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RESEARCH ARTICLE



Evaluating Homework Adherence in Studies of Mindfulness Based Cognitive Therapy for Female Sexual Dysfunction

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ABSTRACT

Homework is a key factor in the effectiveness of mindfulness-based interventions, yet there is no standardized method for measuring homework adherence, particularly in interventions targeting female sexual dysfunction (FSD). This study aimed to describe current methods used to assess homework adherence in research on mindfulness-based interventions for FSD. A descriptive secondary analysis was conducted using data from three randomized clinical trials, totaling 197 women. The analysis focused on the frequency and duration of formal and informal mindfulness practices, assessed immediately post-treatment and at follow-up (6–12 months). Results indicated diverse and inconsistent methods to evaluate homework completion, with a general decline in adherence over time. Participants showed moderate engagement, with formal practices declining more sharply than informal ones and brief exercises showing marked reductions in frequency. These findings highlight the need for consistent monitoring of homework adherence to ensure treatment fidelity and to optimize outcomes. Strengths include the longitudinal approach and methodological recommendations. Limitations involve the use of unvalidated and variable measurement tools. In conclusion, this research underscores the urgent need for psychometrically validated instruments to assess homework adherence in mindfulness-based interventions for FSD and provides practical guidance for researchers and clinicians.

Introduction

Female sexual dysfunction (FSD) includes a variety of issues related to problems with sexual desire, arousal, orgasm, and sexual pain, affecting the sexual health and quality of life of many women worldwide and across ages. Studies estimate that nearly 40% of women report some form of sexual dysfunction, with prevalence varying by age, cultural background, and physical health status (Mitchell et al., 2013; Shifren et al., 2008). The American Psychiatric Association (APA) defines female orgasmic disorder (FOD), genito-pelvic pain/penetration disorder (GPPPD), and female sexual interest/arousal disorder (SIAD) as the three female-specific sexual dysfunctions, each of which can be influenced by physiological, psychological, and relational factors (American Psychiatric Association—APA, 2022).

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Although a variety of treatments, both psychological and pharmacological, have been evaluated for FSD, one of the interventions to receive significant research attention is mindfulness-based cognitive therapy (MBCT) (Banbury et al., 2023), which is based on the principle of attention to the present moment, practiced without judgment, and accepting all sensations just as they are (Williams et al., 2007). Mindfulness-based treatments typically ask participants to regularly practice the skills of mindfulness, which involves paying attention to the present moment non-judgmentally, including those sensations that might arise during sexual activity. This includes paying attention to body sensations, bringing awareness to the breath, and observing thoughts in sexual and non-sexual situations (Brotto et al., 2023; Najafabadi et al., 2023; Thomas et al., 2023).

Practicing mindfulness skills at home is recognized as a crucial aspect of MBCT, as it allows consolidation of therapeutic gains beyond the session. Homework adherence is thus a critical process variable, consistently linked to better outcomes in psychological interventions. In the context of sexual dysfunction, regular practice can reduce ruminative thoughts, enhance tolerance of distress, and strengthen attentional control during sexual activity (Brotto et al., 2023; Jaderek & Lew-Starowicz, 2019; Sears et al., 2023). Conversely, when adherence is not measured, both research and clinical practice are affected: researchers lose the ability to examine mechanisms of change and ensure treatment fidelity, while clinicians lack tools to monitor engagement and tailor interventions.

Despite its central role, few studies systematically evaluate homework adherence, and when they do, inconsistent and often unvalidated measures are used. A recent scoping review confirmed that most studies assessing mindfulness for FSD either omitted adherence data or relied on ad hoc instruments with limited psychometric support (Bonato et al., 2024a; Brotto et al., 2016; Gunst et al., 2019; Paterson et al., 2017). This variability risks misleading conclusions and limits cross-study comparability (Cardoso et al., 2023; Nunnally, 1994; Zumbo, 2006;). While the absence of a gold-standard instrument remains a major gap (Boateng et al., 2018), even consistent use of shared ad hoc measures would represent an improvement.

Our study extends prior work (e.g., Bonato et al., 2024a) by moving beyond narrative review to conduct a descriptive secondary analysis of three randomized clinical trials, totaling 197 women. This approach enables examination of both adherence patterns over time and the methods used to measure them, highlighting methodological strengths and limitations that might inform future research. By doing so, we provide concrete recommendations for advancing standardized assessment of homework adherence in MBCT for FSD.

The goal of the present study was to describe the methods used to assess homework adherence in three publications evaluating mindfulness interventions for FSD (Brotto et al., 2019, 2021, 2024) and to provide recommendations for the standardized assessment of homework adherence in future research. These studies were chosen because (1) they represent methodologically strong randomized trials of MBCT for different populations of women with sexual dysfunction, and (2) they each required participants to complete homework activities between sessions and (3) the authors reported on the homework adherence data in their publications.

