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Sexual health of endometrial cancer survivors before and after a physical activity intervention: a retrospective cohort analysis

Shannon D. Armbruster[a], **Jaejoon Song**[b], **Andrea Bradford**[a], **Cindy L. Carmack**[c], **Karen H. Lu**[a], and **Karen M. Basen-Engquist**[d]

[a]Department of Gynecologic Oncology and Reproductive Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd, Houston, TX 77030, USA.

[b]Department of Biostatistics, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd, Houston, TX 77030, USA.

[c]Department of Palliative Care and Rehabilitation Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd, Houston, TX 77030, USA.

[d]Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd, Houston, TX 77030, USA.

Abstract

Objective—Sexual dysfunction is common in endometrial cancer survivors (ECS). Our group previously tested a six-month exercise intervention in ECS. We performed a secondary analysis to determine intervention's impact on sexual health.

Methods—We studied 100 post-treatment Stage I-IIIa sedentary ECS who participated in a non-controlled, single-arm, home-based exercise intervention utilizing telephone counseling, printed material, and pedometers. Quality-of-life and physical activity measures were collected at baseline and six months. Sexual function (SF) and sexual interest (SI) scores were extracted from the QLACS questionnaire.

Results—Baseline SF and SI were lower in survivors with less than a four-year college degree ($P < 0.001$). Baseline SI was higher in survivors who were married or living with a significant other ($P = 0.012$). No significant differences in SF or SI were observed based on obesity status, race, time since diagnosis, or treatment type. Post-intervention, mean SF score improved ($P = 0.002$), 51% of participants had improved SI, and 43% had improved SF. When controlled for age and time since diagnosis, a one-hour increase in weekly physical activity was associated with a 6.5%

CORRESPONDING AUTHOR Shannon D. Armbruster, Unit 1362, Department of Gynecologic Oncology and Reproductive Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd, Houston TX 77030. Phone: (713) 563-4562; Fax: (713) 792-4132; SDArmbruster@mdanderson.org.

CONFLICTS OF INTEREST

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increased likelihood of improved SI (P = 0.04). Increased physical activity was not associated with improved SF.

Conclusions—Although causation cannot be determined in this study, the correlation between receipt of an exercise intervention and improved sexual health for ECS is a novel finding. This finding suggests a role for physical activity as a strategy to improve the sexual health of ECS, which our group is examining in a larger prospective study.

1. Introduction

Endometrial cancer is the most prevalent gynecologic malignancy in the United States, affecting 1 in 37 women (1). Over 60,500 new diagnoses of endometrial cancer are projected for 2016, adding to the over 620,000 known endometrial cancer survivors (ECS) in the United States (1). The incidence of endometrial cancer continues to increase, secondary to high rates of obesity, which is a significant risk factor for the malignancy (2, 3). Due to the high prevalence and successful treatment of the disease in its early stages, the five-year relative survival rate for patients with endometrial cancer is 83% (4). As a result of the increasing number of cases and subsequent survivors of endometrial cancer, a focus on providing comprehensive survivorship care for this group of women is essential.

Sexual health is an important component of survivorship. Compared with women without a history of cancer, ECS have higher rates of sexual dysfunction; as many as 89% of survivors are affected (5, 6). Thus, several authors have recommended including sexuality as a component of cancer survivorship (7, 8). Risk factors for poor sexual function include: relationship/partner status, mental health, diabetes, age, education level, body mass index, quality of life, and tumor grade (5, 6, 9-11). However, once these women are identified, clinicians have limited treatment options to offer (12).

