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A Psychoeducational Intervention for Sexual Dysfunction in Women with Gynecologic Cancer

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Abstract Treatment of early-stage cervical and endometrial cancer has been associated with significant sexual difficulties in at least half of women following hysterectomy. Despite the fact that women report such sexual side effects to be the most distressing aspect of their cancer treatment, evidence-based treatments for Female Sexual Arousal Disorder (FSAD), the most common sexual symptom in this group, do not exist. We developed and pilot tested a brief, three session psychoeducational intervention (PED) targeting FSAD in 22 women with early-stage gynecologic cancer. The PED consisted of three, 1-h sessions that combined elements of cognitive and behavioral therapy with education and mindfulness training. Women completed questionnaires and had a physiological measurement of genital arousal at pre- and post-PED (sessions 1 and 4) and participated in a semi-structured interview (session 4) during which their feedback on the PED was elicited. There was a significant positive effect of the PED on sexual desire, arousal, orgasm, satisfaction, sexual distress, depression, and overall well-being, and a trend towards significantly improved physiological genital arousal and perceived genital arousal. Qualitative feedback indicated that the PED materials were very user-friendly, clear, and helpful. In particular, women reported the mindfulness component to be most helpful. These findings suggest that a brief 3-session PED can significantly improve aspects of sexual response, mood, and quality of life in gynecologic cancer patients, and has implications for establishing the components of a psychological treatment program for FSAD.

Keywords Psychoeducation · Sexual arousal disorder · Gynecologic cancer · Mindfulness

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Introduction

Cervical cancer affects 9 in every 100,000 American women, with the highest prevalence in young Black and Hispanic women (Centers for Disease Control, 2001). In contrast, endometrial cancer tends to affect women during menopause, and has a prevalence of 7 in every 1 million women in the US (National Cancer Institute, 2005). The success of preventing, identifying, and curing these gynecologic cancers has resulted in a focus on quality of life issues during remission. Sexual health is recognized as an integral aspect of quality of life during and after cancer treatment, and is increasingly receiving research and clinical attention (Juraskova et al., 2003; Wenzel et al., 2002). Hysterectomy, the most common form of treatment for early-stage gynecologic cancer, exerts its effects on a woman's sexual health via biological, psychological, and sociocultural mechanisms.

Whereas research that examines hysterectomy due to benign conditions (e.g., fibroids, heavy bleeding) typically finds either positive or no effects on sexual indices (e.g., Anderson-Darling & McKoy-Smith, 1993; Clarke, Black,

Rowe, Mott, & Howle, 1995; Ewert, Slangen, & van Herendael, 1995; Helstrom, Weiner, Sorbrom, & Backstrom, 1994; Kuppermann et al., 2005; Rhodes, Kjerulff, Langenberg, & Guzinski, 1999; Roovers, van der Bom, van der Vaart, & Heintz, 2003; Virtanen et al., 1993), the literature on hysterectomy due to cervical or endometrial cancer depicts a more deleterious outcome. Compared to a control group of women who received surgery for benign reasons, radical hysterectomy (i.e., surgical removal of the uterus, the parametria and uterosacral ligaments, the upper portion of the vagina, and the pelvic lymph nodes) in cervical cancer patients produced significantly more lubrication problems, a decrease in sexual activities, impairment in all phases of the sexual response cycle, and an increase in diagnosable sexual dysfunctions (Grumann, Robertson, Hacker, & Sommer, 2001; Kylstra et al., 1999). Certainly, the extent to which these findings are attributed to the diagnosis of cancer per se, as opposed to surgical factors, cannot be ruled out.

Both physical and psychological mechanisms are involved in the effects of hysterectomy on sexual function in the gynecologic cancer patient; however, it is often difficult to separate these sources of sexual dysfunction. In a comparison of patients treated 1 year earlier for cervical cancer by radical hysterectomy and/or radiation therapy versus a non-cancer surgery control group, the cancer patients experienced significant impairment in genital arousal and negative genital sensations (Weijmar Schultz, van de Wiel, & Bouma, 1991), despite no between-group difference in frequency of intercourse. The genital arousal problems reported included lubrication difficulties, reduced vaginal length and elasticity, and especially distressing was the absence of genital swelling in more than half of sexual encounters (Bergmark, Avall-Lundqvist, Dickman, Henningsohn, & Steineck, 1999). The vaginal photoplethysmograph (Sintchak & Geer, 1975), an instrument providing an indirect measure of sexual arousal, has quantified this impaired blood flow response following radical hysterectomy (Maas et al., 2002), and these changes have been linked to autonomic nerve damage (Butler-Manuel, Buttery, A'Hern, Polak, & Barton, 2000, 2002; Weijmar Schultz et al., 1991).

In concert with physical sequelae, psychological function is clearly impacted by gynecologic cancer and its treatment (Andersen & Wolf, 1986; Andersen, Woods, & Copeland, 1997; Butler, Banfield, Sveinson, & Allen, 1998; Juraskova et al., 2003). Threats to sexual identity and self-esteem, personal control over body functions, intimacy, relationship stability, and the end of reproductive capacity have all been implicated in negative effects on sexual function after cancer and its treatment, and may be more salient than the effects of surgery per se. In addition, changes in emotional well-being, such as the experience of depression, anxiety, anger, and fatigue, can affect sexuality indirectly. Andersen et al.'s (1997) finding that sexual self-schema were significantly related to sexual morbidity in cervical cancer patients suggests that psychological techniques that enhance sexual self-concept and thus promote sexual arousal may be helpful.

The sexual arousal concerns in many of these women fit the criteria for Female Sexual Arousal Disorder (FSAD), defined in the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2000) as "persistent or recurrent inability to attain, or to maintain until completion of the sexual activity, an adequate lubrication–swelling response of sexual excitement" where "the disturbance causes marked distress or interpersonal difficulty." Evidence-based treatments for FSAD do not exist, and persistent distress due to untreated sexual dysfunction can compromise mental and physical health in the long term. Of note, when women were asked to rate which cancer treatment-related symptoms evoked the most distress, those relating to problems with sexual arousal consistently ranked the highest (Bergmark, Avall-Lundqvist, Dickman, Henningsohn, & Steineck, 2002).

