerobic exercise program over the course of 12 months and received instructions for home exercises that were expected to be performed three times a week. The HRQOL was measured with the 15D, a 15-item standardized, self-reported tool. Sexual activity is the 15th dimension measured in this

instrument. For this study, 182 participants were included out of the total enrolled due to availability of the HRQOL instrument at baseline. Sexual activity significantly improved during the 5 years (p = .009). The researchers also concluded that in comparison to the general female population, BCSs experience more suffering when it comes to sexual activity ($p < .001$).

High Physical Activity

Three studies investigated the connection of high level of physical activity with sexual function (Anderson et al., 2015; Joaquim et al., 2023; Shin et al., 2017). The studies used different measures of physical activity. Shin et al. (2017) described high physical activity as an average metabolic equivalent (MET) value of ≥ 66.83 hours per week. Anderson et al. (2015) described high level of physical activity as engaging in no less than 150 minutes of hard exertional exercise weekly. Joaquim et al. (2023) described vigorous exercise intensity as 77% to 85% of heart rate, scoring a 14 to 17 on the Borg rating of perceived exertion, which indicates levels of hard to extremely hard exercise.

Shin et al. (2017) conducted a cross-sectional study of Korean BCSs that utilized structured questionnaires to determine how engagement of physical activity impacts HRQOL. Physical activity was evaluated by a self-administered questionnaire that prompted participants to report the type, length, and frequency of each physical activity performed. In addition, participants were requested to provide a list of at least three exercises that they engaged in most frequently. A MET value was then assigned to each reported exercise. Health-related quality of life was assessed by the Korean validated version of the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire Core 30 (QLQ-C30) version 3.0, and QLQ questionnaire that is breast specific (QLQ-BR23). The authors examined the characteristics of the participants based on three tertiles of physical activity level: the first tertile had a MET-hour per week of 7.19, the second tertile had a MET-hour per week of 26.96, and the third tertile had a MET-hour per week of 66.83. Increased levels of physical activity were linked to higher scores of sexual functioning. Breast cancer survivors who were categorized in the third tertile, which corresponds to the self-reported high physical activity group, were more likely to have increased sexual functioning (p = .007) when compared to those in the lower activity level group (first tertile). Breast cancer survivors diagnosed with stage II or III breast cancer with high levels of physical activity (third tertile) were linked to increased levels (p = .001) of sexual functioning when compared to the first tertile group.

Anderson et al. (2015) conducted a randomized controlled pilot of The Pink Women's Wellness Program and its impact on menopausal symptoms and HRQOL in 55 Australian BCSs experiencing either moderate or severe menopausal symptoms. Participants in the intervention group engaged in a 12-week lifestyle intervention program called The Pink Women's Wellness Program. The program included a weekly exercise planner (aerobic exercises, strength exercise, pelvic floor exercise), supervision from a health-care provider, and guidance through activities and readings that help to foster healthy habits. The Greene Climacteric Scale (GCS), which includes a sexual function scale, was used to measure menopausal symptoms at baseline and at 12 weeks. The authors reported moderate improvement in sexual dysfunction (d = 0.65) in the intervention group and elevated physical activity level in comparison to the control group. Differences in physical activity compared to baseline and compared to the control group were not significant.

Joaquim et al. (2023) conducted a single center, prospective, double-phase trial to examine the outcomes of a group-based physical exercise program on HRQOL in BCSs with sexual functioning as a secondary outcome. This trial consisted of 16 weeks of a control phase (CP) followed by 16 weeks of an intervention phase (IP). The participants were assessed at five intervals: baseline, 8 and 16 weeks (CP), and 24 and 32 weeks (IP). The IP involved a supervised physical activity program applied in a group setting led by certified instructors to evaluate improvement in HRQOL with secondary outcomes including sexual functioning. A total of 37 participants who were ≥ 18 years old with breast cancer (stages 0–IIIC) and finished primary treatment with the aim of achieving a cure at least 1 month before this study were enrolled. The training program in the IP was 60 minutes in length, three times per week, and consisted of mixed exercises led by a