Materials and methods

This is a descriptive secondary analysis of data collected from three studies focused on evaluating mindfulness interventions for sexual dysfunction published in the past five years. Study 1 was a clinical trial (RCT) evaluating either group cognitive behavioral therapy (CBT) or group MBCT for women with provoked vestibulodynia (PVD), a chronic vulvo-vaginal pain condition (Brotto et al., 2019). Each arm consisted of 8, weekly 2.25 hour sessions co-facilitated by two experts in sexual health, mindfulness, and CBT. The study assessed participants' symptoms at four time points: baseline, post-treatment, and 6- and 12-month follow-up; in addition, homework completion was assessed at each post-treatment time point. In between each of the eight sessions, participants were asked to perform daily mindfulness exercises, including mindful eating, the

body scan, mindfulness of breath, mindfulness of sound and thoughts, and a loving-kindness self-compassion practice.

In addition, participants engaged in a mindfulness exercise at home where they were asked to elicit their own vulvovaginal pain using their finger, while simultaneously practicing mindfulness by observing the bare sensations during touch. Mindfulness recordings to guide participant at-home practice were provided to each participant through a digital link. Practices ranged from 20–45 minutes daily. The study found MBCT to be more efficacious than CBT for self-reported pain, whereas improvements in pain catastrophizing, pain hypervigilance, pain acceptance, and sexual function were equivalent in the MBCT and CBT arms (Brotto et al., 2019).

Study 2 was an RCT of individuals diagnosed with female sexual interest/arousal disorder (SIAD) randomized to a supportive-expressive psychoeducational group, or to MBCT (Brotto et al., 2021). Intervention length, session duration, and assessment time points were the same as Study 1. Those in the MBCT group were asked to perform daily at-home mindfulness activities between sessions, including the body scan, stretch and breath, sitting meditation, working with difficulty, walking meditation, mindful eating, and regular meditations of their choosing. This study found that MBCT led to significantly greater improvements in sexual distress, rumination, and relationship satisfaction compared to the supportive expressive psychoeducation group, but both groups led to equal improvements in sexual desire with large effect sizes.

Study 3 was a randomized, 2-site clinical trial of breast cancer survivors (BrCa) who had sexual dysfunction secondary to cancer, and who were randomized to either online group supportive-expressive psychoeducation or online group MBCT (Brotto et al., 2024). The sessions occurred once a week with a duration of two hours, for eight weeks. The study assessed participants symptoms at baseline, 1 to 2 weeks after completion of the last session, and 6 months after the last session, and homework completion was assessed at both post-treatment assessments.

The MBCT group asked participants to perform home activities, such as body scan, eating meditation, awareness of physical sensations, stretch and breath meditation, exposure to unpleasant, pleasant, and neutral sensations, breath body, sounds and thoughts meditation, the 3-minute breathing space, provoking a mild pain meditation, the two arrows, using mindfulness during sexual activity, working with difficulty meditation, sexual sensations awareness practice, working with sensations in the body, pleasurable touch exercise, and sensate focus. This study found that MBCT and supportive-expressive sex education were equivalent in leading to significant improvements in sexual desire, vaginal pain, sexual distress, interoceptive awareness, mindfulness, and rumination about sex (Brotto et al., 2024).

Participants

Study 1 (2012 to 2016) comprised 130 women diagnosed with PVD who attended two sexual medicine centers in a large urban center in Canada. The group that received the MBCT intervention consisted of 67 women, with an average age of 33.72 years ($SD=7.48$). Most participants were married or in common-law relationships ($n=45$, 67.72%), of White/Euro-Canadian ethnicity ($n=46$, 70.8%), and the majority had a university degree ($n=31$, 52.5%) (Brotto et al., 2019). Study 1 was approved by the Clinical Research Ethics Board at the University of British Columbia, #H12-02358, as well as the Vancouver Coastal Health Hospital Research Ethics Board, and all participants provided written consent.

Study 2 (2015 to 2018) involved 148 women diagnosed with SIAD who were recruited through community advertisements, social media posts, and referrals from a network of sexual medicine healthcare providers in a large metropolitan city in Canada. The group that received the MBCT intervention consisted of 70 women, with a mean age of 39.3 years ($SD=13.2$). The majority of participants were married or in common-law relationships ($n=51$, 72.9%), of White/Euro-Canadian ethnicity ($n=57$, 82.6%). Most had a university degree ($n=28$, 40.6%) or a post-graduate degree (25, 35.7%) and identified as heterosexual ($n=52$, 75.4%) (Brotto et al., 2021). The study was approved by the University of British Columbia Clinical Research Ethics Board (H12-01659) as

well as the Vancouver Coastal Health Hospital Research Ethics Board, and all participants provided written consent.