Unfortunately, research on appropriate interventions targeting these acquired sexual arousal complaints is sparse. There is weak support for physical interventions, such as hormones, dilators, and surgery, to address such sexual side effects (Denton & Maher, 2003); however, these treatments rarely address the significant psychological aspects emerging from cancer. Similarly, while counseling and support are utilized during the post-treatment follow-up period, important education about sexual physiology may not be presented or available. While women rank sexuality as central to their quality of life and well-being during the disease-free survivorship period (Butler et al., 1998; Juraskova et al., 2003; Wenzel et al., 2002), basic psychoeducation about physical *and* psychological sexual changes has been lacking, and women are dissatisfied with the lack of attention given to such concerns (Butler et al., 1998).

Psychoeducation, which combines education and information with elements of psychological therapy, has been found to significantly improve frequency of coital activity (Capone, Good, Westie, & Jacobson, 1980), and enhances compliance with sexual rehabilitation, reduces fear about intercourse, and improves sexual knowledge (Robinson, Faris, & Scott, 1999) among early-stage cancer patients. Although neither study targeted nor assessed sexual arousal or genital sensations—symptoms documented to be most problematic and distressing in this group of women—these studies suggest that psychoeducational tools are feasible and effective in women with early-stage gynecologic cancer.

In summary, radical and simple hysterectomies for gynecologic cancer are associated with significant impairment in subjective and psychophysiological sexual arousal,

and whereas women do not report distress over the loss of the uterus, they report significant distress and relationship deterioration due to these arousal changes (Bergmark et al., 1999). There is thus a need for treatment options that address the myriad of psychological and physical sexuality-related changes that accompany the diagnosis and treatment of early-stage gynecologic cancer. The goals of this study were to assess the efficacy of a brief, 3-session psychoeducational intervention (PED) designed by the authors to evoke sexual awareness, teach arousal-enhancing techniques, and facilitate capacity for change on (1) the primary endpoint of sexual arousal, (2) the secondary sexuality-related endpoints of orgasm, sexual desire, and sexual distress, and (3) relationship satisfaction, depressive symptoms, and quality of life. We also attempted to compare women with cervical to those with endometrial cancer histories to assess possible differential effects of the PED on cancer-specific variables.

Method

Participants

Women who were treated for either cervical or endometrial cancer by hysterectomy in the previous 1–5 years at a university medical center were eligible to participate. Inclusion criteria were: (1) diagnosis of cervical or endometrial cancer, in remission; (2) diagnosis of acquired FSAD according to DSM-IV-TR criteria following the hysterectomy; and (3) currently involved in a heterosexual relationship. Exclusion criteria were: (1) having sexual desire complaints that were more distressing than the FSAD concerns; (2) current symptoms of suicidality, mania, greater than moderate depression, or psychosis; (3) lack of any experience with intercourse; and (4) current use of antidepressants (e.g., SSRIs) or antihypertensive medications. Exclusion criteria were determined by the senior author during a telephone screen and this process resulted in the exclusion of two women. Although desire and arousal complaints are highly comorbid (e.g., Rosen et al., 2000), we included women for whom difficulties in genital arousal were the first noted and most distressing sexual change following cancer. We did not exclude women who may have received bilateral salpingo-oophorectomy (BSO), radiotherapy following the hysterectomy, or those who were receiving hormone therapy.

Letters were sent to approximately 270 patients (in 5 neighboring states) of the physician co-authors and included a brief description of the study and contact information for the investigators. A total of 50 women responded to the recruitment letter and 30 met entry criteria and agreed to participate (15 lived too far, two did not meet study criteria, two were not interested, and one reported being too busy to complete all sessions). Of the 30 women who agreed to participate, seven either cancelled or did not appear for their first session, one passed away for reasons unrelated to her cancer history, and three women completed some but not all sessions. A total of 19 women completed all four sessions. We report on the demographic characteristics of the 22 women who participated in some or all sessions. Reasons for not completing all sessions included distance from research setting and death in the family.

The mean age of the 22 women was 49.4 years (range, 26–68) and 18 (82%) women had some post-secondary education. All women were heterosexual, Caucasian, and currently involved in a relationship with mean duration of 15.3 years (range, 1–45 years). Thirteen women had a history of early-stage cervical and 9 women a history of endometrial cancer. Seventeen women received radical hysterectomy (12 also had BSO), and five women received simple hysterectomy plus BSO, the average date of which had been 54 months earlier (range, 6–115 months). Seven women also received adjuvant external beam radiation therapy. Of the 17 women who had had their ovaries removed, 11 were receiving estrogen therapy.

Procedure

All women responding to the letter of invitation received the option of either a personal $5 gift certificate or of donating $5 to a local non-profit cancer support center. The telephone screen consisted of a detailed description of the study, an assessment of inclusion/exclusion criteria by a psychologist with experience in the diagnosis of sexual dysfunction, and the scheduling of the first of four sessions. Prospective participants were then mailed a questionnaire battery (described below) and asked to return it completed to their first session. Each session was scheduled 4 weeks apart.

The baseline session began with a sexual arousal assessment (subjective and physiological sexual arousal) in response to audiovisual neutral (3 min) and erotic (4 min) films. Physiological sexual arousal was measured with a vaginal photoplethysmograph (Sintchak & Geer, 1975) consisting of an acrylic vaginal probe, which is tampon-shaped and inserted vaginally in a private, locked room. Participants received detailed instructions from the investigator before leaving the testing room on how to insert the probe. Once inserted, they were encouraged to relax on a reclining chair for 10 min before watching the video segments. Subjective sexual arousal was assessed before and after the erotic stimuli with a self-report Film Scale (Heiman & Rowland, 1983).

