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ORIGINAL ARTICLE

Comprehensive Self-Management Reduces the Negative Impact of Irritable Bowel Syndrome Symptoms on Sexual Functioning

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Abstract
Background Women with irritable bowel syndrome (IBS) report sexual dysfunction. Comprehensive self-management (CSM) intervention has been shown to reduce gastrointestinal, psychological, and somatic symptoms in IBS women. Whether this intervention also reduces sexual dysfunction is not known.
Aims We sought to compare demographic and clinical factors in IBS women with and without sexual dysfunction as defined by the Arizona sexual experiences scale (ASEX) and to test the effects of CSM treatment on sexual dysfunction scores and on the sexual relations subscale of an IBS quality of life (IBSQOL) scale which measures the effect of IBS on sexual QOL.
Methods IBS (Rome II) women enrolled in a randomized clinical trial of CSM treatment were characterized as having sexual dysfunction ($N = 89$) or not ($N = 86$) at baseline based on ASEX criteria. Baseline characteristics and symptoms were compared between the two groups. Post-intervention changes were compared between the CSM and the usual care arms of the randomized trial.
Results Women meeting ASEX criteria for sexual dysfunction were older, had higher lifetime depression and antidepressant use, more primary care/MD visits, fewer mental healthcare visits, and greater sleep disturbance than those without sexual dysfunction. No significant group differences in gastrointestinal or somatic symptoms were observed. Compared with usual care treatment, CSM increased sexual QOL scores and had a weaker effect on ASEX scores.
Conclusions Severity of IBS symptoms at baseline did not differ between IBS women with or without sexual dysfunction. The CSM intervention can reduce the effect of IBS on sexual QOL.

Keywords Arizona Sexual Experiences Scale · Irritable bowel syndrome · Sexual dysfunction · Women

Abbreviations

ASEX	Arizona Sexual Experiences Scale
CSM	Comprehensive self-management
IBS	Irritable bowel syndrome
NSexD	No sexual dysfunction group
QOL	Quality of life
SexD	Sexual dysfunction group
SSRI	Selective serotonin reuptake inhibitors

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Introduction

Irritable bowel syndrome (IBS) is prevalent in 3–20% of the United States (US) population [1]. Women with IBS report sexual dysfunction including decreased sexual desire and dyspareunia [2]. It has been reported that the prevalence of sexual dysfunction in women with functional gastrointestinal (GI) disorders is 43% [2], and the prevalence of sexual dysfunction in the general US population of women is estimated at 36–43% [3, 4]. These percentages indicate that sexual dysfunction in women is not uncommon.

The etiology of sexual dysfunction in women with IBS is likely to be multi-factorial. Physiological and psychological factors (e.g. age, depression, and childhood abuse) [5–10] may contribute to greater incidence of sexual dysfunction in women with IBS. One study demonstrated a correlation between the higher severity of IBS symptoms and reports of sexual dysfunction [2]. A history of childhood trauma has been reported to be more likely for women with IBS compared with normal controls [11]. Whether IBS symptoms and psychological distress contribute to sexual dysfunction or vice versa cannot be determined by these studies.

It is known that women with IBS and women with sexual dysfunction have more severe depression, anxiety, somatic complaints, healthcare utilization, and poorer sleep quality compared with women without these conditions [12]. Women with IBS have more somatic complaints than men with IBS [13]. Similar to patients with IBS, approximately 12% of women in the US with sexual dysfunction have concurrent depression, and 22% have personal distress from sexual problems [3]. One-third of women with a distressing sexual problem seek a healthcare provider [14] and perception of bother from sexual function in women has been associated with treatment-seeking behavior [15]. Given the above research, one may hypothesize that women with concurrent IBS and sexual dysfunction may be a subgroup of women with more psychological distress, sleep disturbance, and higher healthcare utilization than women with IBS without sexual dysfunction.

Validated sexual functioning tools have not yet been used to determine sexual dysfunction in IBS patients. The Arizona sexual experiences scale (ASEX) is a reliable and validated scale used to measure sexual dysfunction. Developed in 1997 to assess five core elements of sexual dysfunction including drive, arousal, penile erection/vaginal lubrication, ability to reach orgasm, and satisfaction from orgasm, the ASEX was designed to be clinician or self-administered and used irrespective of sexual preference or availability of a sexual partner [16]. It has been used in the United States and Europe to assess sexual dysfunction in various health conditions including chronic kidney disease, hepatitis C, and antidepressant-associated sexual dysfunction [17–19]. In addition, the ASEX can be used as a measure of sexual dysfunction over time [17, 20].

