

# Sexual functioning and relationship satisfaction of partners of breast cancer survivors who receive internet-based sex therapy

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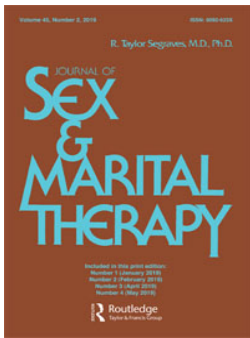
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## Sexual Functioning and Relationship Satisfaction of Partners of Breast Cancer Survivors Who Receive Internet-Based Sex Therapy

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### ABSTRACT

As part of a larger, randomized controlled trial, we evaluated longitudinally the sexual functioning and relationship satisfaction of 69 partners of breast cancer (BC) survivors who received Internet-based cognitive behavioral therapy (CBT) for sexual dysfunction. The findings suggest that Internet-based CBT positively affects the partners' immediate post-CBT and longer-term overall sexual satisfaction, sexual intimacy, and sexual relationship satisfaction. No sustained changes in other areas of sexual functioning were observed. Our CBT program was focused primarily on the sexual health of the BC survivors. We recommend that future programs include more psychoeducational and behavioral elements targeted at the partners.

### Introduction

Sexual problems are a frequent, long-term consequence of the diagnosis and treatment of breast cancer (BC) (Obergruppenberger et al., 2017; Ussher, Perz, & Gilbert, 2012). Between 45% and 77% of BC survivors report sexual problems after treatment (Kedde, van de Wiel, Weijmar Schultz, & Wijzen, 2013; Raggio, Butryn, Arigo, Mikorski, & Palmer, 2014). Frequently occurring problems include decreased sexual desire, decreased sexual arousal or lubrication, dyspareunia, and vaginal dryness (Bober & Varela, 2012; Sadovsky et al., 2010). As the sexuality of partners is

interrelated (Greenstein, Abramov, Matzkin, & Chen, 2006; Jiann, Su, & Tsai, 2013), it is not surprising that about 75% of partners of BC survivors indicate that the BC and its treatment negatively impact their sexuality and sexual relationship (Hawkins et al., 2009). Changes reported by partners of cancer survivors include a reduction of sexual activity and a lack of fulfillment in relation to sex (Hawkins et al., 2009). Given the dyadic nature of the sexual relationship, it has been recommended to involve the partner when offering psychosexual counseling to women who have had BC (Bober & Varela, 2012; Rottmann et al., 2017).

Research has demonstrated the efficacy of different psychosexual interventions in improving the sexual functioning of BC survivors, including studies in which the partner was involved in therapy (Advani, Brewster, Baum, & Schover, 2017; Decker, Pais, Miller, Goulet, & Fife, 2012; Hummel et al., 2017; Hummel et al., 2018; Kalaitzi et al., 2007; Rowland et al., 2009; Schover et al., 2013). However, no studies have evaluated the self-reported sexual functioning of partners in response to sex therapy specifically targeting sexual dysfunction after BC. In a randomized controlled trial (RCT), we evaluated the efficacy of Internet-based cognitive behavioral therapy (CBT) in improving the sexual functioning of BC survivors with a sexual dysfunction (Hummel et al., 2017; Hummel et al., 2018). The intervention had a positive, clinically relevant effect on women's sexual functioning, sexual distress, and body image immediately post-CBT (Hummel et al., 2017) as well as at nine-month follow-up (Hummel et al., 2018). The Internet-based CBT program included psychoeducation on a range of topics concerning general as well as BC-specific sexuality issues, homework exercises, and reports to and feedback from the therapist. Women were encouraged by their therapist to involve their partner in the therapy and/or homework exercises. To our knowledge, no studies have collected data directly from the partner during and after CBT for sexual dysfunction in BC survivors. In this article, we report on the evaluation of changes that occurred during and up to nine months after Internet-based CBT in sexual functioning, relationship intimacy, and relationship satisfaction among partners of BC survivors with a sexual dysfunction who underwent the Internet-based CBT program.

