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The Effect of Postmenopausal Therapeutic Interventions on Sexual Function: a Meta-analysis Study

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ABSTRACT

Aim: The purpose of this study is to identify how therapeutic interventions after menopause affect sexual function.

Methods: For this study, research was conducted by screening studies in PubMed, Web of Science, EBSCOhost, Google Scholar, and YOK Thesis Center databases from May to July 2024. After reviewing the studies, five studies were included in the meta-analysis. The quality assessment of the studies was conducted using a quality assessment tool prepared by The Joanna Briggs Institute, according to Randomized Controlled Trials and Quasi-Experimental design studies. CMA Version 2 was used for data synthesis. The data were synthesized using meta-analysis and narrative synthesis methods.

Results: According to the results of the meta-analysis, therapeutic interventions applied during the postmenopausal period were found to not be effective on sexual function (SMD: 1.056, 95% CI: -0.171 to 2.282; Z= 1.686, p = 0.092, I2= 97.827%). These findings indicate that, when all intervention types are evaluated together, there is no statistically significant overall improvement in postmenopausal sexual function and that the results are highly heterogeneous across studies. However, subgroup analyses revealed that pelvic floor muscle training (PFMT) demonstrated a strong and statistically significant positive effect on sexual function in women with sexual dysfunction ($p < 0.000$), suggesting that the effectiveness of interventions varies according to intervention type. From a clinical perspective, this finding indicates that PFMT may represent a practical and targeted non-pharmacological option for improving sexual function in postmenopausal women, despite the absence of a significant overall pooled effect.

Conclusion: While pelvic floor muscle training (PFMT) appears to be a promising intervention for improving postmenopausal sexual dysfunction, this finding is based on limited evidence and should be interpreted with caution. Given the variability in intervention types and study quality, further high-quality randomized controlled trials are needed to evaluate the comparative effectiveness of PFMT and other therapeutic approaches, as well as their potential combinations, in order to establish more definitive conclusions.

Keywords: Menopause, therapeutic intervention, sexual function, pelvic floor muscle training, meta-analysis

Introduction

Menopause is a process characterized by hormonal and physical changes in women's bodies [1]. Sexual problems are common throughout life, but women going through menopause are more sensitive to such disorders and have a higher risk of experiencing sexual dysfunction

during this period [1,2]. Sexual function is a multidimensional concept encompassing cognitive and physiological elements of sexuality, including desire, arousal, and fantasies [3]. The World Health Organization defines sexual dysfunction as the inability of an individual to engage in sexual intercourse as desired. Sexual health contributes to personal well-being and interpersonal relationships by promoting harmony between the mind, emotions, and body [4]. Sexual dysfunction refers to psychophysiological disorders that cause a significant decrease in sexual desire and arousal, negatively affecting individuals' lives and being among important sexual health problems [5]. Sexual dysfunction can significantly affect social relationships and overall quality of life, thereby creating a need for the development, evaluation, and dissemination of effective treatment approaches [6].

Costello et al. reported a prevalence of sexual dysfunction in half of postmenopausal women, and stated that the frequency of these problems increases with age [7]. In a survey conducted in six European countries, one third of the participants stated that they experienced a loss of libido during menopause, while more than half expressed a decrease in sexual desire [8]. Sexual problems experienced during menopause are often perceived as highly personal and distressing and may have socially and physically disruptive consequences. In addition, these problems reduce women's self-confidence, lead to stress, problems in relationships, and divorces, and create barriers such as fear of stigma, feelings of shame, and discomfort related to sexuality in the use of current treatments [9].

Significant changes can occur in women's sexual lives during the menopausal period. It is known that approximately 47% of women aged between 65 and 71 are still sexually active, highlighting the continued importance of sexual health in later life. However, a decline in sexual activity is frequently observed in this age group. The main causes include genital atrophy and dryness, decreased muscle tone, pain associated with chronic diseases, psychosocial problems, stroke, and side effects of medications [10]. Increased vaginal tissue sensitivity may also result in bleeding during sexual intercourse. Changes such as a reduction in uterine volume and atrophy of breast tissue are also characteristic features of this period [11]. Therefore, supporting access to a healthy sexual life for women in the menopausal and postmenopausal periods is of great importance for maintaining both physical and psychosocial well-being [10].