Patients with IBS have reduced quality of life (QOL) compared with the general population [21]. Drug trials for IBS have focused on motility and pain sensitivity to reduce symptom distress and enhance QOL [22–24]. Therapy such as cognitive behavioral therapy focus on negative thinking and relaxation strategies. We have previously reported that gastrointestinal symptoms and IBSQOL of IBS subjects improved after comprehensive self-management (CSM), nurse-delivered multifaceted intervention including education, diet, relaxation, and cognitive behavioral strategies, compared with those with usual care (UC) [25]. This nine-session program included content on sexual dysfunction which emphasized communication between sexual partners in relation to the effects of IBS symptoms on sexual practices. In this analysis we investigated the incidence of sexual dysfunction as determined by the ASEX for a sample of women with IBS willing to undergo self-management therapy for IBS. We compared women with and without sexual dysfunction in terms of baseline demographics, quality of life, psychological distress, childhood abuse, healthcare utilization, sleep quality, and daily diary bowel symptoms, and we tested the effects of CSM, if any, in terms of reducing the negative effects of IBS on sexual relations as measured by a subscale of the IBSQOL and improving sexual dysfunction scores (ASEX) after completion of CSM therapy.

Methods

This secondary analysis used data from both baseline and follow up of a randomized trial of CSM for women with IBS, which has been described in detail previously [25]. Two hundred and sixteen women were initially enrolled in the study. Of these, 175 women completed the ASEX at baseline, and of these, 147 were randomized and provided follow up data.

In the parent study, women with IBS were randomized to one of three arms: CSM delivered in person (CSM-IP), CSM delivered primarily by telephone (CSM T/IP), and usual care (UC). All three groups completed interviews, questionnaires, and kept symptom diaries for primary and secondary outcomes at each of four assessment periods (baseline, then 9 weeks, and 6 and 12 months post-randomization). Given our previous findings of similar improvement in IBSQOL and GI symptoms in the two CSM treatment arms compared with the UC group, we combined data from the two CSM groups and compared them with data from the UC group [25]. Volunteers with IBS were recruited through community advertisements and

a single mailing to patients in a university-based gastroenterology practice. Inclusion criteria included women at least 18 years of age having a diagnosis of IBS from a health-care provider and reported current IBS criteria based on the Rome-II criteria [26]. Other participants were excluded because of co-morbid conditions or medication use that could confound the measurement of symptoms of IBS or compromise the subject's ability to complete the study, for example, but not limited to, chronic pelvic pain, chronic interstitial cystitis, celiac disease, inflammatory bowel disease, regular narcotic use, or regular use of antibiotics. Subjects were asked to contact study nurses if new medications were to be started during treatment. If new medications were started during CSM treatment (e.g. antibiotics for infection), then these were continued, and subjects remained in the study. Human subjects institutional review approval was obtained before enrolling participants (May 2002) and renewed yearly thereafter.

Survey Instruments and Questionnaires

Arizona Sexual Experiences Scale (ASEX) [16]

Subjects measured five core elements of sexual dysfunction (drive, arousal, vaginal lubrication, ability to reach orgasm, and satisfaction from orgasm). The response format had a six-point Likert scale. Scores ranged from 5 to 30 with a higher score representing greater sexual dysfunction. Criteria for sexual dysfunction included a score $\geq$19, one item $\geq$5, or three items $\geq$4. All three categories were used in this study to determine if a subject had sexual dysfunction. The subjects were then grouped into having sexual dysfunction (SexD) or no sexual dysfunction (NSexD). If the entire scale was not filled by the subject, total ASEX scores were not calculated and were not used in the analysis; however, if the subject answered only questions one or two (i.e. "*How strong is your sex drive*?" and "*How easily are you aroused*?") and met criteria for sexual dysfunction (i.e. one item $\geq$5), the subject was placed in the sexual dysfunction group.

IBS-Quality of Life (IBSQOL) Questionnaire

A forty-two item questionnaire with nine subscales (sleep, emotional, mental health, energy, physical functioning, diet, social role, physical role, and sexual relations) was used to measure QOL in IBS [27]. The response format had a 5 or 6-point Likert scale. The sexual subscale questions addressed interference, avoidance, and satisfaction with sexual activity or experiences because of IBS. The questions were as follows: "*During the past 4 weeks, have you had any sexual activity*? If yes, please answer the next three questions. *Did your IBS interfere with your sexual activities? Did you avoid sexual activities because of your IBS? Did you feel less satisfied with your sexual experiences as a result of your IBS?*" Subjects responded by marking one of the following: 1 (always), 2 (often), 3 (sometimes), 4 (seldom), 5 (never). Not all subjects responded "yes" or "no" to the first question (i.e. "*During the past 4 weeks, have you had any sexual activity*?"); however, if the subject answered the questions following it, their response was assumed to be "yes," and their answers were used. The answers to the last three questions were averaged and rescaled to a standard scale from 0 (worst QOL) to 100 (best QOL).

Brief Symptom Inventory 53 (BSI)

A 53-item retrospective measure of psychological distress was completed by subjects [28]. Subjects were asked to rate how much the symptoms distressed or bothered them over the previous 7 days on a scale from *not at all* "0" to *extremely distressing* "4". Mean somatization, depression, and anxiety scores were reported as well as global severity index (GSI; mean of all 53 items).

Childhood Trauma Questionnaire (CTQ) [29, 30]

Subjects answered 28 self-reported retrospective questions about childhood abuse and neglect. The instrument consisted of five subscales including physical, emotional, and sexual abuse and emotional and physical neglect. A five-point scale was used with each subscale score ranging from 5 (no history of abuse or neglect) to 25 (very extreme history of abuse and neglect). Mean CTQ scores for each subscale were reported.