After the erotic film, women were instructed to remove the probe and meet the investigator, alone, in a separate office for the first of three audio-recorded, 1-h segments of the PED. The second and third 1-h PED segments took

place 4 and 8 weeks later, respectively. The fourth session took place 12 weeks later and consisted of a repeat of the sexual arousal assessment, except that different audiovisual stimuli were shown, and films were counterbalanced across women and sessions. Each woman next took part in a 45 min semi-structured interview during which she was asked, in a qualitative manner, what they found helpful and not helpful about the PED. A set of pre-established questions were asked, and based on a participant's responses, follow-up questions were added that sought to either clarify information provided or elicit deeper levels of experience. The interview was later transcribed by a research associate not directly involved in the sessions. At study completion, women were debriefed and provided a $50 honorarium, which may have been used towards travel expenses.

Measures

The questionnaire battery was administered prior to session 1 and following session 4 and included the following:

Primary endpoint of sexual arousal

The Detailed Assessment of Sexual Arousal (DASA; Basson & Brotto, 2001), an unpublished questionnaire that has been found to significantly differentiate aspects of sexual arousal in women (Basson & Brotto, 2003), was administered. Subscales include "Mental excitement," "Genital tingling/throbbing," and "Pleasant genital sensations."

Secondary endpoints of sexual response and sexual distress

The Female Sexual Function Index (FSFI; Rosen et al., 2000), a validated measure of sexual desire, orgasm, lubrication, pain, and satisfaction, and the Female Sexual Distress Scale (FSDS; Derogatis, Rosen, Leiblum, Burnett, & Heiman, 2002), a measure of sexually related distress were used as secondary endpoint measures. Two scales were administered only at pre-PED: the "Treatment Impact" subscale of the Sexual Function Questionnaire (SFQ; Syrjala et al., 2000), which is a validated measure of sexual function in cancer patients, and the Sexual Beliefs and Information Questionnaire (SBIQ; Adams et al., 1996), which is a measure of sexual knowledge.

Relationship satisfaction, mood, and quality of life

The Dyadic Adjustment Scale (DAS; Spanier, 1976), the Beck Depression Inventory (BDI; Beck & Beamesderfer, 1974), and the SF-36 Quality of Life Questionnaire (SF-36; Ware & Sherbourne, 1992), were administered. For the SF-36, we computed a Physical Component subscore and a Mental Component subscore—the latter was our measure of quality of life.

Self-report of sexual response

The Film Scale (Heiman & Rowland, 1983) was administered during the sexual arousal assessments that assessed perception of genital sexual arousal, subjective sexual arousal, autonomic arousal, anxiety, positive affect, and negative affect. Items were rated on a 7-point Likert scale from 1 (not at all) to 7 (intensely).

Content of psychoeducational intervention

The PED included a therapist manual plus participant handouts (52 pages total; Brotto & Heiman, 2003).[1] The therapist manual contained detailed information on the material to be covered, the sequence of topics, and tips on trouble-shooting difficult topics. The ingredients in the PED were adapted from a variety of sources, including (1) *Becoming Orgasmic* by Heiman and LoPiccolo (1988), which is an empirically supported behavioral treatment for women with lifelong orgasmic disorder, (2) *Seven Principles for Making Marriage Work* by Gottman and Silver (1999); (3) *The Miracle of Mindfulness* by Hahn (1976); and (4) *Progressive Relaxation* by Jacobson (1938).

The PED was developed over a period of 5 months by the first two authors with input from a number of others not directly involved in the research. Table 1 contains information on the general topics covered in each session. At the end of each session, women were given a booklet of information and exercises and they were encouraged to spend 5–7 h over the next month working through the material.

Analysis of interview feedback

Thematic analysis, as described by van Manen (1990), was used to interpret the interview transcripts, with a specific focus on feedback women provided regarding the PED. Each transcript was read several times by the investigator and two members of the research team who did not conduct the interview. When an interesting passage of text was identified and preliminary categories were formed, the coders then sought meaning in the passages that might uncover something deeper than the words or preliminary categories suggested. Each identified passage was "read" many times with different potential themes considered. Specific passages were then linked together that contribute to a particular theme. We used two methods to establish

[1] The treatment manual is available from the corresponding author upon request.

Table 1 Contents of the PED targeting sexual arousal complaints in gynecologic cancer patients

Segment 1 (60 min)	Discussion of the possible predisposing, precipitating, perpetuating, and protective factors implicated in the woman's current sexuality, encouraging the woman to consider factors other than cancer and the hysterectomy; cognitive challenging of maladaptive sexual beliefs; homework exercises on relationship and body image; and information on prevalence rates of sexual difficulty following cancer and its treatment to read at home.
Segment 2 (60 min)	Expansion upon topics introduced in session 1 with more information on how to challenge maladaptive beliefs; discussion of the connection between her sexual relationship and sexuality, and body image and sexuality, emphasizing aspects she did not previously consider; psychoeducation on techniques to augment sexual arousal.
Segment 3 (60 min)	Expansion upon the earlier discussion of her intimate relationship; psychoeducation on loosening exercises designed to strengthen the larger muscles of the body; psychoeducation on using self-sensate focus to tune in to sexual arousal; psychoeducation on the potential role of erotica, fantasy, and vibrators in augmenting her natural sexual arousal response.

inter-coder reliability. First, we used double-coding of the same narrative by the different readers and then we used a process of discussing discrepancies and resolving them as a team in line with the guidelines for analysis we developed for each theme.