## Method

### Participants

This longitudinal, within-subject study is part of a larger RCT of the efficacy of Internet-based CBT for sexual dysfunctions in BC survivors. A detailed description of the RCT is provided elsewhere (Hummel et al., 2017). Here we only report the information pertinent to the current analyses.

Women with a history of BC and their partners (if present) were recruited from 10 hospitals in the Netherlands. Women were included based on the following criteria: age 18 to 65 years; a diagnosis of histologically confirmed BC six months to five years prior to study entry; completion of BC treatment (with the exception of maintenance endocrine therapy and immunotherapy); disease-free at time of study entry; sufficient command of the Dutch language; and a sexual dysfunction according to the criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000), as established by a psychologist/sexologist during a diagnostic interview. Single as well as partnered women, and both heterosexual and homosexual women could participate.

Exclusion criteria were as follows: no Internet access; serious psychiatric comorbidity (e.g., depressive disorder, alcohol dependency); treatment for another type of cancer; presence of severe, general relationship problems; concurrent therapy to alleviate problems with sexuality/intimacy; concurrent CBT for other psychological problems; and participation in another trial investigating problems with sexuality/intimacy. The institutional review boards of all recruiting hospitals approved the trial.

## **Procedure**

We identified potentially eligible women via hospital databases and the Netherlands Cancer Registry. Patients received a letter describing the study. Interested women were screened for eligibility for the trial by a member of the study staff and subsequently by a psychologist/sexologist. Eligible women were requested to complete a baseline questionnaire, and consenting women were randomly assigned to either a waiting-list control group or a group that received the Internet-based CBT. We asked women in the intervention group if their partners were willing to complete the study questionnaires. If so, the partner was sent an informed consent form and baseline questionnaire.

## **Internet-based CBT**

Extensive information on the content of the Internet-based CBT is provided elsewhere (Hummel et al., 2017). Briefly, the CBT was composed of four to five modules (selected out of a total of 10 modules by the psychologist/sexologist) that best suited the sexual problems of each individual woman. During the intake interview, the therapist discussed the desired goals of treatment with the patient and proposed a treatment plan. The treatment plan was flexible, and the choice of modules could be adjusted during therapy according to the woman's (and partner's) needs. Each module included information texts on a range of topics, including the nature of sexual problems, the biopsychosocial model, the sexual response curve, the interplay between sexuality and intimacy, and communication with the partner. Accompanying homework exercises included sensate focus exercises, task concentration training, exposure exercises for sexual pain, and exercises promoting cognitive restructuring. Partner involvement was integrated throughout the CBT program, including both a specific module focusing on the partner, as well as in the sensate focus exercises, the couple's discussions of the woman's sexual response curve, in evaluating changes in the couple's sex life after BC, and as part of the communication exercises about sexuality and sexual preferences. This resulted in a therapy of approximately 20 therapist-guided weekly sessions to be completed within 24 weeks. The contact between the therapist and client took place via email. Involvement of the partner in the therapy and homework exercises was recommended, but not required. It was possible for partners to be actively involved in the therapy by logging into the program.

## **Study measures**

Partners completed study questionnaires at baseline (T0), mid-CBT (T1), post-CBT (T2), and at three- (T3) and nine-month (T4) follow-ups. Sociodemographic information was obtained via the baseline questionnaire. We assessed the primary outcomes—sexual functioning and relationship intimacy—at all assessment points. Male partners' sexual functioning was measured with the International Index of Erectile Function (IIEF; Rosen et al., 1997) and female partners' sexual functioning with the Female Sexual Function Index (FSFI; Rosen et al., 2000; Ter Kuile, Brauer, & Laan, 2006). Relationship intimacy was assessed with the Personal Assessment of Intimacy in Relationships Inventory (PAIR; Schaefer & Olson, 1981). The secondary outcome, marital functioning, was assessed from T0 to T3 (Maudsley Marital Questionnaire [MMQ]; Arrindell, Boelens, & Lambert, 1983).