Pittsburg Sleep-Quality Index [31] (PSQI)

Subjects assessed sleep on the basis of a 19-item questionnaire addressing sleep quality and disturbances over one month. Seven component scores for subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction were generated from the items. A global score of five or above distinguished poor sleep quality. Mean PSQI was reported.

Symptom Diary

Subjects kept a 28-day symptom diary at pretreatment, 9 weeks, and 6 and 12 months. Subjects rated 26 symptoms on a scale of 0 (not present), 1 (mild), 2 (moderate), 3 (severe), or 4 (very severe). Six of these were IBS-related GI symptoms: abdominal pain or discomfort, bloating, constipation, diarrhea, intestinal gas, and urgency. Somatic

symptoms included fatigue/tiredness, headache, joint pain, muscle pain. Upper GI symptoms included abdominal pain up to 2 h after eating, heartburn, nausea, and stomach pain. Psychological symptoms included anger, anxiety, reduced desire to talk or move, depressed/sad or blue, and stressed. Two statements addressed sleep: "*Overall the quality of my sleep was*" 1 (poor), 2 (fair), 3 (good), 4 (very good), 5 (excellent), and "*I felt refreshed by last night's sleep*" 1 (not at all refreshed), 2 (somewhat), 3 (moderately), and 4 (very refreshed). Daily diary symptoms were calculated as percent days with moderate to very severe symptoms. The sleep variables were converted into percentage of days with moderately to very refreshed sleep and good to excellent sleep. If data were missing, percentage of days was still calculated, on the basis of the total number of days with data. Subjects also recorded medications taken daily in the symptom diary. If the medication was recorded >50% of the time, this was considered medication compliance and was used in this analysis.

Healthcare Utilization

Subjects were retrospectively asked to document the number of visits in the past six months to health-care providers. The number of visits was summed within categories: primary care providers (e.g. internists, family medicine physicians, nurse practitioners, physician assistants), specialists (e.g. gastroenterologists, cardiologists), mental health visits (counselor, psychiatrist, or psychologist), GI doctors, complementary alternative approaches (e.g. acupuncturist, massage therapists), and medical doctor visits only.

Health Histories

Demographic information included age, marital status, education, ethnic affiliation, year of diagnosis of IBS, a limited past medical history including past history of depression and anxiety diagnoses, a 15-point review of systems, and medications. Menopausal status, menstrual status, and previous gynecological history were also obtained; however, the health histories were not adequate measures of the above, and these data were not sufficiently reliable for use in this analysis.

CSM Intervention

The CSM intervention included nine sessions: overview and introduction, diet and review of abdominal breathing, alternative thinking and passive progressive muscle relaxation, cognitive distortions/diet/personalized goals, fiber/fluids/active progressive relaxation, sleep patterns/sleep hygiene/mini-relaxers, pain management and sexual dysfunction, eating out and travel, and, last, evaluation of plan and termination. Session 7 included the topic of sexual dysfunction in relation to IBS. Subjects were required to read the selected physical intimacy chapter in their workbook which addressed communication with sexual partners and cognitive (e.g. relaxing expectations), dietary (e.g. avoiding trigger foods before sexual activity), relaxation (e.g. abdominal breathing, muscle relaxation exercises), and problem solving (e.g. planning date and time for intimacy, position changes) strategies. The study nurse then addressed sexual dysfunction with the subjects, and, if needed, the above strategies were reviewed.

Statistical Analysis

Differences in groups were analyzed by use of the χ^2 test and ANOVA and ANCOVA. Controlling for age was performed on all measures except for demographic information. Power analysis for baseline comparisons of the sexual dysfunction and no sexual dysfunction groups showed 80% power for detecting an effect size of 0.45 standard deviations. Power analysis for change in the ASEX score over time in all women filling out the scale yielded 80% power for detecting an effect size of 0.55 standard deviations. For those women who were sexually active at both baseline and follow up, power analysis for ASEX scores and the sexual relations subscale of the IBSQOL showed 80% power with an effect size of 0.7 standard deviations. All analyses were conducted using the SPSS 17 data-analysis package. A P value of <0.05 was considered statistically significant.

Results

We restricted subjects to women who completed the ASEX, which resulted in an analysis set of 175 women with IBS pre-randomization. Of these, 89 were placed in the sexual dysfunction group (SexD) and 86 in the NSexD. The demographic characteristics of each group are shown in Table 1. Mean ages in the SexD group were significantly higher than those in the NSexD group. Therefore, testing of other study variables controlled for age in statistical analysis. Percentage married or partnered was higher in the SexD group though this was not quite statistically significant ($P = 0.051$).

Baseline Characteristics by Sexual Dysfunction

The overall incidence of sexual dysfunction in this sample was 51%, but a post-hoc analysis showed that this differed by age: the incidence was 38% (34 out of 90) among those younger than 45, 63% (29/46) among those aged 45–55, and 67% (26/30) among those over 55 ($P = 0.002$).