Physical activity has been suggested as a means of improving sexual health. Cross-sectional studies investigating middle-aged and perimenopausal women without a history of cancer have indicated a correlation between exercise and sexual desire (13, 14). In breast cancer survivors, randomized controlled trials of physical activity interventions have demonstrated sexual health benefits (15, 16). Although breast and endometrial cancers are both obesity-driven diseases, the effects of interventions on breast cancer survivors cannot necessarily be generalized to ECS given the differences in anatomic site and potential variances in psychological factors. However, the benefits seen in other populations support the investigation of the impact of physical activity interventions on the sexual health of ECS. Our group has previously published the outcomes of a physical activity intervention, Steps to Health, for ECS that investigated the impact of social cognitive theory on exercise behavior, but without an analysis of the effect on sexual health (17). Thus, the objective of this secondary analysis was to examine the baseline and post-intervention sexual health, specifically sexual function (SF) and sexual interest (SI), in a group of sedentary ECS who participated in a six-month, home-based physical activity intervention.

2. Methods

2.1. Design and participants

We performed a secondary analysis of the Steps to Health study, the specific methodology of which has been previously published (17, 18). Briefly, those eligible were ECS with stages I to IIIa disease, who had finished treatment at least six months prior, and without evidence of disease. Additional inclusion criteria included failure to achieve the American College of Sports Medicine (ACSM) physical activity guidelines during the previous six months despite having the ability to perform physical activity. The ACSM guidelines require at least 30 minutes of moderate-intensity exercise on at least 5 days per week, or at least 20 minutes of vigorous exercise on at least 3 days per week (19). Participants received medical clearance prior to participation.

All participants were recruited between January 2007 and September 2010 from the main campus and satellite campuses of The University of Texas MD Anderson Cancer Center and private gynecologic oncology offices in Houston, Texas. At MD Anderson, recruitment was facilitated by mail and telephone correspondence, as well as discussions at clinic appointments. Private gynecologic oncology patients were approached by their healthcare provider and then, if they were interested, were contacted by a research coordinator. The MD Anderson review board reviewed and approved all study procedures.

Six hundred forty-three survivors were initially identified as potential study participants. Of these, 270 were not completely screened due to a lack of response or scheduled appointment during the recruitment timeframe, 192 women were uninterested, 39 were ineligible, and 42 expressed initial interest but failed to complete subsequent enrollment steps. One hundred women were enrolled in the study, at which point enrollment was ceased and these patients were eligible for the secondary analysis, performed in April 2016, if they completed the surveys analyzed at each time point.

2.2. Procedure

Participants attended laboratory assessments at MD Anderson at baseline, two months, four months, and six months. The baseline time point occurred prior to starting the intervention. At these visits, the frequency and duration of the survivors' physical activity was assessed. At baseline and six months, assessments of quality of life (QOL), which included sexual health questions, and psychological distress were also administered. Details of these measures follow.

2.2.1. Measures

Physical activity: Engagement in physical activity was measured using the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire (20). This questionnaire is designed to elicit the frequency, duration, and intensity of weekly physical activities in older adults over the previous four weeks. When the instrument was evaluated during the initial development, the six-month test-retest reliability ranged from 0.58 to 0.67, and the results were sensitive to change associated with an intervention ($P<0.01$) (20). In the current sample, correlations between hours of exercise at baseline and at six months were

0.58 (P<0.0001) for activity of moderate or greater intensity and 0.52 (P<0.0001) for all levels of activity. In addition, the correlations between exercise frequencies in this sample at baseline and six months were 0.44 (P<0.0001) for activity of moderate or greater intensity and 0.53 (P<0.0001) for all activity levels.

Quality of life: QOL information was obtained through the 36-Item Short Form Health Survey (SF-36) and Quality of Life in Adult Cancer Survivors questionnaire (QLACS). The SF-36 includes eight components: physical function, social function, pain, mental health, energy and fatigue, general health perceptions, role limitations caused by physical problems, and role limitations caused by emotional problems (21). In a population-based assessment, the internal consistency of the eight subscales was between 0.76 and 0.90 (22). In the current sample, the internal consistency was high for all subscales ($\alpha \geq 0.80$) except for mental health ($\alpha = 0.77$) and general health ($\alpha = 0.77$). The components of SF-36 are grouped to create mental and physical component scores for QOL. A higher score indicates better QOL. The QLACS comprises five cancer-specific domains (appearance concerns, financial problems, distress over recurrence, family-related distress, and benefits of cancer) as well as seven general domains (negative feelings, positive feelings, cognitive problems, sexual problems, physical pain, fatigue, and social avoidance). A higher score is indicative of worse QOL. The internal consistency in initial psychometric evaluation was 0.72 or higher for each domain (23). In the current sample, the internal consistency was high for the subscales (≥ 0.80) except negative feelings ($\alpha = 0.74$) and appearance concerns ($\alpha = 0.56$).