Study 3 (2020–2022) comprised 116 BrCa survivors who had sexual concerns after their cancer treatment. Participants were recruited through: (1) flyers placed at the cancer agency where treatment occurred (in both cities), an After Breast Cancer (ABC) clinic designed for women after primary BrCa treatment, as well as the Breast Cancer Supportive Care Clinic; (2) cancer registries in the provinces where the studies were carried out, distributed to all patients treated for BrCa in the past ten years; (3) advertisements on social media (Instagram, Facebook, and Twitter) using the research teams' existing social media accounts; (4) direct referrals from oncology and psychosocial oncology clinicians; and (5) previous attendees of a sexual health program for survivors at one of the sites. The group that received the MBCT intervention consisted of 60 women, with a mean age of 49 years ($SD=11$). The majority of participants were in long-term relationships ($n=50$, 83.3%) and self-identified as White/Euro-Canadian ($n=53$, 88.3%). Most had completed college ($n=30$, 50.9%) and identified as heterosexual ($n=54$, 91.5%) (Brotto et al., 2024). The study was approved by the Behavioural Research Ethics Board at the University of British Columbia (H19-02480) as well as the Vancouver Coastal Health Hospital Research Ethics Board and the Health Research Ethics Board of Alberta Cancer Committee (HREBA.CC-19-0320), and all participants provided written consent. The sociodemographic characteristics of the participants are presented in Table 1, with additional clinical and historical details available in the Supplementary Table S1.

Procedure

The studies assessed homework completion at various intervals. Study 1 evaluated homework completion immediately post-treatment and at six- and 12-month follow-ups. Study 2 employed

Table 1. Sociodemographic data of the participants in three studies of MBCT for women with sexual dysfunction.

Variables	Study 1 (n=67)	Study 2 (n=70)	Study 3 (n=60)
Age in years, mean (SD)	33.72 (7.48)	39.3 (13.2)	49.0 (11.0)
Relationship status, N (%)			
Married/common law	45 (67.2)	51 (72.8)	NR
Dating	11 (16.4)	9 (13.2)	NR
Single	11 (16.4)	8 (11.8)	8 (13.3)
Short-term relationship	NR	NR	1 (1.7)
Long-term relationship	NR	NR	50 (83.3)
Missing values	0	2 (1.4)	1 (1.7)
Length of relationship in years, mean (SD)	7.77 (6.16)	10.8 (10.1)	19.8 (10.7)
Missing values	NR	NR	9
Race/ethnicity, N (%)			
White/Euro-Canadian	46 (70.8)	57 (82.6)	53 (88.3)
South/East-Asian	10 (15.4)	7 (10)	5 (8.3)
Other	9 (13.8)	3 (4.3)	1 (1.7)
Middle Eastern	NR	2 (2.9)	NR
Black	NR	NR	1 (1.7)
Missing values	2 (1.34)	1 (0.70)	0
Education, N (%)			
High school or earned GED	1 (1.7)	1 (1.4)	1 (1.7)
College/technical or trades	NR	15 (21.7)	NR
Attended some college	10 (16.9)	NR	7 (11.9)
Graduated college	NR	NR	30 (50.9)
University degree	31 (52.5)	28 (40.6)	NR
Post-graduate	17 (28.8)	25 (35.7)	21 (35.6)
Missing values	11 (7.37)	1 (0.7)	1 (0.60)
Years with current sexual concerns, mean (SD)	9.9 (7.7)	8.7 (8.0)	4.0 (3.4)

Note. NR = not reported.

a similar approach, assessing homework completion post-treatment and at six- and 12-month follow-ups. Study 3 measured homework completion, post-treatment and at six-month follow-up.

Homework recommended

In this manuscript, we use the term ‘homework’ to refer to the recommended at-home activities assigned as part of the intervention, whereas ‘practice’ refers to the specific mindfulness exercises participants performed within the assigned homework.

In Study 1, participants in the MCBT group received a Dropbox link with mindfulness recordings that provided daily exercises (approximately 20–45 minutes/day) to support skill development as part of the intervention. They were instructed to provoke vestibular pain by gently touching the vaginal opening with their finger while mindfully observing the sensations. Additionally, all participants received a manual with various meditation exercises, such as mindful eating, body scan, mindfulness of breath, mindfulness of sound and thoughts, and a loving-kindness self-compassion practice. Participants were encouraged to document their observations from these at-home exercises in their participant manuals (Brotto et al., 2019).