Table 1 Baseline characteristics of women with IBS in the subgroups with or without sexual dysfunction on the basis of Arizona sexual experiences scale (ASEX) criteria

	No sexual dysfunction (NSexD, $N = 86$)	Sexual dysfunction (SexD, $N = 89$)	P value
Age (mean ± SD)	38.7 ± 12.7	46.2 ± 13.9	<0.001
Race, Caucasian, *n* (%)	70 (81%)	80 (90%)	0.58
Partnered or married, *n* (%)	31 (36%)	44 (49%)	0.051
Education (college degree or above), *n* (%)	56 (65%)	51 (57%)	0.18
Income (<$50,000/year), *n* (%)	67 (81%)	65 (83%)	0.41
Years with diagnosis of IBS, phone screener (mean ± SD)	6.6 ± 8.6	8.7 ± 9.6	0.13
Rome II subgroup, *n* (%)			
Diarrhea	42 (49%)	42 (47%)	0.89
Constipation	20 (23%)	25 (28%)	
Mixed	18 (21%)	17 (19%)	

Sexual dysfunction was defined as: ASEX score ≥19, one item with score ≥5, or three items with score ≥4

The individual ASEX items for those with sexual dysfunction are shown in Table 2. Over 70% of subjects with sexual dysfunction had scores ≥4 (worse sexual dysfunction, reporting "somewhat weak" to "absent") for sexual drive, arousal, vaginal lubrication, and ability to reach orgasm.

Table 3 summarizes the baseline survey measures: ASEX, IBSQOL, health history depression diagnoses, psychological distress (BSI), childhood abuse history (CTQ), use of medication, healthcare utilization, and sleep quality for the NSexD and SexD groups. Consistent with the ASEX scores, those in the SexD group had significantly worse sexual relations IBSQOL scores than those in the NSexD group ($P = 0.01$). Other IBSQOL subscales, psychological distress (BSI) measures, and childhood abuse history (CTQ) were not different between groups. The SexD group did have a higher history of depression, use of selective serotonin reuptake inhibitors (SSRIs), and worse sleep quality. There were no differences in other diary-recorded medications used between groups including anticholinergics, anticonvulsants, antihypertensives (including beta blockers and calcium-channel blockers), barbiturates, and benzodiazepines at 50% compliance. In addition, the SexD group had a fewer mental health visits but more primary care and physician visits than those in the NSexD group. Specialists, GI, and alternative visits between groups were not significant.

Table 2 Baseline ASEX individual criteria for women with IBS and sexual dysfunction reporting somewhat weak to absent sexual drive, sexual arousal, vaginal lubrication, ability to orgasm, and satisfaction from orgasm

Individual ASEX criteria	Individuals reporting somewhat weak to absent (%(*n*/*N*))
Sexual drive	85.4 (76/89)
Sexual arousal	81.8 (72/88)
Vaginal lubrication	77.3 (68/88)
Ability to orgasm	73.9 (66/88)
Orgasm satisfaction	46.1 (41/89)

Diary symptoms were summarized as percentage of days with moderate to very severe symptoms, as shown in Table 4. None of the IBS symptoms differed significantly between the SexD and NSexD groups. In agreement with the retrospective measures in Table 3, diary reports of sleep quality are significantly lower in the SexD group. Two related measures, fatigue/tiredness and sleepiness during the day were somewhat higher but not significant. None of the other somatic or psychological symptoms differed between the SexD and NSexD groups.

Effect of CSM Intervention on IBSQOL Sexual Subscale and ASEX Scores

The effect of CSM treatment on the sexual relations subscale of the IBSQOL is shown in Fig. 1. This figure shows the mean change from baseline, adjusted for age and baseline value of sexual QOL. Only those women who reported any sexual activity in the past 4 weeks at both baseline and the relevant follow up time are shown. This accounts for 56, 58, and 56% of the sample of women at 9 weeks, and 6 and 12 months, respectively. There is a significantly greater improvement in CSM than in usual care (an increase corresponds to improvement) at 9 weeks and 6 months, and not quite significant at 12 months.

Further analysis was conducted to address the question of whether the effect of CSM on improving IBSQOL sexual subscale was a consequence of the improvement in IBS symptoms due to CSM, rather than a direct effect. The partial correlation between change in IBSQOL sexual

Table 3 Comparison of baseline survey measures (Arizona sexual experiences scale, IBS-QOL, health history depression diagnoses, psychological distress, childhood abuse history, medications, healthcare utilization, and sleep quality) in the no sexual dysfunction and sexual dysfunction groups