There is a strong connection between psychosocial factors and sexual dysfunction, therefore cognitive therapies and sex therapies play an important role in the treatment of sexual dysfunction [12]. These approaches aim to provide individuals with accurate and sufficient information about sexuality and to address maladaptive beliefs and emotional responses. Lack of sexual knowledge can lead to the emergence of false beliefs, feelings of guilt, and excessive anxiety in individuals, paving the way for the development of sexual problems. Accordingly, educational, cognitive, and psychosocial interventions are considered essential components of comprehensive sexual health care, alongside physiological treatments [13].

To date, there is limited meta-analytic evidence specifically focusing on the effects of therapeutic approaches on sexual function in menopausal and postmenopausal women. This study aims to address this important gap by providing a comprehensive synthesis of the available evidence. As a meta-analysis addressing this specific topic, the study offers an integrated evaluation of therapeutic interventions and underscores the importance of developing effective strategies to improve sexual health and quality of life in postmenopausal women.

The hypotheses of the study

H0 (Null Hypothesis): Therapeutic interventions in the postmenopausal period have no significant effect on women's sexual function.

H1 (Alternative Hypothesis): Therapeutic interventions in the postmenopausal period improve women's sexual function.

Methods

This study is a meta-analysis conducted in accordance with the PRISMA checklist (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols, PRISMA Checklist) [14]. To minimize bias in the study, four researchers (A.Ç; S.Y; N.Ö; Y.Ç.B) independently conducted the literature review, article selection, and data extraction processes. Each phase of the review was performed independently by individual reviewers to ensure objectivity and reliability. Afterward, the decisions were reviewed and any discrepancies were resolved through consensus among the researchers. Furthermore, the number of times each record was screened and the specific reviewers involved at each stage were documented to provide transparency. The studies included in the meta-analysis were rigorously assessed for quality by the same researchers, ensuring the validity of the results.

Population (P): Women in the postmenopausal period.

Intervention (I): This meta-analysis included three clearly specified therapeutic interventions: education-based programs, pelvic floor muscle training, and motivational interviewing, each aimed at improving sexual function in postmenopausal women.

Comparison (C): Groups receiving no therapeutic intervention.

Outcomes (O): Sexual function outcomes, including standardized measures and variability indicators (e.g., SD, 95% CI).

Study design (S): Experimental and quasi-experimental studies published in Turkish and English.

Exclusion Criteria: Letters to the editor, qualitative studies, case reports, case presentations, and studies of systematic and traditional review nature were excluded from this research. Only studies that included postmenopausal women were eligible for inclusion in this meta-analysis. Studies focusing on premenopausal or perimenopausal participants were excluded to maintain homogeneity in the study population.

Search Strategy

A search was conducted between February and June 2024 using the keywords ((((((((menopause) OR (climacteric))) OR (postmenopausal)) OR (postmenopausal women)) AND (sexual function)) AND (sexual dysfunction)) OR (dyspareunia)) OR (dyspareunia) in PubMed, Web of Science, EBSCOhost, YOK National Thesis Center, and Google Scholar, and the studies were transferred to Mendeley. No year limit has been set in the literature review.