Sexual health: Questions from the sexual problems domain of the QLACS were used for this analysis. Two of the questions assessed SF (inquiring about the participants' satisfaction with their sex lives and whether they are bothered by their limitations to their SF) and two were related to SI (addressing lack of SI and avoidance of sex). Participants note their distress related to each factor using a Likert scale of 1 (never) to 7 (always), with a higher score indicating more frequent bother. Internal consistencies of the two subscales, SI and SF, were 0.87 and 0.90, respectively, in the initial psychometric evaluations (23). The 2-week test-retest reliability of QLACS sexual problem scale is 0.89(24). In the current sample, the internal consistencies were 0.87 and 0.89, respectively, for subscales of SI and SF.

Psychological distress: The Brief Symptom Inventory-18 (BSI-18) was used to assess psychological distress/severity index. Items are rated on a Likert scale from 0 (not at all) to 4 (always), with higher scores indicating more distress. The internal reliability ranged from 0.74 to 0.89 in the psychometric evaluation (25) and from 0.65 to 0.85 in the current sample. The BSI-18 has been validated in an outpatient oncology population that included female cancer patients (26).

2.2.2. Intervention—The details of the intervention were previously published (17). In brief, after completing the baseline assessment, participants received a personalized exercise regimen based on their pre-intervention physical activity level. The objective for participants was gradual attainment of 30 minutes per day of moderate exercise on at least five days of the week, in accordance with the ACSM guidelines. The research team supported this goal through telephone counseling, printed materials, and pedometers. Weekly 20–30 minute

telephone calls occurred during months 1 and 2, followed by twice-monthly calls during months 3 and 4, and monthly calls for months 5 and 6. Telephone calls addressed barriers, reinforced activity goals, and focused attention on behavioral and cognitive skill development. Prior to each telephone session, participants received mailed newsletters that included topics coinciding with the upcoming phone call topics, as well as motivational stories from other survivors.

2.3. Analysis

Survivors who completed baseline and six-month assessments were compared with those who completed assessments at only one time point using Fisher's exact test for categorical variables and Welch's two-sample *t*-tests, assuming non-homogeneity of variance, for continuous variables. The relationships of baseline SF and SI to baseline variables, including obesity status, marital status, time since diagnosis, treatment with or without radiotherapy, race, education, and relationship status, were determined using a bootstrapped two-sample *t*-test.

Baseline correlation of SF and SI to QOL components and psychological distress were evaluated using Spearman correlation analyses. Bootstrapped two-sample paired *t*-tests were used to assess changes in SF and SI from baseline to follow-up. Logistic regression models were used to examine the effects of physical activity on change in SF and SI. The models assessed whether change in self-reported total hours of physical activity per week predicted self-reported increase in SF or SI from baseline to follow-up, adjusting for potential confounders of age and time since diagnosis. The change in hours of physical activity was defined as a difference score. Increases in SF or SI were determined as a binary indicator of having a lower SI or SF score at follow-up in comparison to the baseline measure. Lastly, indirect effects of physical activity on SI or SF were examined using mediation models. Specifically, the mediation models examined whether effects of change in physical activity on change in SI or SF were mediated by QOL factors or psychological distress. Separate mediation models were fitted for subscales of SF-36, QLACS, and BSI, examining indirect effects of either the frequency or hours of physical activity per week. The treatment and demographic features of survivors who reported increased SI or SF were compared with those of ECS reporting stable or worsening SI or SF using Fisher's exact test for categorical variables and Welch's two-sample *t*-tests, assuming non-homogeneity of variance, for continuous variables. P was significant at 0.05. All statistical analyses were performed using the R statistical computing environment, version 3.2.0 (R Foundation for Statistical Computing, Vienna, Austria).