	No sexual dysfunction (NSexD, $N = 86$)	Sexual dysfunction (SexD, $N = 89$)	P value
ASEX (mean ± SD)	11.9 ± 2.8	20.6 ± 4.1	<0.001
QOL subscales (mean ± SD)			
Emotion	54.3 ± 20.8	55.3 ± 19.3	0.76
Mental health	76.5 ± 17.4	79.4 ± 15.5	0.68
Sleep	82.7 ± 16.4	82.5 ± 18.1	0.29
Energy	65.1 ± 19.5	65.6 ± 23.5	0.66
Physical function	79.3 ± 20.1	77.1 ± 20.9	0.61
Food	60.5 ± 18.1	62.5 ± 20.5	0.65
Social role	65.0 ± 23.4	61.5 ± 24.1	0.50
Sexual relations	69.7 ± 24.0	58.3 ± 27.4	0.01
Health history diagnoses, *n* (%)			
Depression	33 (38%)	49 (55%)	0.02
Anxiety	28 (33%)	28 (32%)	0.50
Psychological distress BSI (mean ± SD)			
Somatization	0.54 ± 0.40	0.49 ± 0.47	0.35
Depression	0.46 ± 0.55	0.47 ± 0.51	0.84
Anxiety	0.65 ± 0.57	0.61 ± 0.54	0.56
Global severity index	0.49 ± 0.36	0.51 ± 0.37	0.59
Childhood abuse history (CTQ mean ± SD)			
Emotional abuse	9.7 ± 5.2	9.4 ± 4.4	0.27
Physical abuse	7.4 ± 4.0	7.0 ± 3.5	0.40
Sexual abuse	7.1 ± 4.3	7.4 ± 4.8	0.82
Emotional neglect	9.5 ± 4.9	10.1 ± 4.7	0.97
Physical neglect	6.4 ± 2.7	6.7 ± 2.8	0.88
Diary of recorded medications, *n* (%)			
TCA	3 (4%)	1 (1%)	0.37
SSRI	10 (12%)	27 (33%)	0.007
Health-care utilization (mean days ± SD)			
Primary care visits	1.7 ± 1.6	2.3 ± 1.9	0.02
Mental health visits	2.9 ± 6.0	1.1 ± 3.1	0.05
Physician visits	2.8 ± 3.3	4.1 ± 4.8	0.008
Sleep quality (PSQI mean ± SD)	6.16 ± 3.1	8 ± 3.7	0.005

ASEX, Arizona sexual experiences scale; QOL, quality of life; BSI, brief symptom inventory; CTQ, childhood trauma questionnaire; TCA, tricyclic antidepressants; SSRI, selective serotonin reuptake inhibitors; PSQI, Pittsburg sleep-quality index

subscale and change in IBS symptom scale, controlling for baseline values of those two measures, was −0.36 ($P = 0.002$), −0.29 ($P = 0.017$), and −0.45 ($P < 0.001$) at 9 weeks, 6 months, and 12 months, respectively.

An ANCOVA analysis was conducted to see how much the estimated effect of CSM on improvement in IBSQOL sexual subscale, as shown in Fig. 1, was weakened when change in IBS symptom score was controlled. At 9 weeks, controlling for change in IBS symptom score had almost no effect. However at 6 months and, especially, at 12 months controlling for change in IBS symptom score led to a reduction in estimated effect of CSM, from 14 to 11 at 6 months and from 9 to 4 at 12 months, both becoming non-significant after adjustment. It thus seems that reducing IBS symptoms could be the mechanism by which CSM improves IBSQOL sexual subscale at the longer term follow-up times, but not immediately after the end of intervention. The explanation of this difference is not obvious.

In contrast with the results for IBSQOL sexual subscale, ASEX scores were not statistically significantly different between CSM and usual care from baseline with $P > 0.05$ at all three time points, as seen in Fig. 2a. One reason for these different results could be that the instructions for the sexual relations subscale of IBSQOL indicate that it is only to be filled out if the subject had any sexual activity in the past month. Therefore the analysis of ASEX was repeated, restricting it to only those with any sexual activity in the past month, as shown in Fig. 2b. The results now show a trend toward greater improvement in CSM relative to usual care, at 6 and 12 months, but it is not quite significant.

Table 4 Baseline diary symptoms (mean moderate to very severe symptom days; % ± SD (*N*)) for IBS women with and without sexual dysfunction in percentages of moderate to very severe symptom days per symptom in a 28-day period