certified physiologist and members of the research team. The physical activity was designed based on ACSM guidelines. Every session included a warmup (light mobility exercises) followed by aerobic exercise (walking, running, and stepping). The aerobic exercises started at a moderate intensity (measured as 65% to 76% of maximal heart rate) and was increased to vigorous exercise intensity (measured as 77% to 85% of heart rate). The heart rate was monitored throughout each exercise using a chest-based device. The maximal heart rate was recorded to determine the intensity of the physical activity of each session. Secondary outcomes, such as sexual functioning, were evaluated using the EORTC QLQ-C30 and breast cancer-specific EORTC quality of life questionnaire. There was an improvement in sexual functioning during the IP ($p = .017$). There were no changes to sexual functioning during the CP ($p = .602$). Sexual functioning improved from 24 to 32 weeks ($p = .040$). This trial demonstrated that incorporation of group-led physical activity can improve sexual functioning in BCSs.

DISCUSSION

This review establishes that engagement in none/low, moderate, and high levels of physical activity when compared to no physical activity improves sexual function and can increase sexual pleasure. Findings demonstrate that physical inactivity is associated with lower levels of sexual pleasure.

The FSFI has been validated for use in women with HSDD in both premenopausal and postmenopausal women. It is considered the gold standard for the measurement of sexual function and provides understanding of the extent of sexual dysfunction faced by patients, regardless of diagnosis (Meston et al., 2020). Four of the articles in this review utilized FSFI as the sexual function outcome measure (Boing et al., 2023; Chang, 2023; Denig et al., 2022; Paiva et al., 2016) but had varying results depending on the type and level of physical activity and the particular domain of the FSFI, validating that sexual function is a complex entity that does not lend itself to unitary measurement. The pain domain within the FSFI measurement improved with belly dance, which could be attributed to the belly dance movements that improve circulation and pelvic floor strength (Boing et al., 2023). On the contrary, Boing et al. (2023) reported that orgasm decreased over time in all participants, regardless of physical activity. Orgasm is a complex physiological and psychological process that may not be responsive to physical activity.

The use of hormone therapy may have also impacted the FSFI results. Hormone therapy causes symptoms of menopause, which can result in vaginal dryness, dyspareunia, and low libido, all of which can contribute to sexual dysfunction in BCSs. Dyspareunia, which can be classified under domain of pain in the FSFI, is a symptom that most likely influences sexual function. Therefore, lack of improvement in the domain of discomfort/pain coupled with the use of hormone therapy may explain why there was no significant improvement in sexual functioning.

The use of supervised or group-based intervention may have influenced outcomes. Five of the studies utilized a supervised intervention with improvement in certain domains of sexual functioning as compared to independent, unsupervised interventions. Supervision holds participants accountable, and increases attendance rates, motivation, and overall health. Group-based activity, such as belly dance and Pilates, provides peer support and encourages a sense of community with a common goal.

High body mass index (BMI) may be a factor that can be detrimental to sexual outcomes in BCS. Obesity and increased BMI are negatively associated with sexual outcomes in the general population. Two of the studies found elevated BMI contributed to the severity of sexual dysfunction that participants experienced. Physical activity improved overall physical functioning, sexual outcomes, and weight and BMI during the intervention phase in the Joaquim et al. (2023) study. These findings correspond to existing literature and demonstrate that at minimum, moderate-intensity exercise or resistance training, or the two combined, performed at least three times per week can significantly improve self-reported physical function (Campbell et al., 2019).

Age may also have contributed to the variation in findings. Two of the articles reviewed found that increasing age was associated with sexual dysfunction. Sexuality is affected by physical and age-related changes, especially after the age of 60 years, as well as changes to their sexual partners

(Ambler et al., 2012). Older women experience decreased libido and are more susceptible to vaginal dryness and pain. Therefore, there can be a natural decline in sexual functioning in women in their later decades (Fobair & Spiegel, 2009).