3. Results

3.1. Baseline characteristics

Sixty-three of the 100 enrolled participants completed baseline and six-month assessments and were considered for the secondary analysis of intervention effect. For the 63 ECS who completed both assessments, the mean age was 58.1 years, and average body mass index was 34.0 kg/m^2. The majority of women in this sample were non-Hispanic white (81%), had stage I disease (71%), and were approximately 2.3 years from diagnosis (SD = 1.3 years).

Most women had some level of college education (89%) and were married or living with a significant other (73%). Table 1 shows the characteristics for the sample.

Baseline demographics for the participants who completed assessments at baseline and six-month time points were compared with those of women who completed assessments at only one time point (Table 1). Women who did not complete both assessments were significantly more likely to have lower-stage disease, to be less educated, and to report lower baseline total hours of moderate-to-vigorous physical activity and of all physical activity per week.

Of the 100 sedentary ECS enrolled during the baseline assessment, 99 women had baseline SF data and 95 had baseline SI data. Baseline SF and SI were significantly worse in women with less than a four-year college degree compared with those with a higher degree ($P<0.001$). SI was higher in survivors who were married or living with a significant other ($P = 0.012$). No significant differences were observed in baseline SF or SI based on obesity status, race, treatment type, or time since diagnosis (Table 2). At baseline, both SI and SF were correlated with the mental component score of QOL (SF-36), negative feelings, positive feelings, cognitive problems, pain, fatigue, social avoidance (QLACS), and psychological distress (BSI-18 severity index). SF was also correlated with financial problems (Table 3). The SF and SI scores were moderately correlated at baseline ($r = 0.38$, $P<0.01$).

3.2. Effect of the intervention

Data from the 63 ECS who completed both baseline and six-month assessments were compared to determine the effect of the intervention. On average, participants reported a 0.8-hour increase in their total hours of activity per week (SD = 10.9) from baseline to six months.

SF and SI scores were moderately correlated at six months ($r = 0.33$, $P<0.01$). Both SF and SI scores decreased throughout the intervention, by a mean of 0.83 and 0.52 points, respectively, indicating an improvement in sexual health. However, only the improvement in SF was significant ($P = 0.002$) (Table 4). Forty-three percent of participants experienced an increase in SF, and 51% experienced an increase in SI. When controlling for age and time since diagnosis, a one-hour increase in weekly physical activity was associated with a 6.5% increase in the odds of experiencing improved SI ($P = 0.04$). No statistically significant association was found between an increase in physical activity and improvement in SF. Neither QOL factors nor psychological distress significantly mediated the effect of change in physical activity to change in SI or SF. No demographic or treatment differences were noted between survivors reporting improvement in SI or SF and those with stable or worsening SI or SF (Table 5).

4. Discussion

Our study is the first to correlate a sexual health benefit with participation in a physical activity intervention for sedentary ECS. After our six-month intervention, 43% of participants experienced improvement in SF, and the majority of participants indicated improved SI. Furthermore, an increase in weekly physical activity was associated with

increased odds of improved SI, after controlling for age and time since diagnosis. We also found that educational attainment and relationship status—as well as the baseline mental component of QOL, negative and positive feelings, cognitive problems, pain, fatigue, social avoidance and physiologic distress—were correlated with baseline SI and SF.

Our participants' sexual health was consistent with the published literature. In our study, the baseline mean sexual health score (11.7 ± 3.59) was comparable to that reported by 34 women with a history of gynecologic cancer (11.9 ± 4.7) (23). Additionally, our data showing sexual health improvement after a physical activity intervention are consistent with results from randomized controlled trials of physical activity interventions for breast cancer survivors. Two interventions involving telephone counseling were beneficial, with one reporting a significantly improved feeling of sexual attractiveness and the other finding a trend toward improved feeling of sexual desirability (15, 27). Another intervention, employing clinic appointments and journaling, resulted in significantly improved sexual function for participants (16). Taken together, these studies support the continued investigation of physical activity interventions to improve sexual health in ECS.