## **Statistical analysis**

We calculated questionnaire scores according to published scoring algorithms. Missing values were replaced by the average score of the completed items in the same scale for each individual, provided that  $\geq 50\%$  of the items in that scale had been completed.

To evaluate the intra-individual difference in the trajectory of change over time for both the primary and secondary outcomes, we used a growth-curve modeling approach based on restricted maximum likelihood estimation with random intercept and slope. We checked for the presence of a linear effect of time from T0 to T3 or T4. Subsequently, we added a quadratic effect of time to the model to determine if an initial improvement or deterioration in the outcome was followed by a discontinuation or deceleration of this effect. The choice between the model including only a linear effect of time and the model including both a linear and quadratic effect of time was based on model fit statistics: the Bayesian information criterion (BIC; Schwarz, 1978) and Akaike's information criterion (AIC; Akaike, 1998).

If, for a primary outcome, the model including a quadratic effect of time had the best fit and the quadratic effect of time was statistically significant, we fitted a piecewise linear growth model to the data to determine if the discontinuation or deceleration of the effect was statistically significant (Hernández-Lloreda, Colmenares, & Martínez-Arias, 2004). Piecewise linear growth models can be used when specific transition points can be specified, such as the end of treatment. They model nonlinearity by including two interrelated linear slopes reflecting the growth trajectory before and after this transition point (Bollen & Curran, 2006). In our analyses the transition point was the end of CBT, with an active treatment phase before (P1: pre-, mid-, and immediate posttreatment) and the follow-up phase after this transition point (P2: immediate posttreatment, three-month, and nine-month follow-up) (Hernández-Lloreda et al., 2004). We tested if changes during the active treatment and follow-up period were significantly different from zero. Evidence of a sustained effect of the CBT over time was considered present if, after a statistically significant improvement in the outcome during P1, the time coefficient for P2 was nonsignificant. The change during the active treatment phase and follow-up period was accompanied by effect sizes (ES) based on the  $t$ -test statistic:  $(2*t)/(\sqrt{df})$ . An ES of .20 was considered small, .50 moderate and clinically significant, and .80 large (Cohen, 1988).

As the secondary outcomes were not assessed at T4, we decided not to use a piecewise growth model on these outcomes, as too few measurement points were available. Instead we evaluated the presence of a linear and quadratic effect of time and subsequently calculated ES based on the difference in mean scores (i.e., T0 to T2, and T2 to T3) and pooled standard deviation. The  $p$  value for statistical significance was set at .05.

First, we performed the analyses on an intention-to-treat basis. However, as the rate of missing follow-up questionnaires appeared to be related to the degree of the women's compliance to the Internet-based CBT (see Results section), this suggested that the data were not missing at random. As a second step, we therefore adjusted for nonignorable dropout in the analyses (Son, Friedmann, & Thomas, 2012). This allowed evaluation of the contribution of missing data patterns to the outcome by adding the missing data pattern and its interaction with time to the model. As some patterns included too few cases, we combined patterns, resulting in two groups: a group with a maximum of two missing assessments from T2 to T4, and a group with three or more missing assessments from T1 to T4. Last, in response to the outcomes of the analyses adjusted for nonignorable dropout, we performed per-protocol analyses, including only the partners of those women who successfully completed the Internet-based CBT.

As an exploratory analysis, we investigated whether male partners who ever logged into the Internet-based CBT program to report to the therapist about their experiences with the homework exercises (yes versus no) reported a larger improvement in overall sexual functioning during the CBT or a more sustained improvement during follow-up than partners who did not log into the program. We added this variable to the model that included the linear and quadratic effect of time.

The analyses regarding the partners' sexual functioning were based on the data of male partners, as only two female partners completed study questionnaires. The data of the female partners were included in the analyses of the PAIR Inventory and the MMQ.

## Results

Recruitment and participant flow of the RCT are reported in detail elsewhere (Hummel et al., 2017). Specific to the current analysis, 169 women were randomly assigned into the trial, 84 of whom were assigned to the intervention group. Sixty-nine partners agreed to complete questionnaires and completed the T0 assessment, 62 (89.9%) completed the T1 assessment, 55 (79.7%) the T2 assessment, 53 (76.8%) the T3 assessment, and 52 (75.4%) the T4 assessment.