Diary symptom	No sexual dysfunction (NSexD)	Sexual dysfunction (SexD)	*P* value
IBS symptoms			
Abdominal pain/discomfort	39.8 ± 26.6 (84)	36.7 ± 24.1 (87)	0.72
Abdominal pain after eating	30.7 ± 26.7 (84)	30.5 ± 24.9 (87)	0.69
Abdominal distension	30.3 ± 32.4 (84)	36.2 ± 31.2 (87)	0.48
Bloating	32.9 ± 30.6 (84)	38.6 ± 31.8 (87)	0.44
Intestinal gas	35.4 ± 30.0 (84)	46.3 ± 28.3 (87)	0.07
Flatulence	40.1 ± 30.4 (84)	48.5 ± 26.1 (87)	0.12
Urgency	20.6 ± 22.3 (82)	17.5 ± 21.5 (87)	0.64
Upper GI symptoms			
Heartburn	7.2 ± 14.9 (84)	8.5 ± 18.4 (87)	0.98
Nausea	11.3 ± 17.3 (84)	6.5 ± 13.6 (87)	0.11
Stomach pain	25.3 ± 26.9 (84)	20.8 ± 23.2 (87)	0.47
Somatic/musculoskeletal symptoms			
Backache	18.5 ± 26.0 (84)	17.3 ± 24.6 (87)	0.68
Fatigue/tiredness	31.9 ± 22.9 (84)	39.7 ± 30.1 (87)	0.06
Headache	14.7 ± 19.8 (84)	14.9 ± 17.7 (87)	0.88
Joint pain	15.5 ± 23.2 (84)	19.0 ± 17.3 (87)	0.98
Muscle pain	17.1 ± 23.5 (84)	20.5 ± 28.5 (87)	0.74
Psychological symptoms			
Anger	8.5 ± 13.5 (84)	8.0 ± 13.1 (87)	0.94
Anxiety	20.8 ± 23.2 (84)	19.1 ± 20.8 (87)	0.85
Decreased desire to talk or move	12.6 ± 15.8 (84)	10.1 ± 16.3 (87)	0.84
Depressed/sad or blue	11.0 ± 18.3 (84)	10.4 ± 14.6 (87)	0.91
Hard to concentrate	13.8 ± 19.8 (84)	16.1 ± 21.7 (87)	0.25
Panic feelings	6.9 ± 14.8 (84)	4.7 ± 10.0 (87)	0.47
Stressed	27.1 ± 26.5 (84)	25.4 ± 22.3 (87)	0.96
Sleep			
Sleepiness during the day	24.3 ± 22.0 (84)	28.1 ± 27.8 (87)	0.16
Quality of sleep (mean % days good to excellent ± SD)	66.2 ± 21.8 (84)	56.4 ± 29.1 (87)	0.028
Refreshing (mean % days moderately to very refreshed ± SD)	58.5 ± 22.4 (84)	46.9 ± 29.9 (87)	0.007
Gynecological cramps, uterine/pelvic	11.4 ± 16.7 (84)	11.7 ± 18.4 (87)	0.65

Discussion

By using a validated sexual dysfunction tool (ASEX), this study demonstrated that the rate of sexual dysfunction is 51% in a group of women with IBS enrolled in a self-management intervention trial. In this sample, the presence of sexual dysfunction was associated with older age, a history of depression, use of SSRIs, self report of more primary care and physician visits, and poorer sleep quality. Although the percentage partnered or married was slightly higher in the SexD group, ASEX takes into account sexual dysfunction irrespective of partner availability [16]. The CSM intervention which addressed sexual functioning produced no significant differences in ASEX scores post-intervention but did lead to an improvement in the sexual relations subscale of IBSQOL up to 6 months. This finding confirms that the ASEX scale incorporates other factors affecting sexual functioning and does not address the effect of IBS symptoms on sexual functioning, suggesting there are underlying causes of sexual dysfunction other than IBS symptoms.

Other investigators have also found that sexual dysfunction is relatively common in women with IBS [2, 32]. The greater incidence of sexual dysfunction found in this study compared with Fass [2] may be attributed to the use of the validated ASEX scale. The definition of sexual

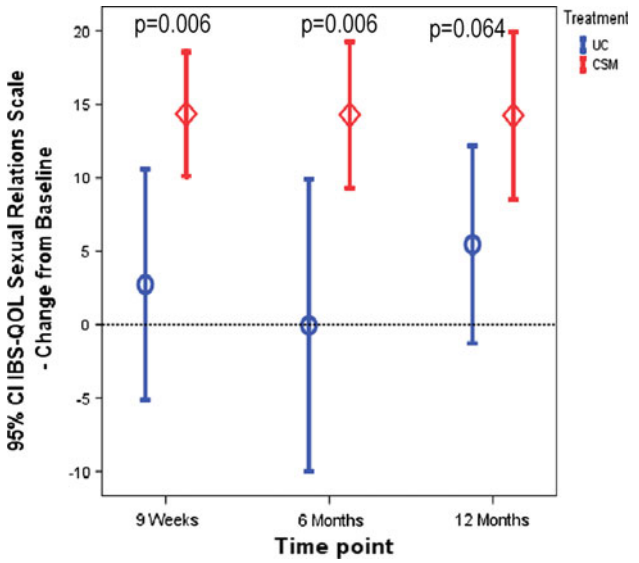

Fig. 1 The effect of CSM treatment on the sexual relations subscale of the IBSQOL (9 weeks ($N = 79$), 6 months ($N = 78$), 12 months ($N = 73$)). A positive value corresponds to improvement. *CSM* comprehensive self management, *IBSQOL* irritable bowel syndrome quality of life scale, *UC* usual care group

dysfunction based on the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) [33] has various categories including those related to the phases of normal sexual responses (i.e. sexual desire and excitement, orgasm, and resolution) and sexual pain disorders (i.e. dyspareunia and vaginismus). ASEX incorporates five core areas of sexual functioning (i.e. drive, arousal, vaginal lubrication, ability to reach orgasm, and satisfaction from orgasm) related to the phases of normal sexual responses. Previous studies on IBS and sexual functioning have incorporated none or some of the DSM-IV criteria and have specifically asked about IBS symptoms affecting sexual functioning [2, 32, 34]. ASEX provides a more complete definition of sexual dysfunction and incorporates other factors affecting sexual functioning, which might explain the greater incidence of sexual dysfunction in our sample. Although there have been no studies specifically on the health-seeking behavior of women with IBS and sexual dysfunction, the incidence of sexual dysfunction may also be higher in women seeking behavioral management for IBS symptoms.