The mechanism by which our physical activity intervention correlated with an improvement in SI is unknown, as we were unable to identify a QOL mediating factor or relationship with psychological distress to account for the increase in physical activity and SI in our model. Known mediators of sexuality in women without a history of cancer include sexual self-esteem and sexual anxiety (28). For instance, sexual self-schema (i.e., a composite of beliefs and attitudes toward one's own sexuality) has been found to influence risk for sexual difficulties in women with gynecologic cancer (29, 30). These mediators may drive changes in the survivor population's sexual health as well and should be evaluated by future interventions to determine the etiology of sexual health changes and isolate factors that can be addressed by intervention design.

Endometrial cancer survivor's sexual health can improve after the completion of treatment due to time alone (11, 31), potentially confounding the findings of longitudinal trials. Two prospective randomized trials for ECS demonstrated improvement in sexual health, with the first showing sexual function returning to baseline 6 months after surgery (11) and the second reporting that sexual activity and interest in patients receiving either external beam pelvic radiotherapy or vaginal brachytherapy increased for 6 month after starting treatment and plateaued thereafter (31). As our patients were recruited 6 months after completing therapy, the impact of the duration of time after diagnosis on sexual health should be minimal, which is supported by our participants' similar baseline sexual health scores regardless of their time since diagnosis.

Researchers have identified risk factors for poor sexual health of women, particularly ECS (5, 6, 9-11, 32-34). In our study, survivors with lower baseline sexual health had lower educational attainment, which aligns with findings from the general female population (33) and ECS (34). In addition to education, marital or partner status can impact sexual health. Two studies of ECS have correlated marriage with better sexual health (9, 11), although partner status in one study had no effect on sexual well-being (10). In our study, women who had a partner experienced higher SI, which is consistent with the majority of published

literature. Furthermore, our results support the well-known relationship of sexual health with mental well-being. Our participants' baseline sexual health correlated with multiple components comprising their overall QOL, agreeing with the correlation of sexual health and QOL reported in previous studies (6, 11). Additionally, our survivors' psychological distress was correlated with sexual dysfunction, reinforcing the relationship between mental well-being and sexual health.

Continued exploration of the impact of physical activity on endometrial cancer survivors' sexual health, a multi-faceted issue, is merited given the results of our study and others. Many studies denote that physical activity improves mental health (35, 36), which may subsequently mediate changes in sexual health. Physical activity interventions also improve fatigue, physical functioning, and self-efficacy, while resulting in weight loss and less sleep dysfunction (37), all of which are beneficial alone and may mediate changes in sexual health as well. A prospective assessment of endometrial and ovarian cancer survivors indicated that the quality of sexual encounters impacts sexual health more than the quantity of encounters (38), further highlighting the complexity involved in assessing the sexual health of this population. Therefore, future studies should include sexuality-based questionnaires to obtain robust information about cancer survivor sexuality (39). Other authors recommend the development of questionnaires that would better account for the lack of or limited sexual activity within the cancer survivor population (32). Moving forward, our results provide the foundation for future studies to employ exercise interventions with high-quality sexual health assessments to further investigate the impact of exercise and other factors that mediate changes in sexual health.

Our study does have limitations that should be acknowledged. First, this is a secondary analysis of a single-arm study with no control group. Therefore, we cannot definitively state that the changes in sexual health were due to the intervention rather than outside factors. However, our findings correlate with those observed in prospective studies of breast cancer patients, as noted previously. Second, sexual health outcomes were a secondary endpoint, and more detailed information about sexual health could have been obtained by using a sexual health-specific questionnaire. Along those lines, the use of estrogen, anxiolytics, sleeping medication, or anti-depressant medication during the intervention were not investigated and if used, may have confounded our results. Additionally, the QLACS sexual problem items were never specifically validated against known measures of SI or SF. Furthermore, our results may not be generalizable to those ECS who are already physically active, although this percentage is low. A survey of 120 early-stage ECS found that only 12% were meeting physical activity recommendations (40), indicating that our findings are applicable to the vast majority of ECS. Finally, those survivors who did not complete the intervention had lower stage disease, lower educational level, and reported less moderate to vigorous physical activity than those who completed the intervention, which may have biased our results. Studies have noted differences in sexual health based on stage of disease as well as educational level (10, 34). These baseline differences could theoretically lead to variances in the change in sexual health experienced during the intervention, with an individual with very low sexual function having a greater potential for improvement compared to an individual with moderate sexual function for example. However, no baseline differences in sexual health were noted in those survivors that participated in the intervention