The mean age of the partners was 53.6 years (standard deviation [SD] = 8.5), 97.1% were male, and 68.1% had completed post-high school education. Sixty-eight percent of the partners were part of a couple that completed the CBT successfully, 27.5% ended the CBT prematurely, and 4.3% never started the CBT. Fifty-four percent of the partners logged into the CBT program themselves to report on their experiences with the homework exercises (7.2% missing data).

The mean time since BC diagnosis was 37.0 months ( $SD = 17.3$ ). Most couples (92.8%) had been in a relationship for more than five years. The majority of the women had undergone breast-conserving treatment (58.0%), 20.3% a mastectomy only, and 21.7% a mastectomy with reconstruction. The majority of women had undergone chemotherapy (76.8%), endocrine therapy (85.5%), and radiotherapy (85.5%). Nineteen percent of the women had undergone immunotherapy.

Among the women, hypoactive sexual desire disorder was the most prevalent sexual dysfunction (85.5%), followed by sexual arousal disorder (42.0%), dyspareunia (33.3%), orgasmic disorder (11.6%), sexual aversion disorder (7.2%), sexual dysfunction not otherwise specified (4.3%), and vaginismus (1.4%).

### Intention-to-treat analysis

#### Primary outcomes

For each primary outcome, the model including both a linear and a quadratic effect of time showed the best fit based on the AIC and BIC. We found a statistically significant linear and quadratic effect of time for overall sexual functioning, erectile functioning, orgasmic functioning, intercourse satisfaction, overall sexual satisfaction, and sexual relationship intimacy ( $p < .05$ ), which indicated that these outcomes improved during the CBT and that this improvement decelerated after completion of the CBT. To assess if the post-CBT deceleration was statistically significant, we fitted a piecewise growth model for these outcomes. See Table 1 for the results of the growth curve models and piecewise growth curve models.

A statistically significant improvement during the active treatment phase (P1) and maintenance of the treatment effect during the nine-month follow-up phase (P2) were observed for overall sexual satisfaction (IIEF overall satisfaction subscale:  $p_{P1} < .001$ ,  $p_{P2} = .098$ ) and sexual relationship intimacy (PAIR sexual subscale:  $p_{P1} = .020$ ,  $p_{P2} = .190$ ). We observed a statistically significant improvement during P1, followed by a decrease during P2 for overall sexual functioning (IIEF total score:  $p_{P1} = .001$ ,  $p_{P2} = .001$ ), orgasmic functioning (IIEF orgasmic function subscale:  $p_{P1} = .015$ ,  $p_{P2} = .046$ ), and intercourse satisfaction (IIEF intercourse satisfaction subscale:  $p_{P1} = .001$ ,  $p_{P2} = .001$ ). We observed no change during P1 and a statistically significant decrease during P2 for erectile functioning (IIEF erectile function subscale:  $p_{P1} = .236$ ,  $p_{P2} = .026$ ). Tables 1 and 2 display the effect sizes and mean scores.

There were no statistically significant changes over time observed for the IIEF subscale sexual desire, and for the PAIR subscales emotional intimacy, social intimacy, intellectual intimacy, recreational intimacy, or conventionality.

#### Secondary outcomes

The secondary outcomes were assessed from T0 to T3. For each outcome, the model including both a linear and quadratic effect of time showed the best fit based on the AIC and BIC.

Table 1. Linear and quadratic effects of time for the primary and secondary outcomes.