LIMITATIONS

A limitation in this review is the variability in study designs, as it includes four randomized controlled trials, three cross-sectional studies, one prospective randomized exercise intervention study, and one prospective-double phase trial, making it difficult to compare findings. The observational studies utilized self-reported outcomes, which may impact the consistency and reliability of findings. Some studies lacked baseline, pre-treatment surveys. This made it difficult to assess changes in sexual functioning over time. Without pre-treatment data, it is challenging to determine whether sexual dysfunction was a result of cancer treatment or other preexisting factors. Additionally, the number of participants varied across the studies. Four of the studies had small numbers of participants, which limits the generalizability of the findings. The age of the participants varied across studies, which limits the ability to conduct head-to-head comparisons that account for age-related changes.

The lack of a consistent measure of sexual outcomes also limited the ability to directly compare and interpret findings. Only four studies used the FSFI for sexual outcome measures. The other five articles used HRQOL questionnaires with functional scales that included sexual function and sexual enjoyment. These functional scales are not as detailed as the FSFI and do not consider a BCS's pain, satisfaction, lubrication, desire, or arousal. Therefore, they are not directly comparable with one another.

IMPLICATIONS

Although the results from all the studies were mixed, the overall finding is that engagement in some form of physical activity leads to better sexual outcomes. Physical inactivity is a modifiable risk factor when it pertains to sexual dysfunction (Mollaioli et al., 2020). Therefore, advanced practice providers (APPs) are well suited to advise, educate, and engage BCSs in discussions about physical activity, and it should be implemented in a survivorship care plan.

Adequate sexual health recovery is still an unmet need as many providers may avoid the topic or patients feel uncomfortable bringing it up (Boswell & Dizon, 2015; Vegunta et al., 2022). Advanced practice providers should be consistent in their approach to assess sexual health and function with BCSs. Health-care providers may lack the knowledge for sexual education needs in BCSs, lack prior training, or fear eliciting a sense of embarrassment from the patients. There should be a standardized approach when addressing sexual health, whether it be the creation of a guideline or inclusion of questions on sexual health when taking a thorough history of present illness. This way, there is confidence in the clinician-patient relationship and will allow for open communication, medical understanding, and education (Boswell & Dizon, 2015). Furthermore, it can help guide oncology health professionals to determine what kind of physical activity is needed for BCSs in the various sexual domains.

Advanced practice providers should consider recommending group and supervised physical activities to patients. Further research could focus on group-based and supervised interventions on BCSs' overall health outcomes. Belly dance has been determined to be beneficial in improving sexuality and sexual outcomes. Therefore, group-based, supervised activities, such as dance, can be considered as options offered in cancer survivorship settings and not limited to breast cancer survivors.

The FSFI is a valuable and validated tool that provides insights into how BCSs experience sexual outcomes. Future research on BCSs' sexual functioning should incorporate this measure. The FSFI scores in pre- and postmenopausal BCSs could provide better understanding of treatment- and intervention-related differences, allowing for tailored recommendations based on specific domains of dysfunction. Alternative tools are the Patient-Reported Outcomes and Measures Information System (PROMIS), Brief Sexual Symptom Checklist for Women (BSSC-W), and Sexual Function Questionnaire (SFQ-28).

Physical activity is not the typical first-line intervention that is offered when addressing sexual concerns. There is existing evidence in the current literature that physical activity improves overall quality of life in cancer survivors, and there

is prior knowledge that BCSs experience sexual dysfunction due to treatment; however, there are few studies that combine these two aspects. This article contributes to the current body of knowledge by offering a unique intervention to address certain aspects of sexual functioning in BCS.

CONCLUSION

The findings of this literature review indicate that low, moderate, or high levels of physical activity are effective in improving sexual outcomes in BCS when compared to no physical activity. Though results in this review were mixed, any level of physical activity is better than no physical activity. With this information, APPs should consider recommending physical activity to their patients who experience sexual dysfunction.

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