and those who did not. It is also possible that survivors with lower baseline physical activity levels would be less engaged in the intervention, thus receiving little benefit from it. This theory is also unsupported as the amount of moderate to vigorous physical activity at baseline of the participating survivors did not indicate those survivors whose SI or SF improved after the intervention.

In conclusion, this is the first study to demonstrate the correlation between participation in a physical activity intervention for ECS and sexual health benefits. Prospective studies of physical activity interventions that include sexual health as a QOL outcome are needed to explore causation and further address the complex survivorship issues of this growing population and validate our findings. However, given the wide-reaching benefits of physical activity for survivors and the sexual health benefits seen in breast cancer survivors, we encourage providers to consider physical activity as an option for their patients who are struggling with poor sexual health.

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HIGHLIGHTS

- There is a correlation between receiving an exercise intervention and improved sexual health for endometrial cancer survivors.
- Lower educational attainment and not being married or not co-habiting were risk factors for poor sexual health.

Table 1

Comparison of participants with baseline and follow-up assessments to participants who completed one assessment.

		Participants completing both assessments (N = 63)	Participants completing one assessment (N = 37)	
		No. of participants (%)[a]	**No. of participants (%)**	**P-value**[b]
Race	Black/non-Hispanic	3 (5)	4 (11)	0.214
	White/non-Hispanic	51 (81)	24 (65)	
	White/Hispanic	5 (8)	7 (19)	
	Other/non-Hispanic	4 (6)	2 (5)	
Education	≤High school/diploma/GED	4 (6)	11 (30)	***0.003***
	Technical/vocational degree	3 (5)	5 (14)	
	Some college/two-year degree	25 (40)	11 (30)	
	At least a four-year degree	31 (49)	10 (27)	
Marital status	Married or living with significant other	46 (73)	24 (65)	0.498
	Single, separated, divorced or widowed	17 (27)	13 (35)	
Disease stage	I	45 (71)	35 (95)	***0.005***
	II-IIIa	18 (29)	2 (5)	
Treatment	Surgery only	35 (56)	23 (62)	0.003
	Surgery + radiotherapy	21 (33)	6(16)	
	Surgery + radiotherapy + chemotherapy	7 (11)	7 (19)	
	Surgery + radiotherapy + hormone therapy	0 (0)	1 (3)	
		Mean (SD)	**Mean (SD)**	**P-value** [c]
Age, years		58.2 (9.7)	55.0 (12.7)	0.199
Body mass index, kg/m2		34.0 (9.7)	34.9 (9.0)	0.663
Time since diagnosis, years		2.3 (1.3)	2.2 (1.1)	0.662
Sexual Interest (baseline)		6.8 (3.9)	8.0 (3.7)	0.161
Sexual Function (baseline)		4.9 (3.1)	6.2 (3.6)	0.090
Total hours of activity/wk [d]		13.6 (12.1)	10.2 (8.1)	***0.011***
Total hours of moderate-vigorous activity/wk		5.9 (8.0)	3.6 (3.5)	***0.043***

[a] Percentages may not equal 100 due to rounding.

[b] Fisher's exact test was performed to examine independence between assessment completion status and sample characteristic.

[c] Welch's two-sample *t*-tests were performed assuming nonhomogeneity of variance.

[d] Total hours of all listed activities in the CHAMPS questionnaire per week.