Outcome Measure	Linear and quadratic growth model						P1†						P2‡											
	Coefficient			p			95% CI			ES‡			Coefficient			p			95% CI			ES‡		
	Linear	Quadratic	SE	p	Lower bound	Upper bound	ES‡	Lower bound	Upper bound	ES‡	Coefficient	SE	p	Lower bound	Upper bound	ES‡	Coefficient	SE	p	Lower bound	Upper bound	ES‡		
<b>PRIMARY OUTCOMES</b>																								
<i>Overall sexual functioning</i>																								
IIEF total score		Linear	6.09	<.001	3.60	1.06	.001	1.48	5.72	0.91	-4.13	1.13	.001	-6.40	-1.85	-1.01								
		Quadratic	-1.59	<.001																				
<i>Erectile function</i>																								
IIEF erectile function		Linear	2.10	.019	0.99	0.83	.236	-0.65	2.63	0.17	-1.96	0.88	.026	-3.69	-0.23	-0.32								
		Quadratic	-0.62	.004																				
<i>Orgasmic functioning</i>																								
IIEF orgasmic function		Linear	1.04	.015	0.70	0.28	.015	0.14	1.26	0.65	-0.56	0.27	.046	-1.11	-0.01	-0.57								
		Quadratic	-0.24	.019																				
<i>Sexual desire</i>																								
IIEF sexual desire		Linear	0.24	.205																				
		Quadratic	-0.08	.056																				
<i>Intercourse satisfaction</i>																								
IIEF intercourse satisfaction		Linear	1.76	<.001	1.02	0.30	.001	0.43	1.61	0.89	-1.10	0.30	.001	-1.70	-0.50	-1.01								
		Quadratic	-0.45	<.001																				
<i>Overall sexual satisfaction</i>																								
IIEF overall satisfaction		Linear	0.88	<.001	0.57	0.15	<.001	0.28	0.87	1.02	-0.22	0.13	.098	-0.48	0.04	-0.47								
		Quadratic	-0.18	<.001																				
<i>Emotional intimacy</i>																								
PAIR emotional		Linear	0.90	.612																				
		Quadratic	-0.15	.690																				
<i>Social intimacy</i>																								
PAIR social		Linear	-0.45	.721																				
		Quadratic	0.14	.652																				
<i>Sexual intimacy</i>																								
PAIR sexual		Linear	4.89	.001	2.78	1.17	.020	0.45	5.11	0.60	-1.29	0.97	.190	-3.25	0.66	-0.37								
		Quadratic	-1.04	.004																				
<i>Intellectual intimacy</i>																								
PAIR intellectual		Linear	1.18	.320																				
		Quadratic	-0.24	.388																				

(continued)



Table 1. Continued.

Outcome Measure	Linear and quadratic growth model									
	P1 <sup>†</sup>					P2 <sup>†</sup>				
	Coefficient	p	SE	ES <sup>‡</sup>	95% CI	Coefficient	p	SE	ES <sup>‡</sup>	95% CI
<i>Recreational intimacy</i> PAIR recreational	Linear	0.21	.855							
	Quadratic	0.11	.689							
<i>Conventionality</i> PAIR conventionality	Linear	0.65	.594							
	Quadratic	-0.13	.665							
<b>SECONDARY OUTCOMES</b>										
Marital satisfaction MMQ marital	Linear	0.45	.613							
	Quadratic	-0.24	.394							
Sexual relationship satisfaction MMQ sexual	Linear	<b>-3.19</b>	<b>.002</b>						<b>-0.40</b>	
	Quadratic	<b>0.80</b>	<b>.012</b>							0.07
Marital general life satisfaction MMQ general life	Linear	0.07	.913							
	Quadratic	-0.09	.601							

Note. CI = confidence interval; ES = effect size; IIEF = International Index of Erectile Function; MMQ = Maudsley Marital Questionnaire; PAIR = Personal Assessment of Intimacy in Relationships Inventory; SD = standard deviation; SE = standard error. Bold font indicates a significant effect of time and time coefficients for P1 or P2 that are significantly different from zero.

<sup>†</sup>P1 = active treatment phase; P2 = follow-up phase.