Psychophysiological recording

Vaginal pulse amplitude (VPA) was monitored throughout exposure to each film segment and recorded on a personal computer (Power Macintosh 6100/70, Apple, Cupertino, CA) to collect, convert (from analog to digital), and transform data. The software program, AcqKnowledge III, Version 3.3 (BIOPAC Systems, Inc., Santa Barbara, CA) and a Model MP100WS data acquisition unit (BIOPAC Systems, Inc.) was used for analog/digital conversion. A sampling rate of 200 samples/second was used for VPA throughout the 180 s of neutral and 240 s of erotic film exposure. The signal was band-pass filtered (0.5–30 Hz). One of two vaginal probes (Behavioral Technology Inc., Salt Lake City, UT) was used. Data were analyzed in 30 s segments, then averaged over the neutral and erotic segments separately, resulting in two data points per subject per session. Artifact detection following visual inspection of the data permitted the smoothing of artifacts. The vaginal probe was sterilized in a solution of Cidex OPA (ortho-phthalaldehyde 0.55%), a high level disinfectant, immediately following each session.

Results

Sexuality, depression, and quality of life characteristics at Pre-PED

The mean FSFI subscale scores at baseline appear in Table 2. The Desire, Lubrication, and Satisfaction subscales were in the range found for women with FSAD (Rosen et al., 2000), and the arousal, orgasm, and pain domains were slightly higher (i.e., better sexual function) than a group of women with FSAD. The mean FSDS score was in the range of women with significant sexually related personal distress (Derogatis et al., 2002). Overall, participants were quite knowledgeable regarding sexually related information as indicated by the SBIQ. The mean BDI score indicated that women fell in the mild level of depressive symptoms. Depressive scores were significantly associated with FSFI pain scores, $r(21) = -.55, p = .007$, with relationship adjustment (DAS), $r(21) = -.46$, $p = .035$, and with sexual distress (FSDS), $r(21) = .58$, $p = .004$, such that higher BDI scores were related to more genital pain, poorer relationship adjustment, and more sexual distress.

The "Treatment Impact" subscale of the SFQ showed a mean impact score of 3.13 ($SD = 1.04$) where 5 = maximal impact of cancer on sexual functioning.

Effects of erotic stimuli on physiological and subjective sexual arousal at pre-PED

We employed a Bonferroni correction factor to Film Scale self-report measures given that these subscales were correlated. Thus, a p value of (.05/6) = .008 was necessary in order to determine significance. The erotic film significantly increased physiological sexual arousal, perception of genital arousal, and subjective sexual arousal, all $ps < .001$ (Table 3). Perception of autonomic arousal and positive affect were also significantly increased, whereas anxiety was significantly reduced after the erotic film (all $ps < .001$). Negative affect was unchanged following the erotic stimulus (Table 3).

Effects of PED on physiological and subjective sexual arousal during an erotic stimulus

Preliminary analyses showed no significant age effects. Thus, the efficacy of the PED on VPA and subjective measures was assessed using a dependent samples t-test. Physiological and subjective arousal data during film presentation were not collected for one participant. Percent increase in VPA was computed by taking the difference between the mean erotic and neutral VPA scores, and then dividing by the mean neutral VPA score. Although there was a trend towards increased scores ($d = -0.39$), the

Table 2 Characteristics of participants ($n = 22$) at pre-PED on measures of sexual response, sexual beliefs, depression, relationship adjustment, and sexual distress

Questionnaire	*M*	*SD*	Scale range
FSFI desire	2.40	0.88	1.2–6.0
FSFI arousal	3.38	1.96	0–6.0
FSFI lubrication	3.67	2.27	0–6.0
FSFI orgasm	3.42	2.19	0–6.0
FSFI satisfaction	3.83	1.66	0.8–6.0
FSFI pain	3.76	2.31	0–6.0
FSFI total score	33.30	21.37	2.0–36.0
SBIQ	19.05	3.57	0–24.0
BDI	9.70	7.78	0–63.0
DAS	100.0	22.7	0–160.0
FSDS	21.82	11.81	0–48.0

Note: Higher Female Sexual Function Index (FSFI) subscale scores denote better sexual functioning. Higher SBIQ scores indicate more accurate sexually related information. Higher BDI scores indicate more depressive symptoms. Higher DAS scores indicate better relationship adjustment. Higher FSDS scores indicate more sexually related distress

percent increase in VPA (40–56%) was not statistically significant, $t(17) = -1.16$, $p > .05$ (Fig. 1A).

Each of the Film Scale subscales were calculated as difference scores from neutral to erotic stimulus conditions at both time points, and then compared from pre- to post-PED. Moreover, a Bonferroni correction of $p = .008$ was applied to these measures. The perceived physical sexual arousal difference score (Fig. 1B) was increased after the PED, $t(17) = -2.03$, $p = .05$ ($d = -0.49$), but this did not meet statistical significance after applying a Bonferroni correction. The subjective arousal difference score (Fig. 1C) was not statistically increased, $t(17) = -1.37$, $p > .05$ ($d = -0.41$).

Although women reported an increase in perceived autonomic arousal after the PED (Fig. 1D), this was not statistically significant, $t(17) = -1.90$, $p > .05$ ($d = -0.53$).

Anxiety, $t(17) < 1$, positive affect, $t(17) < 1$, and negative affect, $t(17) < 1$ were not significantly affected during the erotic stimulus following PED. There were no significant effects of depressive status on any of these measures, all ps $> .05$.

Effects of PED on self-report questionnaire items of sexual response

One woman did not return her final questionnaire package. There was a significant increase in the desire, arousal, orgasm, and satisfaction subscales of the FSFI (all ps $< .01$) as well as the FSFI Total Score ($p = .014$) following the PED, but no significant effect on the Lubrication or Pain subscales. Sexual distress significantly decreased following the PED, as measured by the FSDS ($p < .001$) (see Table 4).

Effects of PED on relationship function, mood, and quality of life

Women reported an improvement in their relationship adjustment that did not quite meet statistical significance ($p = .06$). BDI scores significantly decreased (indicating lower levels of depressive symptoms; $p = .004$), and there was a significant interaction of the PED by initial BDI status, $F(1, 16) = 9.19$, $p = .008$, such that women in the high BDI group showed an overall greater reduction in their depressive symptoms compared to those in the lower BDI group. There was no significant effect of the PED on the Physical Composite score of the SF-36 but a significant improvement in the Mental Health Composite after the PED ($p < .001$). There were no significant interactions with these latter two variables and depressive status (Table 4).