Table 2

Comparison of means for Sexual Interest and Sexual Function subscales (QLACS) at baseline (N=100)

	Sexual Interest [a]		Sexual Function [a]	
Category	**Mean (SD)**	**P-value**	**Mean (SD)**	**P-value**
Obesity status				
Obese (BMI at least 30 kg/m^2)	7.00 (3.71)	0.083[b]	5.19 (3.28)	0.062[b]
Not obese (BMI < 30 kg/m^2)	7.58 (4.14)		5.74 (3.43)	
Marital status				
Currently married or living with significant other	6.88 (3.57)	***0.012*** [b]	5.86 (3.34)	0.518[b]
Other (single, divorced, separated, or widowed)	8.00 (4.45)		4.30 (3.08)	
Time since diagnosis				
< 2 years	7.00 (3.52)	0.164[b]	5.54 (3.05)	0.499[b]
At least 2 years	7.38 (4.15)		5.24 (3.59)	
Treatment				
Surgery only	7.05 (3.83)	0.195[c]	5.17 (3.56)	0.090[c]
Surgery + radiotherapy	7.73 (4.01)		5.48 (2.75)	
Surgery + radiotherapy + chemotherapy	6.17 (3.27)		5.46 (2.73)	
Surgery + radiotherapy + hormone therapy	14 (—)[d]		14 (—)[d]	
Race				
Non-Hispanic white	7.47 (3.85)	0.539[b]	5.41 (3.09)	0.507[b]
Other	6.35 (3.82)		5.32 (4.02)	
Education				
At least a 4-year college degree	6.00 (3.35)	***<0.001*** [b]	4.51 (2.63)	***<0.001*** [b]
Less than a 4-year college degree	8.07 (3.98)		6.00 (3.64)	

[a] Higher score indicates more distress.

[b] Welch's two-sample *t*-test statistic were calculated assuming nonhomogeneity of variance. The P-values were calculated by generating an empirical distribution of the test statistic based on 5000 bootstrap resamples.

[c] P-values are based on permutation based one-way analysis of variance. The P-values were calculated by generating an empirical distribution of the F test statistic based on 10,000 permutations.

[d] Only one individual received the treatment combination of Surgery + radiotherapy + hormone therapy.

Table 3

Spearman correlations for sexual interest and sexual function to baseline variables (N=100)

Variable 1 (Baseline)	Variable 2 (Baseline)	Estimate	P-value
Sexual Interest (QLACS) [a]	***Sexual Function (QLACS)***	***0.471***	***<.001***
	Total Frequency of Activities Per Week	−0.111	0.286
	Frequency of Mod.-Vig. Activity Per Week	−0.008	0.938
	Total Hours of Activity Per Week	−0.094	0.367
	Hours of Mod.-Vig. Activity Per Week	−0.004	0.970
	Negative Feelings (QLACS) [b]	***0.385***	***<.001***
	Positive Feelings (QLACS)	***−0.283***	***0.006***
	Cognitive Problems (QLACS)	***0.289***	***0.005***
	Pain (QLACS)	***0.344***	***0.001***
	Energy/Fatigue (QLACS)	***0.290***	***0.004***
	Social Avoidance (QLACS)	***0.422***	***<.001***
	Financial Problems (QLACS)	0.172	0.100
	Benefits (QLACS)	−0.095	0.363
	Distress-Family (QLACS)	0.127	0.225
	Appearance (QLACS)	0.047	0.655
	Distress-Recurrence (QLACS)	0.203	0.052
	Mental Component Score (SF-36) [c]	***−0.351***	***0.001***
	Physical Component Score (SF-36)	−0.048	0.652
	Severity Index (BSI-18) [b]	***0.367***	***<.001***
Sexual Function (QLACS) [a]	Total Frequency of Activities Per Week	−0.128	0.208
	Frequency of Mod.-Vig. Activity Per Week	−0.070	0.492
	Total Hours of Activity Per Week	−0.083	0.414
	Hours of Mod.-Vig. Activity Per Week	0.040	0.696
	Negative Feelings (QLACS)	***0.478***	***<.001***
	Positive Feelings (QLACS)	***−0.299***	***0.003***
	Cognitive Problems (QLACS)	***0.345***	***<.001***
	Pain (QLACS)	***0.386***	***<.001***
	Energy/Fatigue (QLACS)	***0.356***	***<.001***
	Social Avoidance (QLACS)	***0.287***	***0.004***
	Financial Problems (QLACS)	***0.232***	***0.022***
	Benefits (QLACS)	−0.132	0.199
	Distress-Family (QLACS)	0.178	0.080
	Appearance (QLACS)	0.099	0.336
	Distress-Recurrence (QLACS)	0.145	0.157
	Mental Component Score (SF-36)	***−0.346***	***0.001***
	Physical Component Score (SF-36)	−0.133	0.196
	Severity Index (BSI-18)	***0.307***	***0.002***