In Study 2, participants received a Dropbox link with guided mindfulness recordings to use daily (approximately 20–45 minutes/day). These home exercises included practices such as body scan, stretch and breath, sitting meditation, working with difficulty, walking meditation, and a meditation of their choice. Participants were also asked to report the specific exercises they chose to practice each week, allowing them to select from various options provided (Brotto et al., 2021).

Study 3 participants were invited to practice mindfulness and associated homework exercises for up to 60 minutes per day. The MBCT home exercises include mindful eating, body scan, mindful stretching, walking meditation, mindfulness of thoughts, sexual sensations meditation, working with difficulty meditation, sensate focus, self-reflection exercises, and worksheets. Participants were instructed to report the specific exercises they selected for weekly practice, choosing from a range of options made available to them (Brotto et al., 2024).

Homework measures

Study 1 used an ad hoc scale that asked the participants two questions: (1) overall, to what degree were you able to complete your homework assignments?; and (2) overall, since the last group session, to what degree have you been able to practice the skills and exercises you learned in group. Each item was scored on a 5-point Likert scale from 0 (not at all) to 4 (high degree) (Brotto et al., 2019).

In Study 2 the participants received an online checklist at posttreatment to report the completion of exercises assigned each week. To measure homework adherence, the following ad hoc items were used: (1) since the group ended, on how many days per week have you done one or more formal mindfulness meditations, on average? By formal meditations, we mean meditations like the Body Scan, in which you are following a guided meditation or your own set of similar instructions (0–7 days per week); (2) For each day of formal mindfulness meditation, for how many minutes did you practice? (1 minute per day (1) to 40 minutes?); (3) Since the group ended, on how many days per week have you used the 3-Minute Breathing Space or checked in with your experience in a similar way, on average? (0–7 days per week); (4) How many times did you do it?; (5) Since the group ended, on how many days per week have you engaged in informal mindfulness practice, on average? By informal practice, we mean times during the day in which you intentionally attend to the present moment (e.g., mindfulness during a regular activity, such as mindful eating or a meditation of your choosing) (0–7 days per week); and (6) on those days in which you engaged in informal mindfulness practice, for how many minutes did you practice, on average? (Brotto et al., 2021).

Table 2. Types of homework adherence assessment items across studies.

Study	Number of items	Main topics assessed
Study 1	3	General adherence to homework assignments; self-reported practice frequency and duration
Study 2	4	Total weekly minutes of formal and informal meditation; specific mindfulness exercises (e.g., 3-Minute Breathing Space)
Study 3	6	Frequency and duration of formal and informal mindfulness practices; adherence to specific mindfulness exercises; completion rates of assigned exercises

Study 3 also assessed homework adherence with ad hoc items: (1) total weekly time spent on formal meditations at immediate post-treatment; (2) the total weekly time spent on a three-minute breathing space exercise or doing a mindful check-in at immediate post-treatment; (3) the total weekly time spent on doing informal meditations at immediate post-treatment, and (4) a total number of minutes per week spent on formal, informal meditation, and other exercises at immediate post-treatment. They also report the number of days per week and minutes per day they practiced the assigned mindfulness homework for each week of the treatment. They were also asked to report which exercises they chose to practice for weeks that gave participants options (Brotto et al., 2024). Overall, the items used across the three studies evolved with a more specific focus on relevant aspects of homework adherence in later studies (Table 2).

Data analysis

Exploratory descriptive analyses were performed to present the sample data, distribution, frequency, and mean scores of the responses to the homework items. For descriptive analyses, pairwise deletion was applied due to presence of missing values in some variables while others were complete, allowing the use of all available data for each analysis. Given that the primary aim was to describe and compare homework adherence measurement approaches, descriptive statistics were deemed sufficient to summarize patterns and identify methodological trends rather than to test causal hypotheses.

Formal and informal mindfulness practices were examined separately in Studies 2 and 3, whereas Study 1 did not differentiate between them. This distinction allows for a nuanced understanding of adherence patterns and highlights methodological variability across studies.

It should be noted that this study constitutes a secondary analysis of preexisting datasets from three RCTs evaluating MBCT for FSD. All analyses were performed using SPSS version 26.

Results

Table 3 presents the items used to measure homework and the results obtained in each of the three studies.