Effects of PED on sexual arousal subtypes

Because we were interested in effects on sexual arousal as our primary endpoint, we included a detailed measure of arousal to delineate the aspects of arousal that were affected

Table 3 Effects of erotic stimuli on VPA and self-report measures at pre-PED

Measures	Neutral stimulus		Erotic stimulus		Scale range	*t*-test
	M	*SD*	*M*	*SD*		
VPA ($\times 10^{-2}$ mV)	5.24	2.91	7.85	5.41	–	–3.92*
Perception of genital arousal	6.91	2.02	14.09	6.21	5–35	–6.62*
Subjective sexual arousal	7.82	1.10	9.82	2.04	7–14	–4.64*
Autonomic arousal	8.90	3.88	13.38	4.07	5–35	–4.05*
Positive affect	9.18	3.14	14.77	6.70	5–35	–3.78*
Negative affect	13.09	3.44	12.20	2.59	11–77	1.82
Anxiety	2.45	1.18	1.55	0.60	1–7	3.85*

Significant effect of erotic film at *$p < .001$

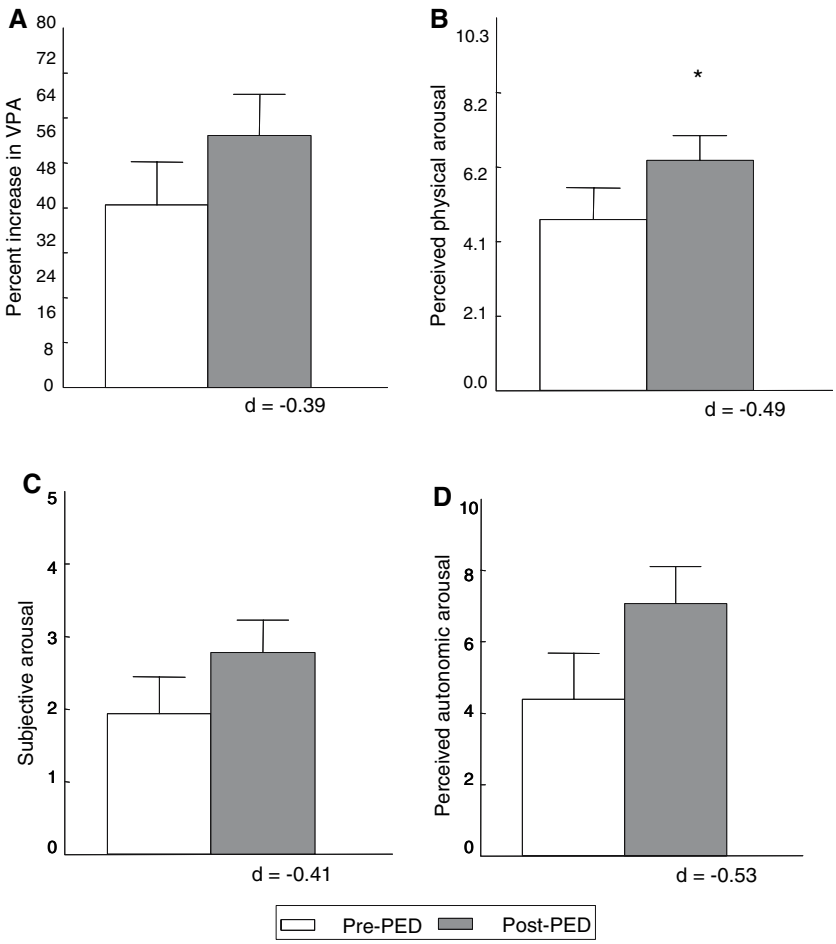

Fig. 1 Effects of a PED on (**A**) physiological sexual arousal (VPA), (**B**) perceived genital arousal, (**C**) subjective sexual arousal, and (**D**) perceived autonomic arousal (n = 18). Data in **A** represent mean percent change scores from neutral to erotic, and data presented in (**B–D**) represent mean difference scores from neutral to erotic conditions

Table 4 Effects of psychoeducation on measures of sexual response, sexual distress, relationship adjustment, depression, and physical and mental health

Measure	Pre-PED		Post-PED		t-test
	M	*SD*	*M*	*SD*	
Desire	2.43	0.22	3.37	0.20	–3.69**
Arousal	3.35	0.49	4.48	0.38	–3.40**
Lubrication	3.43	0.59	3.79	0.50	<1
Orgasm	3.06	2.34	4.56	1.87	–3.06**
Satisfaction	3.95	0.43	4.75	0.31	–3.20**
Pain	3.40	0.57	3.81	0.56	–1.13
Total score	20.19	10.53	25.39	7.22	–2.85*
FSDS	22.72	11.94	15.06	10.43	3.86***
DAS	102.9	4.24	108.56	3.71	–1.99†
BDI	10.9	1.92	6.72	1.22	3.28**
SF-36 physical composite					<1
SF-36 mental health composite					–3.83***

Significant effect of PED at $^{\dagger}p$ = .06, $*p < .05$, $**p < .01$, $***p < .001$

by the PED. There was a significant increase in DASA Question 1 (mental sexual excitement) scores, $t(15) = -3.67$, $p = .002$, and DASA Question 2 (genital tingling/throbbing) scores, $t(12) = -2.48$, $p = .029$, following the PED (Fig. 2 A). There were no significant interactions of PED with depressive status on DASA Question 1 or DASA Question 2. There was an interaction of PED treatment by depressive status on DASA Question 3 (pleasant sexual genital sensations), $F(1, 13) = 7.16$, $p = .019$, such that women who were initially more depressed showed a more marked improvement on this variable (Fig. 2B).