[a] Higher sexual function and sexual interest scores indicate worse sexual health.

[b] For QLACS and BSI-18 subscale, higher scores indicate worse QOL and psychological distress.

[c] For SF-36 subscales, higher scores indicate better QOL.

Table 4

Change in sexual health from baseline to 6 months

	Baseline Mean (SD)	Follow-up Mean (SD)	P-value [a]
Sexual Interest (QLACS) [b]	6.81 (3.90)	6.29 (3.82)	0.070
Sexual Function (QLACS) [b]	***4.94 (3.12)***	***4.11 (2.53)***	***0.002***

[a] Paired *t*-tests were performed. The P-values were calculated by generating an empirical distribution of the test statistic based on 5000 bootstrap resamples.

[b] For QLACS sexual health subscales, higher scores indicate more frequent bother due to the measured construct.

Table 5

Comparison of baseline characteristics for participants who increase in sexual interest or sexual function.

		Sexual Interest (SI)			Sexual Function (SF)		
		Increased N (%)[a]	No Increase N (%)[a]	P-value[b]	Increased N (%)[a]	No increase N (%)[a]	P-value[b]
Race	Black/non-Hispanic	0 (0)	3 (8)	0.5355	1 (4)	2 (5)	0.2649
	White/non-Hispanic	25 (86)	26 (76)		22 (88)	29 (76)	
	White/Hispanic	2 (7)	3 (9)		0 (0)	5 (13)	
	Other/non-Hispanic	2 (7)	2 (6)		2 (8)	2 (5)	
Education	≤High school/diploma/GED	2 (7)	2 (6)	0.9356	1 (4)	3 (8)	0.9019
	Technical/vocational degree	2 (7)	1 (3)		1 (4)	2 (6)	
	Some college/two-year degree	11 (38)	14 (41)		11 (44)	14 (37)	
	At least a four-year degree	14 (48)	17 (50)		12 (48)	19 (50)	
Disease stage	I	19 (66)	26 (76)	0.4072	16 (64)	29 (76)	0.3938
	II-IIIa	10 (34)	8 (24)		9 (36)	9 (24)	
		Mean (SD)	Mean (SD)	P-value[c]	Mean (SD)	Mean (SD)	P-value[c]
Age		58.5 (9.5)	57.9 (10.0)	0.8174	57.0 (10.7)	58.9 (9.1)	0.4565
Total hours of activity/wk[d]		11.5 (13.6)	15.4 (10.6)	0.2191	14.0 (10.9)	13.3 (13.1)	0.8267
Total hours of moderate-vigorous activity/wk		5.0 (9.2)	6.7 (6.9)	0.4144	6.5 (7.4)	5.5 (8.4)	0.6284
Time since diagnosis, years		2.4 (1.5)	2.2 (1.2)	0.5717	2.3 (1.3)	2.3 (1.4)	0.9231

[a] Percentages may not equal 100 due to rounding.

[b] Fisher's exact test was performed to examine independence between assessment completion status and sample characteristic.

[c] Welch's two-sample *t*-tests were performed assuming nonhomogeneity of variance.

[d] Total hours of all listed activities in the CHAMPS questionnaire per week.