<sup>‡</sup>The effect size for the primary outcomes was calculated based on the t-test statistic:  $(2^*t)/(n,df)$ . For the secondary outcomes, the effect size was based on the mean scores and pooled SD:  $(\text{mean}_{T2} - \text{mean}_{T0}) / \text{pooled } SD_{T0-T2}$  or  $(\text{mean}_{T3} - \text{mean}_{T2}) / \text{pooled } SD_{T2-T3}$ ; small 0.2; moderate 0.5, large 0.8.



**Table 2.** Mean scores and standard deviations for the primary and secondary outcome measures of the partners.

Outcome Measure	T0 <sup>†</sup>			T1 <sup>†</sup>			T2 <sup>†</sup>			T3 <sup>†</sup>			T4 <sup>†</sup>		
	No. of participants	Mean	SD	No. of participants	Mean	SD	No. of participants	Mean	SD	No. of participants	Mean	SD	No. of participants	Mean	SD
<b>PRIMARY OUTCOMES</b>															
<i>Overall sexual functioning</i>															
IEEF total score	67	38.02	20.46	59	39.95	22.39	53	47.11	21.12	52	42.85	21.90	51	38.98	22.29
<i>Erectile functioning</i>															
IEEF erectile function	67	16.66	10.57	60	16.43	11.22	53	19.79	10.58	52	18.02	10.85	51	15.94	11.04
<i>Orgasmic functioning</i>															
IEEF orgasmic function	67	5.55	4.48	59	5.80	4.37	53	7.38	3.99	52	6.62	4.52	51	6.14	4.53
<i>Sexual desire</i>															
IEEF sexual desire	67	6.88	1.57	60	6.78	1.69	53	7.09	1.70	52	7.00	1.73	51	6.57	1.93
<i>Intercourse satisfaction</i>															
IEEF intercourse satisfaction	67	4.32	4.59	60	5.13	5.19	53	6.91	4.89	52	5.52	5.37	51	4.69	5.27
<i>Overall sexual satisfaction</i>															
IEEF overall satisfaction	67	4.61	2.19	59	5.42	2.49	53	5.94	2.59	52	5.69	2.54	51	5.65	2.44
<i>Emotional intimacy</i>															
PAIR emotional	69	75.07	16.37	62	76.58	18.09	55	76.87	17.88	53	78.30	17.42	52	77.92	15.14
<i>Social intimacy</i>															
PAIR social	69	61.80	18.27	62	60.58	19.63	55	63.45	19.40	53	64.00	17.94	52	63.58	18.20
<i>Sexual intimacy</i>															
PAIR sexual	69	56.00	18.89	62	60.32	18.96	55	62.18	20.64	53	62.42	20.98	52	60.27	19.13
<i>Intellectual intimacy</i>															
PAIR intellectual	69	67.01	15.50	62	68.77	15.73	55	68.44	16.38	53	70.42	16.10	52	68.42	16.31
<i>Recreational intimacy</i>															
PAIR recreational	69	72.70	16.83	62	71.81	13.40	55	74.69	15.47	53	73.28	14.22	52	75.65	12.75
<i>Conventionality</i>															
PAIR conventionality	69	64.41	15.94	62	64.90	16.44	55	65.81	19.40	53	67.43	17.95	52	65.50	17.33
<b>SECONDARY OUTCOMES</b>															
<i>Marital functioning -</i>															
MMQ marital	69	12.18	8.65	62	11.94	8.26	55	11.85	10.41	53	10.69	9.92		n.a.*	
<i>Marital sexual satisfaction</i>															
MMQ sexual	69	20.15	9.74	62	18.34	10.59	55	16.02	11.16	53	16.83	11.78		n.a.*	
<i>General life satisfaction</i>															
MMQ general life	69	8.51	5.38	62	8.42	5.38	55	7.84	5.92	53	7.49	4.60		n.a.*	

Note. CBT = cognitive behavioral therapy; IIEF = International Index of Erectile Function; MMQ = Maudsley Marital Questionnaire; PAIR = Personal Assessment of Intimacy in Relationships Inventory; SD = standard deviation.

<sup>†</sup>T0 = baseline; T1 = mid-treatment; T2 = post-treatment; T3 = 3-month follow-up; T4 = 9-month follow-up.