In this study, women with IBS and sexual dysfunction had significantly lower sexual relations IBSQOL scores than women with IBS and without sexual dysfunction whereas all other subscales were not significant between groups. Given that the IBSQOL sexual relations subscale specifically asked about avoidance, interference, and decrease of sexual activity because of IBS, one can conjecture that IBS negatively affects sexual relations. Our analysis provides evidence that improved IBS symptoms mediates the effect of CSM on sexual relations and that the improvements in the IBSQOL sexual subscale and IBS symptoms scores are strongly correlated. As such, these results are consistent with the study of Hahn and colleagues [35]. In Hahn's study, 112 subjects with IBS retrospectively rated the severity of their IBS from mild to very severe. The sexual relations IBSQOL mean scores worsened with increasing perceived severity of IBS. Fass and colleagues also reported that sexual dysfunction in patients with IBS was significantly correlated with the perceived intensity of their GI symptoms [2]. It is interesting to note that Fass and colleagues had several classifications of sexual dysfunction including "symptoms directly preventing intercourse" and "worsening sexual problems during

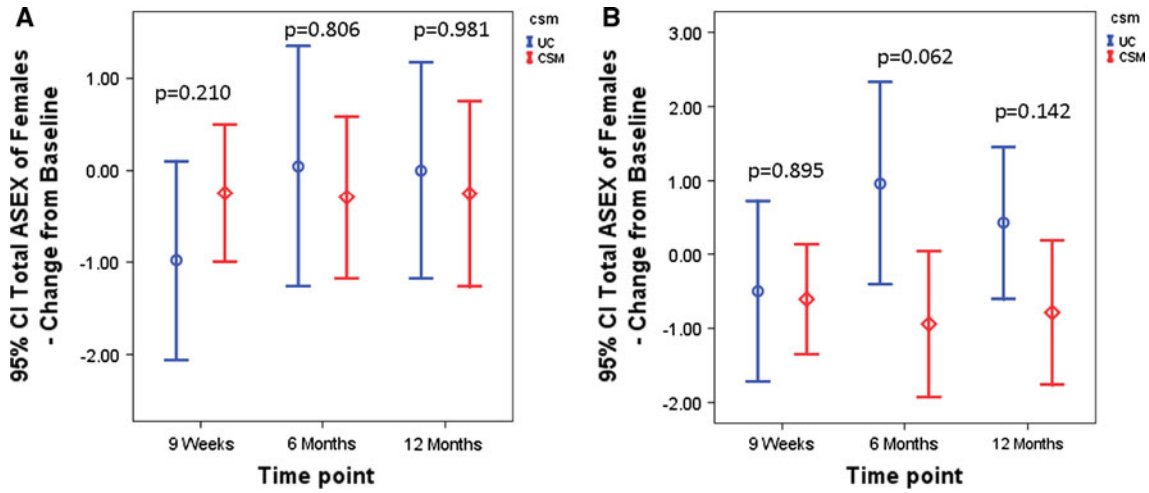

Fig. 2 Change in Arizona sexual experiences scale (ASEX) scores with comprehensive self-management (CSM) or usual care (UC). **a** This depicts all women with IBS who filled out the ASEX at different times, and their changes of ASEX scores from baseline (9 weeks ($N = 127$), 6 months ($N = 126$), 12 months ($N = 125$)). **b** This depicts all women with IBS who filled out the ASEX but also reported that they were sexually active at baseline and at follow up (9 weeks ($N = 79$), 6 months ($N = 78$), 12 months ($N = 73$)). A negative value corresponds to improvement

worsening of bowel problems". These classifications were both similar to IBSQOL sexual relations subscale questions, and 29% of Fass and colleagues' IBS sample with sexual dysfunction classified sexual impairment in these terms. This seems to be consistent with this study's finding of lower IBSQOL sexual relations scores in those with sexual dysfunction.

Our study failed to discover a significant relationship between sexual dysfunction and GI symptom severity based on diary symptoms. This may be secondary to the use of prospective diary data to record GI symptoms rather than one-time retrospective measures used by previous studies to determine perceived GI symptom severity [2, 35]. Computation of the percentage of days of moderate to severe symptoms over a 28-day period may be a more accurate means of measuring IBS symptom severity than use of one retrospective time point. Other studies that have studied pain severity via prospective diaries and retrospective questionnaires have shown overestimation of pain reported on retrospective questionnaires compared with daily diaries [36–38].