During the treatment phase, participants exhibited moderate adherence to the assigned exercises. In Study 1, engagement with homework assignments was generally moderate, though independent practice between sessions was somewhat limited. In contrast, Study 3 revealed a broader range of adherence to mindfulness exercises, with some participants completing nearly all mindfulness exercises while others engaged minimally. The overall completion rate suggested satisfactory treatment engagement despite individual variability. These findings suggest that while participants in Study 1 demonstrated moderate engagement, those in Study 3 exhibited a higher overall adherence rate, albeit with considerable variability in the number of exercises completed.

Post-treatment engagement patterns differed by practice type. For formal meditation, Study 1 participants maintained relatively consistent practice time that temporarily increased at 6-month follow-up before declining. Both Studies 2 and 3 showed progressive decreases in formal meditation frequency and duration during follow-up periods, though the decline was more pronounced in Study 2.

Table 3. Items used to measure homework, and the results obtained in each of the three studies.

Study 1 – Mean (SD); number of participants			
Label ¹	During treatment		
Overall, to what degree were you able to complete your homework assignments?	2.48 (0.68); n = 39		
Overall, since the last group session, to what degree have you been able to practice	2.0 (1.06); n = 38		
Study 1 – After treatment			
Label	Immediate post-treatment	6-month follow-up	12-month follow-up
How many minutes per week were you able to practice the mindfulness skills?	87.46 (96.43); n = 59	109.63 (196.37); n = 46	80.51 (98.33); n = 42
Study 2			
Label	Immediate post-treatment	6-month follow-up	12-month follow-up
Total weekly minutes spent on formal meditations	59.85 (69.62); n = 59	47.68 (85.63); n = 56	41.22 (77.82); n = 52
Total weekly minutes spent on shorter mindfulness practices (e.g., three-minute breathing space)	23.01 (25.74); n = 61	14.00 (20.39); n = 56	12.95 (17.85); n = 52
Total weekly minutes spent on doing informal meditations	50.70 (87.20); n = 57	46.06 (78.87); n = 55	23.35 (33.72); n = 50
Total number of minutes per week spent on formal, informal meditation, and other exercises	128.28 (135.67); n = 61	105.05 (145.92); n = 57	75.19 (104.07); n = 53
Study 3 – Range; mean (SD), number of participants			
Label	During treatment		
Overall, count of all exercises completed after each session	0–22; 14.21 (7.17); n = 60		
Overall, count of percentage of completed exercises after all sessions	0–100; 76.02 (19.22); n = 51		
Study 3 – After treatment			
Label	Immediate post-treatment	6-month follow-up	
Since the group ended, on how many days per week have you done one or more formal mindfulness meditations, on average? By formal meditations, we mean meditations like the Body Scan, in which you are following a guided meditation or your own set of similar instructions. ²	2.36 (1.87); n = 50	1.26 (1.40); n = 39	
For each day of formal mindfulness meditation, how many minutes did you practice? ³	22.37 (10.91); n = 41	14.58 (10.28); n = 24	
Since the group ended, on how many days per week have you used the 3-Minute Breathing Space or checked in with your experience in a similar way, on average? ²	3.08 (2.12); n = 51	1.77 (2.05); n = 39	
How many times did you do it?	1.77 (1.80); n = 35	1.59 (1.00); n = 22	
Since the group ended, how many days per week have you engaged in informal mindfulness practice, on average? By informal practice, we mean times during the day in which you intentionally attend to the present moment (e.g., mindfulness during a regular activity, such as mindful eating or a meditation of your choosing). ²	3.78 (1.93); n = 50	3.36 (2.47); n = 39	
On those days in which you engaged in informal mindfulness practice, for how many minutes did you practice, on average? ³	12.44 (12.96); n = 34	15.00 (26.60); n = 16	

Note. ¹Each item was scored on a 5-point Likert scale from 0 (*not at all*) to 4 (*high degree*).

²Each item was scored from 0–7 days per week.

³Each item was scored based on minutes per day (1).

Homework adherence items and results from three MBCT studies for women with sexual dysfunction. The table shows completion rates, frequency, and duration of practices, allowing comparison of adherence levels and item performance across studies; n = number of participants.

Engagement with brief mindfulness exercises (e.g., 3-minute breathing space) followed a similar trajectory across studies. Initial moderate participation consistently diminished during follow-ups, with particularly marked decreases in weekly practice frequency observed in Study 3.

Informal mindfulness practice demonstrated somewhat greater sustainability. While Studies 2 and 3 both recorded gradual declines in weekly engagement, the reduction was less substantial than with formal practice. Some participants maintained consistent informal practice throughout follow-up periods. Lastly, when considering total mindfulness practice time, including all forms of engagement, all studies showed declining practice time during follow-up, though the pattern was less pronounced for informal compared to formal practice.