Effects of PED on cancer subtypes and cancer-related variables

An assessment of depression at baseline revealed that levels were unrelated to cancer or surgery type, BSO, hormone status, having received radiation therapy, or age.

Following the PED, there were no significant effects of cancer or surgery type, receiving radiation therapy, BSO, or hormonal status on physiological sexual arousal (VPA). With regards to self-report measures during the erotic stim-

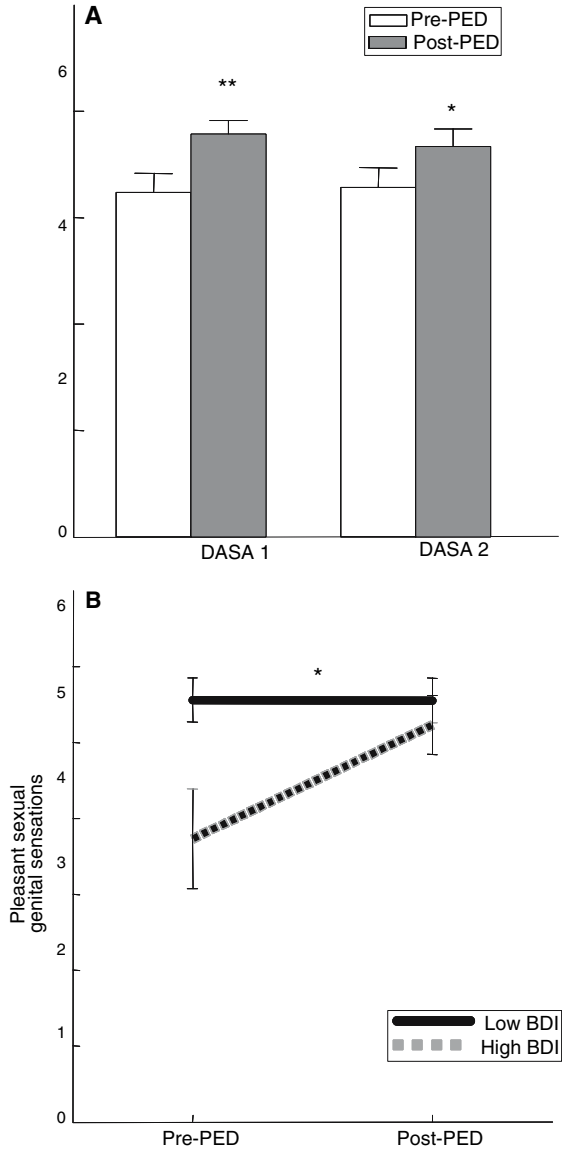

Fig. 2 Effects of a PED on (**A**) DASA question 1 (mental sexual excitement), and DASA question 2 (genital throbbing/ pulsing). Figure 2B represents the interaction of PED and depressive group status (high BDI = more depressed group, low BDI = less depressed group) on DASA question 3 (pleasant sexual genital sensations) (n = 18). Data represent means ± standard error of the mean

ulus, there was a significant interaction of PED with a number of cancer-related variables on perception of genital arousal. For example, women with cervical cancer had higher scores than women with endometrial cancer, $F(1, 16) = 5.60$, $p = .031$; women receiving radical hysterectomy showed greater improvements than women receiving simple hysterectomy, $F(1, 16) = 10.94$, $p = .004$; and hormonally replete women had higher perceived genital arousal following the PED than women not receiving hormones, $F(1, 16) = 9.73$, $p = .007$. There was also a main effect of radiation therapy on perceived genital arousal, $F(1, 16) = 6.52$, $p = .021$, such that women who had radiation therapy had lower scores than those who had not. There was a marginally significant main effect of BSO status on subjective sexual arousal to the erotic film, $F(1, 16) = 3.90$, $p = .06$, such that women who received BSO showed overall lower subjective sexual arousal than those who had not.

There were no significant effects of cancer or surgery type, radiation therapy, BSO, or hormonal status on perceived autonomic arousal, positive or negative affect following the PED. However, there was a main effect of radiation therapy on anxiety during the film such that women who received radiation therapy showed overall higher anxiety scores than those who had not, $F(1, 16) = 5.56$, $p = .049$.

Regarding sexual distress and the detailed analysis of sexual arousal subtypes, there were no significant interactions with cancer or surgery type, radiation therapy, BSO, or hormonal status on any of these variables.

Homework compliance

Women were given a rating (0–100%) for homework completion at each session. The mean homework completion rating for sessions 1, 2, and 3 were 90%, 82%, and 82%, respectively. There was no significant difference across sessions on this measure, $F(2, 32) = 1.99$, $p > .05$. Total homework compliance was significantly correlated with degree of subjective arousal during the audiovisual stimulus following PED, $r(17) = .51$, $p = .035$, such that women with higher overall homework compliance showed a greater increase in subjective sexual arousal to the film. Homework compliance was not related to any other measure.

Analysis of interview feedback

During the individual semi-structured interviews, we specifically invited feedback with respect to women's perceptions about the efficacy of the PED in their own lives. They were encouraged to also share suggestions for how to improve the PED in the future. Content analyses were used to derive themes from the transcripts.

Of the 19 interviews conducted, all women reported a beneficial effect of the PED and stated that they were pleased to have participated. Many women also shared that they became more hopeful about their sexuality. There seemed to be a unanimous message that sexuality was important after cancer, and many women would have welcomed information about cancer earlier in their treatment:

> I think if you could put people in a…support-type thing. You know 3 months down the road it wouldn't have mattered to me. But a year down the road? It was a big difference. A year later you realize you haven't

died, but all these things have changed. And you're walking in the world physically a different person. And that's hard.

[Participant 1]

I've loosened up. I did need to learn to re-route. When I came in here, I really thought the quality of sexuality for me was like 10–20% of what it was pre-surgery. And I would say that now it is like 80–90%. I've found a different route and it's quite satisfying.