\*n.a. = not applicable, secondary outcome measures were not assessed at T4.

We observed a significant linear and quadratic effect of time for sexual relationship satisfaction (MMQ sexual subscale:  $p_{\text{quadraticT0-T3}} = .012$ ). The effect sizes and mean scores (see Tables 1 and 2) show that sexual relationship satisfaction improved during P1 and that this effect was maintained during P2. There were no statistically significant changes over time in the MMQ subscales marital satisfaction or marital general life satisfaction.

### ***Intention-to-treat analysis adjusted for nonignorable dropout***

Adjustment of the models for nonignorable dropout resulted in a better fit based on the AIC and BIC. For each primary and secondary outcome, the model including both a linear and a quadratic effect of time showed the best fit based on the AIC and BIC. No statistically significant effects of time were observed for the IIEF, PAIR, and MMQ subscales in the context of a model including the adjustment for nonignorable dropout (data not shown in tabular form), indicating that the dropout had an effect on the outcomes. Evaluation of the dropout patterns suggested that the completion of assessments was related to therapy compliance, as 86% of the partners who completed all assessments were part of a couple that completed the CBT successfully. We therefore performed per-protocol analyses, including only the partners of BC survivors who completed the CBT successfully ( $n = 47$ ).

### ***Per-protocol analysis***

For each primary and secondary outcome, the model including both a linear and a quadratic effect of time showed the best fit based on the AIC and BIC. We fitted the piecewise growth model for the primary outcomes that had a statistically significant quadratic effect of time (data not shown in tabular form).

The outcomes of the per-protocol analyses were similar to the intention-to-treat analyses, except for erectile functioning (improvement during P1 [ $p_{P1} = .028$ ] and decrease during P2 [ $p_{P2} = .006$ ]), orgasmic functioning (improvement during P1 [ $p_{P1} = .017$ ] and maintenance during P2 [ $p_{P2} = .056$ ]) and sexual desire (stable during P1 [ $p_{P1} = .180$ ] and decrease during P2 [ $p_{P2} = .006$ ]).

### ***Partner's use of the online program and overall sexual functioning***

The results of the growth curve model indicated that partners who logged into the program did not report a larger improvement during the CBT or a more sustained improvement during follow-up in overall sexual functioning than partners who did not log in. This was also reflected in the IIEF total scores of these two partner subgroups (data not shown in tabular form). In this analysis, the effects of time (linear and quadratic) on overall sexual functioning were similar to those observed in the intention-to-treat analysis.

## **Discussion**

The results of the intention-to-treat analyses indicate that the partners' overall sexual functioning, erectile functioning, orgasmic functioning, intercourse satisfaction, overall sexual satisfaction, sexual relationship intimacy, and sexual relationship satisfaction improved during the Internet-based CBT. However, only the improvement in the partners' overall sexual satisfaction, sexual relationship intimacy, and sexual relationship satisfaction were maintained during a three- to nine-month follow-up. No significant changes over time were observed for sexual desire or any of the other areas of relationship intimacy or relationship satisfaction. The per-protocol analyses resulted in

similar conclusions regarding the long-term effects of the CBT. We would note that the sustained effect on orgasmic functioning detected in the per-protocol analysis was marginal, as the deterioration during follow-up was borderline nonsignificant ( $p_{p2} = .056$ ). Partners who logged into the program themselves did not report a larger improvement or a more sustained effect during follow-up in sexual functioning than partners who did not log in.

As we had no control group, we cannot assert with certainty that the changes in sexual health observed in the partners are attributable to the CBT. However, as we have reported previously, the results of our RCT indicated that the Internet-based CBT significantly improved the BC survivors' sexual functioning (Hummel et al., 2017; Hummel et al., 2018). Since the partners of the BC survivors were indirectly exposed to the intervention, it seems likely that the partners' improvements in sexual health are a result of the CBT program.