Discussion

The present study aimed to describe the methods used to assess homework adherence in recent studies evaluating mindfulness interventions for FSD (Brotto et al., 2019, 2021, 2024) and to provide recommendations for the use and development of homework adherence measures in future research. The main findings suggest that all studies assessed participants' engagement with mindfulness practices both during and after treatment with MBCT, using measures such as the total time spent on mindfulness practice (in minutes per week). Each study evaluated adherence during the treatment phase, often via self-reported completion of assigned exercises or homework practices. All studies tracked changes in practice over time, typically at immediate post-treatment and at follow-ups (6 months, with some extending to 12 months). Also, there is a common focus on quantifying both the frequency (days per week) and the duration (minutes per week) of formal meditation, brief mindfulness exercises (e.g., 3-minute breathing space), and informal mindfulness practices.

There were methodological differences in how the studies assessed homework completion. While Study 1 primarily relied on self-reported adherence to homework assignments and overall practice engagement, Study 2 provided a more detailed breakdown by separately quantifying time spent on formal meditation, brief mindfulness exercises, and informal mindfulness practices, and Study 3 combined self-reported measures with a standardized quantitative metric—the counted number of mindfulness exercises completed—to assess adherence. Moreover, while all studies measured overall practice time, only some reported specific metrics like the number of days per week of formal meditation or self-check-in practices, and the frequency of individual exercises (e.g., the total number of times a 3-minute breathing space was practiced). In addition, Studies 1 and 2 tracked adherence at both 6- and 12-month follow-ups, whereas Study 3 only extended its follow-up until 6 months post-treatment. As such, in Study 3 it is unknown whether practice continued with the same frequency, or if it declined (as in Studies 1 and 2).

Moreover, although participants consistently engaged in mindfulness practices during and after treatment, adherence tended to decline over time across most measures. While all studies prioritized the assessment of overall engagement and adherence throughout treatment phases, they differed in methodological approaches, the specificity of the measures employed, and the duration of post-treatment follow-up.

The variability in adherence measurement observed across studies highlights a critical gap in the current assessment of homework compliance in FSD. While several ad hoc or partially validated tools have been used to capture adherence, there is still no widely accepted or fully validated instrument for this purpose (Bonato et al., 2024b; Kazantzis et al., 2017).

Several factors may contribute to the observed decline in homework adherence after treatment ended. Participant burden, including the perceived time commitment and complexity of exercises, can reduce engagement, especially when balancing other life responsibilities (Ryum & Kazantzis, 2024). Additionally, the perceived relevance or meaningfulness of homework tasks may influence motivation, with participants less likely to continue exercises they consider less applicable to their daily experiences. Relational factors, such as the quality of guidance from therapists, group cohesion, and feedback on homework completion, may also impact adherence (Ryum et al., 2024). On the other hand, it is also possible that participants perceived an improvement in their sexual health and thus did not deem ongoing homework practice to be necessary. These trends are consistent with broader psychotherapy adherence research, which indicates that sustained

engagement requires not only clear instruction and rationale but also ongoing support and reinforcement (Bonato et al., 2024a; Ryum et al., 2024; Ryum & Kazantzis, 2024). Recognizing these potential barriers is essential for both clinical practice and research, as they inform strategies to enhance adherence and optimize treatment outcomes.

Considering these potential barriers highlights the importance of developing standardized and sensitive measures to capture homework adherence accurately. Our study contributes to this discussion by identifying specific items that could inform the development of a comprehensive psychometric instrument for tracking homework adherence in MBCT protocols to treat FSD.

Items used in our reviewed studies and recommendations for future research

The items used in Studies 1 and 2 were developed or adapted based on the MBCT Adherence Scale (Segal et al., 2002). The items were adapted because the original instrument focuses only on evaluating the therapist's delivery and review of homework assignments that complement in-session treatment. This instrument does not assess whether the patient completed the homework but rather examined how the facilitator communicated the treatment rationale and instructed group participants. The MBCT Adherence Scale evaluates aspects such as group cohesion, provision of treatment rationale, adherence to mindfulness skills, the organization of the home practice setting, the thorough review of home practice, adherence to the treatment modality, and commitment to practice. In sum, the scale measures the fidelity of the therapist's role in conveying and reinforcing homework practices, rather than directly monitoring patient compliance.

Recognizing this limitation, this scale was adapted for these three studies in order to capture group participants' perspectives. In Study 1, for example, participants were asked: (i) overall, to what degree were you able to complete your homework assignments? and (ii) overall, since the last group session, to what degree have you been able to practice the skills and exercises you learned in the group? Each item was rated on a 5-point Likert scale from 0 (not at all) to 4 (high degree). In Study 2, the adaptation was further refined by quantifying the total weekly minutes spent on formal meditations, three-minute breathing space exercises or mindful check-ins, and informal meditations. This adaptation shifts the focus from evaluating therapist fidelity to assessing patient engagement with recommended homework.