[Participant 2]

Some women commented that through the self-observation exercises, and through practicing of mindfulness, they were able to view their bodies in a more positive light. One stated, "It was a transference of being aware to wanting to do that...to wanting to look. And that was a much more positive thing." [Participant 2]

Some women noted an important realization was that despite a change in arousal and responsivity following their hysterectomy, some residual arousal remained, and that by using a combination of arousal enhancing techniques and mindfulness, they were able to tune into these aspects of preserved response:

When you go through a change like this, there's that message in your mind that your body has failed you. And you don't know if that is going to happen again. But one bit of learning out of all this is, "OK, my body has changed, but its not dead. Life is not over."

[Participant 3]

It was the comforting things such as "yes, you are still a woman" and "yes, you still have all of your female parts". And "yes, they are still yours and it's ok to feel good about them."

[Participant 4]

Many women commented that the specific information on arousal-enhancing aids, such as fantasy, erotica, and the use of vibrators, was quite helpful in allowing them to experience their genital arousal in a way that they reported not experiencing for some time since before cancer:

That was useful for people like me who are…well, older. Back when I had sexual desire that stuff (fantasy, erotica, and vibrators) was not necessary. But I did get online and my feelings fluctuated between amazement and well, that it sounded useful or maybe interesting!

[Participant 5]

Women, on the whole, indicated that the materials were easy to understand and well-written. Some women provided specific feedback with respect to aspects of the PED that could be improved in a future revision. These included: (1) suggesting specific sexual education websites to include in the materials; (2) modifying the pelvic muscle exercises to take age and physical health into account; (3) including more specific examples; (4) more clarity on the number of times each homework exercise should be practiced; (5) including body image information for women who are *not* ashamed of their bodies as a result of cancer.

Discussion

In this study, we established preliminary effect sizes for a PED for women with sexual arousal difficulties following hysterectomy for cervical or endometrial cancer. The findings indicated that, prior to the PED, this group of women all met DSM-IV-TR criteria for FSAD, and scored within the range found for a comparison group of women with FSAD on the FSFI (Wiegel, Meston, & Rosen, 2005). Although women with a diagnosis of Major Depressive Disorder were excluded, BDI scores were in the mildly depressed range. Women with higher BDI scores were significantly more likely to have higher levels of genital pain, poorer relationship adjustment, and more sexual distress, but this was not associated with type of cancer or surgery, age, or whether women received BSO or radiation therapy.

Responses to an erotic film prior to the PED revealed that the film effectively increased sexual arousal as shown by a significant increase in VPA and self-reported genital arousal, subjective arousal, positive affect, and perceived autonomic arousal. As a group, their level of anxiety was significantly reduced, and the film did not induce negative affect. These findings suggest that our film stimulus was effective despite the artificial laboratory environment in which the assessment took place, and despite their self-reported sexual arousal complaints. Because we did not have a comparison group of women who did not receive hysterectomy, the magnitude of these increases is unknown. Others have found significantly lower VPA scores in women after radical and simple hysterectomy compared to a control group (Maas et al., 2002); thus, we expected that although there was a significant increase in VPA scores, the magnitude of increase was likely less than women without hysterectomy.

Effects of the PED were assessed during exposure to an audiovisual erotic stimulus. Among the self-report items, only perceived genital arousal was increased, with an effect size of $d = -0.49$, though applying a statistical correction factor reduced the significance level. Self-reported mental arousal and perceived autonomic arousal showed only a marginal increase to the erotic film after the PED, and there

were no changes in positive or negative affect. There was a notable increase in VPA (d = –0.39); however, this did not reach statistical significance.

Recent research has focused on the effects of pharmacological agents on genital arousal in women (e.g., sildenafil, ephedrine, levodopa, yohimbine, L-arginine, as reviewed in Basson, 2004); however, these are the first published findings that we are aware of that suggest that a psychological intervention may increase actual and perceived physiological sexual arousal in women. Obviously given the limited power to detect significance, these effects deserve replication in a larger group of women. The finding that women with cervical cancer experienced a greater improvement than women with endometrial cancer and women who had received radical hysterectomy faired better than women who received simple hysterectomy are worth noting. It is possible that baseline differences between these cancer groups accounted for these significant interactions, and suggests that the PED intervention may be especially useful for women with more invasive disease requiring more extensive (i.e., radical) surgeries.

Among the secondary endpoints, assessment of sexual desire, orgasm, satisfaction, and overall sexual function on the FSFI were all significantly increased following the PED. Sexually related distress and depression significantly decreased, and women who at baseline had higher BDI scores responded especially well to the PED on the measure of depressive symptoms. There were no significant effects of the PED on self-reported lubrication or pain. It is possible that the latter was due to the fact that very little information on pain during intercourse was included in the PED, and that women with a diagnosis of dyspareunia were excluded from participation, thus producing a floor effect with this variable.

When sexual arousal responses were explored in more detail, the DASA revealed a significant beneficial effect of the PED on mental excitement and on genital throbbing/pulsing, with a trend towards significantly increased pleasure from genital stimulation. There was an interesting interaction between depressive symptoms and this latter variable such that women in the more depressed group at baseline responded to the PED with significantly greater improvements in ability to experience pleasure from genital stimulation than did women who were less depressed at baseline. In the absence of a control group, it is difficult to know whether the improvements in "genital pleasure" were due specifically to the PED or to non-specific factors. The possibility that the PED directly improves depressed mood is appealing and has implications for women with Major Depressive Disorder and sexual dysfunction following cancer.

Not surprisingly, there was an overall improvement in quality of life, as measured by the Mental Health Composite score of the SF-36. Moreover, it was the more depressed women at baseline who especially improved on this measure with the PED.