Given the somewhat small sample size and the lack of prior theoretical justification (i.e. the parent study was not designed to delineate the cause or causes of sexual dysfunction in women with IBS), the etiologies of sexual dysfunction in women with IBS warrant further investigation. The presence of sexual dysfunction in this study was associated with older age, a history of depression, use of SSRIs, self report of more primary care and physician visits, and poorer sleep quality. In general, proposed etiologies of sexual dysfunction include neurogenic, psychogenic, vascular, and hormonal factors through the hypothalamus, limbic system, and cerebral cortex [39]. We acknowledge that the women in our group with IBS and sexual dysfunction (mean age 46 years) were significantly older than those women with IBS without sexual dysfunction, yet the women with sexual dysfunction in this sample had ages similar to those of other IBS populations with sexual dysfunction (mean 48 years old) [2] and similar to those in studies measuring sexual dysfunction in women in the US (mean 49 years old) [3]. Multiple studies have shown that women report more sexual problems with increasing age [6, 7]. Furthermore, specific areas of sexual dysfunction noted with increasing age in women include decreased sexual drive and interest and increasing vaginal dryness [6, 7] which, on the basis of individual ASEX items, was seen for 77–85% of this study's sample of women with sexual dysfunction. Fass et al. [2] also reported that decreased sexual drive was the most common finding in sexual dysfunction. Age may well be the cause of sexual dysfunction in our group of IBS women; however, our data are limited by small sample size, selective recruitment, and lack of data on menopausal status.

Other sexual dysfunction etiologies considered in our sample include SSRI use and depression. Again, the four areas of sexual dysfunction which more than 70% of our sample with sexual dysfunction reported on ASEX were decreased sexual drive, arousal, lubrication, and achieving orgasm. These findings have also been reported with SSRI use and depression. The prevalence of sexual dysfunction associated with use of SSRIs, i.e. in which serotonin excess inhibits sexual desire, ejaculation/lubrication, and orgasm, has been reported to be from 40 to 78% [39, 40]. Sexual dysfunction is common in depression [9], and, compared with healthy controls, reduced signaling to areas of the brain responsible for sexual arousal has been noted on magnetic resonance images of women with depression [41]. From our study, we are unable to ascertain if our group of women with IBS and sexual dysfunction developed sexual dysfunction before or after their diagnosis of depression, at the start of or during their treatment with SSRIs, or as a consequence of IBS. Our analysis showed an increase in lifetime depression, SSRI use, and reported primary care visits and physician-only visits and fewer reported mental health visits for women with IBS and sexual dysfunction. The NSexD group may have been euthymic if given mental health treatment while in the SexD group, SSRIs may have been prescribed by primary care or other medical doctors without psychological treatment, which could account for these findings. However, a potential confounder in our study is recall bias in reporting the number of visits to mental health, primary care, and physician providers.

Some SSRIs may need to be avoided when treating women with IBS with or without depression to avoid sexual dysfunction. Meta-analysis of SSRI efficacy in treatment of IBS symptoms favors treatment [42]. Studies have concentrated on evaluating which SSRIs cause more sexual dysfunction and on medical therapy which can reverse SSRI-induced sexual dysfunction. Paroxetine and sertraline may have more sexual side effects than other SSRIs in women than in men [39, 43], and switching to escitalopram (another SSRI) resulted in some improvement in sexual functioning in women although more improvement was seen in men [44] Adjunctive therapy, for example adding mirtazapine and buproprion to SSRIs, has been reported to reduce SSRI-induced sexual dysfunction in women [45, 46]. Further studies should focus on evaluating SSRIs with lower sexual dysfunction side effects in women as potential treatments for IBS symptoms.

Unlike previous studies that have reported increased sexual dysfunction in those with childhood trauma [5, 10], our analysis did not show a difference between childhood trauma in subjects with and without sexual dysfunction, nor did it show different psychological distress between the two groups. Again, this might be attributable to our small sample size, recall bias, and our methods of selective recruitment.

Comprehensive Self-Management Intervention

The CSM intervention had a significant treatment effect on the sexual subscale of IBSQOL up to 6 months and a weaker non-significant effect on ASEX among the 62% of women who reported some sexual activity at both baseline and follow-up at 6 and 12 months. As reported earlier [25], this intervention resulted in reduced IBS symptoms and improved overall QOL. Because the IBSQOL sexual subscale measures the extent to which IBS symptoms have a negative impact on sexual activity, it makes sense that CSM would improve this aspect of IBSQOL, and other components of IBSQOL. In contrast, the ASEX scale measures sexual dysfunction with no reference to IBS symptoms. Thus, underlying causes of sexual dysfunction do not seem to be amendable to CSM intervention. However, ASEX as a tool for measuring sexual dysfunction over time has only been used in pharmacological testing thus far [47, 48], and future studies can be considered to evaluate the ASEX in behavioral therapy.

Although GI-diary symptoms were not statistically significant between those with and without sexual dysfunction, and ASEX scores revealed no significant change post CSM intervention, the CSM intervention with the sexual functioning component did improve IBS-QOL sexual subscale scores. Self-management programs for IBS with a sexual functioning component can be considered, because sexual dysfunction in women with IBS is not uncommon.

In conclusion, sexual dysfunction in women with IBS is common. Women with IBS and sexual dysfunction seem to be a subgroup with higher lifetime history of depression, current SSRI use, higher rates of healthcare utilization, and poorer sleep quality. Age, depression, and SSRI use are potential etiologies for sexual dysfunction in this study population. Selection of antidepressants less likely to cause sexual dysfunction, or adding medications to reduce SSRI-induced sexual dysfunction in women with IBS, may be helpful. CSM approaches have potential to reduce the negative effects of IBS on sexual functioning; however, further studies are warranted.

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Conflict of interest None.

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