The items in Study 3 were based on those from Studies 1 and 2, with some adaptations and additions. These modifications aimed to refine and expand the assessment of homework conducted in previous studies. Similar items were used, but with more detailed wording, providing explanations and examples of formal and informal meditation rather than simply asking for the number of minutes spent on each practice, as was done in Study 2. Additionally, items similar to those in Study 1 were included to assess the quantity and percentage of exercises completed by participants.

The modifications across studies reflect the ongoing refinement of methods to assess mindfulness practice adherence. These methodological developments suggest that both formal and informal practices may yield varying adherence patterns warranting differentiated measurement approaches.

Moreover, the items used to measure homework completion differed not only in structure (e.g., Likert scale, number of minutes or days) but also in the topics measured. Although Study 3 included more items, it did not assess some relevant aspects from the previous studies, such as the overall degree to which participants complete homework assignments. While the frequency and duration of homework are evaluated, measuring overall adherence on a Likert scale is also important, as participants may struggle to accurately recall the number of days or minutes they practiced over weeks or months (Boateng et al., 2018; Nunnally, 1994).

Recommendations

This study also brings some recommendations regarding the assessment of homework adherence in future research:

For researchers

1. Assess both frequency and duration of homework practice in psychological and mindfulness-based treatment studies. Different methods of assessing duration per week (e.g., total weekly minutes spent on formal or informal meditation) provide valuable insights into the most suitable measures based on specific MBCT designs and instructions. If participants struggle to differentiate between formal and informal practice, assessing total mindfulness minutes may be more practical (Nunnally, 1994).
2. Use validated self-report instruments whenever possible. Studies using both client self-reports and therapist evaluations report greater effect sizes than those relying solely on therapist assessments (Mausbach et al., 2010). This is particularly relevant because many current mindfulness-based intervention studies lack validated instruments, especially for female sexual dysfunction (FSD) interventions (Bonato et al., 2024b; Vettese et al., 2009).
3. Develop and validate new psychometric instruments specifically for homework adherence in MBCT interventions for FSD. A recent review of 30 MBCT studies addressing FSD found that only nine assessed homework adherence, with six relying on ad hoc measures and three using instruments with limited psychometric validation (Bonato et al., 2024a). Existing tools, such as the MBCT Adherence Scale (Segal et al., 2002) and the Homework Rating Scale (Kazantzis et al., 2005), have been adapted for use in the FSD field but lack broad validation. Given the strong relationship between homework adherence and treatment outcomes (Kazantzis et al., 2017), developing standardized instruments is crucial.
4. Address methodological limitations in homework adherence measurement, including reliance on therapist reports and lack of standardized instruments.
5. Consider statistical methods appropriate for longitudinal data, such as trend analysis or repeated-measures approaches, to complement descriptive analyses and capture changes in adherence over time.

For clinicians

1. Provide a clear rationale for each homework exercise, emphasizing its relevance to treatment outcomes.
2. Offer structured options for formal and informal mindfulness exercises, allowing patient choice to enhance engagement.
3. Encourage documentation of practice via manuals, logs, or digital tools.
4. Monitor adherence using practical metrics, combining Likert scales (to capture perceived engagement) with frequency-based measures (e.g., number of days or minutes practiced per week) (Boateng et al., 2018; Masters, 1988; Nunnally, 1994).
5. Adjust and tailor homework assignments based on patient feedback and observed adherence patterns to optimize engagement.

For instrument developers

1. Ensure new instruments capture both formal and informal practices, total minutes, and overall adherence perception.
2. Select appropriate response scales for adherence measures. The choice between Likert scales and continuous frequency scales should be guided by the study's objectives and the nature of the data being measured (Masters, 1988). Likert scales offer a straightforward approach for attitudes and perceptions, whereas continuous frequency scales provide more precise behavioral data but may introduce recall bias. A combined approach may be advantageous, with Likert scales capturing intensity and continuous scales measuring frequency (Boateng et al., 2018; Nunnally, 1994).

3. When employing mixed response formats, apply appropriate validation methods, such as Principal Component Analysis (PCA) or Partial Credit Scoring (PCS) (Greenacre et al., 2022; Masters, 1988). PCA is useful for identifying underlying factors when integrating different response types, while PCS is particularly suited for modeling ordinal and continuous responses.
4. Apply a systematic roadmap for instrument development (Boateng et al., 2018; Nunnally, 1994), including:
 - a. Item generation based on literature review and expert consultation
 - b. Pilot testing to ensure clarity and relevance
 - c. Assessment of reliability (e.g., internal consistency, test-retest) and validity (content, construct, criterion)
 - d. Refinement through exploratory and confirmatory factor analysis
 - e. Validation across diverse populations and treatment settings
6. Ensure instruments are sensitive enough to detect changes over time and suitable for both research and clinical monitoring purposes.