Increasingly, the importance of combining quantitative with qualitative methods is being encouraged in women's sexuality research (Tolman & Szalacha, 1999). We specifically used the transcripts to clarify and expand upon findings yielded from the psychophysiological and questionnaire measures. During their qualitative feedback, women unanimously reported that they found the PED helpful. Among the different components, the segment on mindfulness training was reported to be particularly helpful as it encouraged women to tune into remaining genital arousal that they otherwise believed was gone after their surgeries. The utility of mindfulness-based approaches in psychological therapy are being increasingly realized (Hayes, Follette, & Linehan, 2004) and their application specifically to sex therapy is expanded upon in another paper (Brotto & Heiman, 2006). Many women also indicated that the PED encouraged them to recognize the importance of their sexual health, and that contrary to their beliefs, sexuality was still very much an important part of their lives and they were still "a woman." The addition of the qualitative segment in this study is seen as valuable in that it allowed us to capture effects of the PED that could not be assessed by the quantitative measures. Moreover, it provided us with feedback that will allow us to improve the PED for future investigations.

Although partners of women were not included in the PED sessions, some of the homework assignments included the partners, and many women shared all of the take-home materials with their partners. Some women suggested that a future revision of the PED manual might include more information specifically for the partners. We acknowledge that this is a limitation of the study in that only women were included, and the degree of cooperation by partners may have affected progress. We noted the significant correlation between degree of homework completion and subjective sexual arousal scores. It is possible that this finding was influenced by the extent to which women included their partners in the homework assignments.

A major limitation of the study was the fact that there was not a no-treatment control group. There is evidence that providing a venue for women to receive education and discuss sexual concerns following cervical cancer is therapeutic as it might encourage an awareness of sexual rehabilitation, thus evoking a more active coping style (Leenhouts et al., 2002). Therefore, the improvements in sexual response may be an artifact of non-specific therapeutic factors as opposed to being due specifically to the behavioral exercises in the PED. It is also worth noting that all women in this study had *both* a diagnosis of gynecologic cancer and had received surgery, thus, the deleterious

effects of hysterectomy on sexual response may be attributable to either or both of these mechanisms. In order to separate out effects of surgery from a cancer diagnosis per se, future research must attempt to include other subgroups of women (e.g., women with other cancers not requiring surgery, women receiving surgery for benign reasons, etc.).

There was also heterogeneity in the type of cancer and treatment received for women in this study. Moreover, there was a broad post-surgical range in time since treatment ranging from 6 to 115 months and this may have led to different stages of psychological coping and physiological status at the time of their participation. Women did share in common, however, the diagnosis of FSAD at the time of their participation, and this was the main study inclusion criterion given that the PED targeted arousal. Although sexual health is reported to be important among women in more advanced stages of cancer or who are receiving palliative care (Lemieux, Kaiser, Pereira, & Meadows, 2004; MacElvenn-Hoehn & McCorkle, 1985; Rice, 2000), it is possible that the specific PED material and homework assignments were more acceptable for women who have physical recovery from their cancer and who are involved in a relationship. Despite the sample heterogeneity, there were only minor differences between groups, according to cancer-specific variables, in their response to the PED. For example, there were no effects of cancer type or treatment factors on physiological sexual arousal. However, women with cervical cancer, being therefore more likely to have received a radical hysterectomy, did better on perceived genital arousal compared to women with endometrial cancer or to women who received a simple hysterectomy. In addition, treatment by radiation therapy produced a smaller improvement on this variable. Thus, there is some evidence that the PED might be especially effective, at least for perceived genital arousal, for women with cervical cancer who received radical hysterectomy but not radiation therapy. Finally, despite a significant age difference between the groups of women, there were no significant interactions of the PED with age on any endpoint.

Another limitation was the small, highly selective group that participated. The women who participated represented only a small fraction of all women contacted. This may be due to the fact that many women contacted did not experience sexual concerns and therefore determined that they did not meet study criteria. A second possibility is that the highly sensitive topic may have deterred some women from participating, even if they experienced significant sexual problems and distress. Finally, some women may not have participated because of the intensity of the program and the fact that there was an expectation of "work to be done." The finding that participants had a high baseline level of sexual knowledge and that homework compliance rates were high suggests that this may have facilitated their positive outcome with the PED and that a less motivated or less educated group may not have responded as well. Clearly, if the PED is to have wide applicability, it must be portable and feasible, and, this may involve the use of paraprofessionals such as nurses or peer counselors. Psychoeducational interventions that have been modified for online access by patients have been found to significantly decrease depression, pain, stress, and to significantly improve post-traumatic growth among women with breast cancer (Lieberman et al., 2003; Winzelberg et al., 2003). If the PED is to have wider accessibility, it must be adapted for online access and subsequently assessed for efficacy.

What were the mechanisms by which the PED was effective? Although directly targeting psychological constructs such as thoughts, affect, and behavior, psychological treatments can evoke physiological change. The finding that perceived genital arousal was most increased after the PED in women who were hormonally replete suggests that a certain baseline level of hormones might be necessary in order for improvements in sexual response, through a behavioral intervention, to be borne out. There is also the suggestion that women with more depressed mood might especially respond to the intervention since quality of life scores improved most in women with higher baseline depressive scores. Given the link among appraisal of sexual stimuli, the limbic system, and genital responding in women (Basson, 2002), it is not surprising that a behavioral intervention significantly improved physiological function.

In cancer-related sexual dysfunction where the psychological and physical contributors of impairment are difficult to tease apart, a PED that addresses both etiological domains is ideal (Weijmar Schultz, van de Wiel, Hahn, & Bouma, 1992). Our findings indicate that a brief PED is feasible and effective in women with sexual complaints following treatment for early-stage gynecologic cancer, and raise opportunities for adapting the PED to other subgroups of women such as women with more advanced gynecologic cancer, for women in lesbian relationships, and for women living in rural areas who would benefit from a "self-help" version of the PED. In the future, we hope to understand better the mechanisms by which the PED was effective, and to use this information to establish the basic, essential components of a sexual arousal treatment program for women.

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