The intervention did, however, appear to have more sustained, long-term effects on the BC survivors as compared to their partners. The BC survivors reported sustained improvements in various sexual functioning domains (Hummel et al., 2018), while the partners reported a long-term improvement only in overall sexual satisfaction. This difference in effect is not entirely unexpected in that the Internet-based CBT specifically addressed the sexual functioning of the BC survivors. This may have resulted in both members of the couple acquiring skills that benefit the women's long-term sexual functioning, but not that of the partner.

The fact that some of the IIEF subscale scores depend on having had intercourse might also explain the lack of long-term improvement in most areas of the partners' sexual functioning. The CBT may have encouraged couples to engage in intercourse, and with the end of therapy and the loss of therapeutic support, intercourse frequency may have decreased. This is supported by the finding that 57.8% of the partners reported having intercourse at baseline, as compared to 77.3% and 54.5% at immediate post-CBT and nine-month follow-up, respectively. The fact that the partners did report a sustained improvement in overall sexual satisfaction, a subscale that is not dependent on intercourse, further supports this interpretation of the results. We also suspect that, because the FSFI is less focused on intercourse than the IIEF is, we were able to detect sustained positive effects of the intervention on the BC survivors' sexual health, but not on that of their partners. The focus of the IIEF on intercourse reflects the enduring idea that heterosexual sexuality revolves primarily around vaginal penetration (Jackson, 1984).

While the partners' sexual functioning improved during the Internet-based CBT, their IIEF scores at immediate post-CBT were lower than those of general population peers, although higher than those of men with erectile dysfunction (ED) (Rosen et al., 1997). The overall sexual satisfaction scores of the partners were, despite the sustained positive effect of the CBT on this outcome, still closer to those of an ED population. These findings suggest that BC and its treatment affect not only the sexual functioning of BC survivors, but also that of their male partners.

Our study had several limitations that should be noted. First, we could not compare our partner sample to a control group. Both we and the institutional review board considered it to be ethically unacceptable to request partners of women in the control group—who did not receive the CBT at that time—to complete assessments, especially since the initial invitation for study participation was addressed to the BC survivors. We did, however, compare the sexual health of the partner sample with external control groups (Rosen et al., 1997). Second, in order to reduce respondent burden and increase response rates, we did not assess the secondary outcomes at the nine-month post-CBT point. This necessitated use of different statistical methods for the analysis of the secondary outcomes. Third, it might be that only highly motivated partners agreed to complete study questionnaires, which may have introduced bias. Fourth, we had only one variable available concerning the partner's use of the Internet-based intervention. We would recommend that future trials collect more detailed information about the partner's involvement in and adherence to such a program (e.g., frequency and duration of log-ins and number of messages sent).

Finally, the loss to follow-up during the course of the study was not at random. However, we adjusted for dropout patterns in the analyses and performed additional per-protocol analyses.

Our study also had a number of strengths, including the collection of data derived directly from the partners of patients undergoing sex therapy, the availability of several postintervention follow-up assessments, and the assessment of both sexual functioning and relationship satisfaction.

Our results suggest that the positive effects of Internet-based CBT targeting the sexual functioning of BC survivors also positively affect the partner's overall sexual satisfaction and sexual relationship satisfaction. The results of this observational study should be confirmed in an RCT setting. Another subsequent step would be to investigate which elements of the CBT or combination of modules contribute most to the efficacy of the intervention in BC survivors as well as in their partners. We recommend expanding the content of Internet-based sex therapy for women who have been treated for BC to include more tailored information and interventions for the partners. Topics to be incorporated into future programs could include dealing with fear of harming the woman by initiating sex, finding time for intimacy with the pressures of life in general and life post-BC, the changing role from caregiver to (sexual) partner, coping as a couple with changes in erotic sensations, coping as a partner with the woman's vulvovaginal atrophy and sexual pain and arousal problems, and renegotiating intimacy and expanding the range of sexual activities. A future program could also include weekly, recurring communication exercises to further stimulate communication about sexuality. Such a partner-tailored program could provide partners with tools to not only facilitate improvement in their spouse's sexual functioning, but in their own sexual functioning as well.

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