Strengths and limitations

The current study adds to the literature on psychological treatments for FSD given its focus on homework measurement, and its recommendations for future studies. These recommendations may contribute to the development of a robust psychometric instrument for assessing homework adherence in the field of FSD. The 3 studies reviewed were methodologically strong, well powered, and made good efforts to report on homework completed in the publications. This approach allows for longitudinal monitoring of homework completion, including follow-up assessments of up to 12 months. Additionally, the studies progressively refined their measurement methodologies, ranging from subjective self-perception of homework completion (Study 1) to a combination of self-report and standardized quantitative metrics (Study 3). This methodological evolution enables a more comprehensive understanding of adherence patterns to mindfulness home exercises.

There are some limitations worth considering. The methodological variability among the studies makes a direct comparison of results challenging. Moreover, the instruments used are not widely validated, and the lack of consensus on the best way to assess adherence compromises the reliability of the measurements. Furthermore, the lack of a clear distinction between formal and informal practices in study 1 limits the understanding of the differential impact of these approaches on treatment outcomes.

Also, despite the progressive refinement of measurement methods, the studies did not consistently assess overall adherence to homework practices using Likert scales. This poses a challenge, as participants may struggle to accurately recall the frequency and duration of their practices over time. Additionally, we did not assess participants' perceptions of the assigned homework, which may introduce bias, particularly given recent evidence indicating that participants expressed complaints about the amount assigned homework, potentially contributing to a decline in completion rates after a few weeks (Sears et al., 2023). This may explain why adherence tended to decrease overtime across most measures in our studies.

Another important limitation is the lack of diversity in the samples across all three studies, which predominantly included White/Euro-Canadian women. This homogeneity limits the generalizability of the findings to other racial, ethnic, or cultural groups. Future research should aim to include more diverse populations to better understand homework adherence patterns and the applicability of MBCT interventions for FSD across different demographic groups.

Finally, it should be noted that the present study is based on secondary analyses of preexisting datasets from three randomized trials. While this allowed for a detailed examination of

homework adherence, it limits the generalizability of the findings, as other MBCT studies may differ in design, population, or reporting of homework adherence. In addition, the study employed only descriptive analyses, reflecting the heterogeneity of homework items across studies and the primary aim of summarizing adherence patterns rather than testing causal hypotheses. More advanced statistical methods, such as longitudinal trend analysis, could be applied in future research if standardized, validated homework adherence measures are available. Lastly, the absence of validated instruments for measuring adherence to mindfulness practices is also a significant limitation, highlighting the need for the future development of more robust scales.

Conclusion

This study analyzed the methods used to assess adherence to homework from three studies evaluating MBCT for FSD. The findings indicate that, although all studies prioritized the assessment of adherence throughout treatment and follow-up, substantial differences exist in the methodological approaches employed. These differences reflect both the evolution of measurement strategies and the lack of consensus on the best instruments to evaluate adherence to homework practices.

This study highlights the need for developing standardized and fully validated measures for assessing patient adherence to homework. Existing ad hoc instruments provide some workable data, but more robust tools are required to facilitate reliable cross-study comparisons and to better understand the role of homework completion in the effectiveness of mindfulness-based interventions for FSD. Additionally, our study identifies specific items that could inform the development of a psychometric instrument for tracking homework adherence.

Future efforts should focus on developing validated instruments that consider both the therapist's and the patient's perspectives, thereby reducing the reliance on subjective therapist perceptions. Additionally, further research is needed to investigate the differential impact of formal and informal practices on homework completion and therapeutic outcomes. Standardizing measurement approaches would facilitate better comparisons across studies and contribute to a more precise understanding of the role of homework completion in the effectiveness of mindfulness-based interventions for FSD.

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Authors' contributions

Fernanda Rafaela Cabral Bonato: conceptualization (equal); investigation (equal); methodology (equal); validation (equal); writing—original draft (equal); writing—review & editing (equal). Nicolas de Oliveira Cardoso: formal analysis (equal); methodology (equal); supervision (equal); writing—original draft (equal); writing—review & editing (equal). Lori A. Brotto: conceptualization (equal); methodology (equal); project administration (equal); supervision (lead); validation (equal); visualization (equal); writing—original draft (equal); writing—review & editing (equal).

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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