Selection of Studies

After the screening process, initially 6416 records were identified through database searches. Following the removal of 2154 duplicates, 4262 records remained and were screened based on titles and abstracts. At this stage, 4205 studies were excluded for being irrelevant to the research topic. As a result, 57 studies were selected for full-text review. During the full-text assessment, 52 studies were excluded based on the predefined inclusion and exclusion criteria (e.g., studies not focusing solely

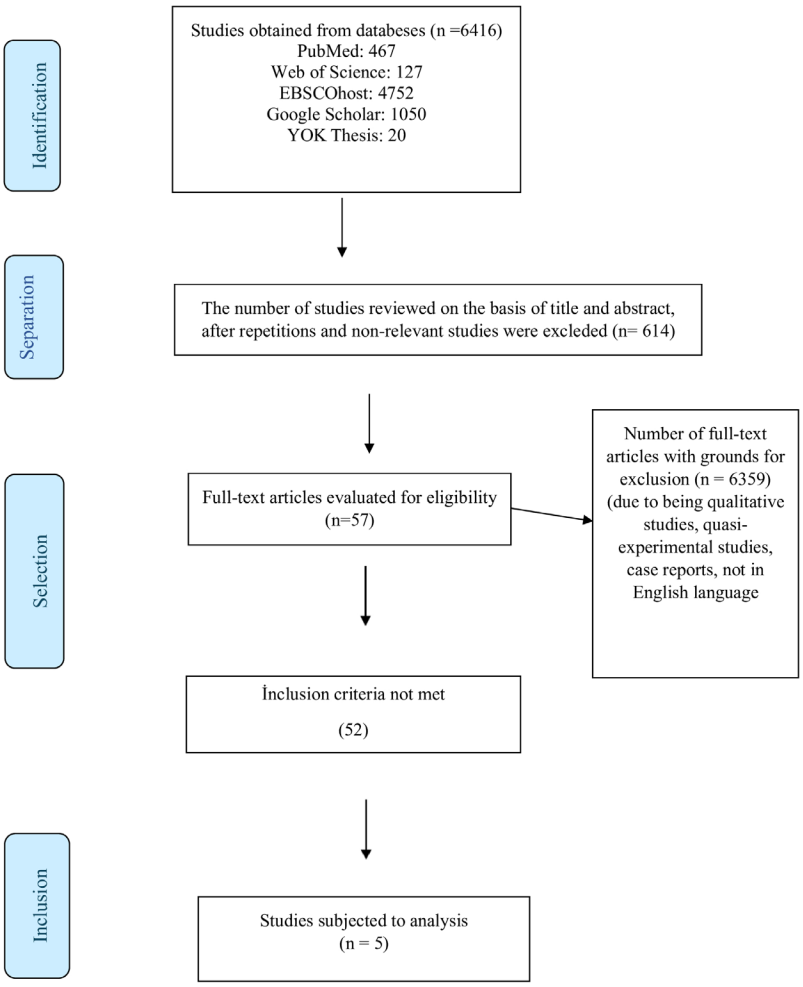

Figure 1 – Selection of studies according to PRISMA flow diagram

on postmenopausal women, lack of therapeutic intervention, or absence of sexual function outcomes). Finally, 5 studies that evaluated the effects of therapeutic interventions on sexual function in postmenopausal women were included in the meta-analysis.

A detailed description of the article selection process is provided in Figure 1.

Data Extraction

Researchers used a data extraction tool they developed specifically for this systematic review and meta-analysis to gather data. The tool was designed in accordance with established methodological recommendations for meta-analytic studies to ensure consistency and reproducibility. This tool allowed for the organized compilation and incorporation of studies in systematic reviews and meta-analyses, collecting data (e.g., intervention and control groups related to the studies, mean post-test scores, and standard deviation values) on authors and publication year of included studies, country in which the studies were carried out, sample size, patient group, scale used in the studies, main results, and quality score (Table 1).

Data extraction was conducted independently by two researchers using the same standardized extraction form. Discrepancies were resolved through discussion, and consensus was achieved. This structured approach strengthened methodological transparency and enhanced the reproducibility of the study.

Ethical Principles

This study was conducted as a meta-analysis based on research published in the literature.

Evaluation of the Methodological Quality of Studies

The methodological quality of the studies included in the meta-analysis was evaluated using the quality assessment tool developed by the Joanna Briggs Institute (JBI) for randomized controlled trials, consisting of 13 questions [15] and the quality assessment tool developed for quasi-experimental studies consisting of 9 questions [16]. The questions in this evaluation tool were answered with "Yes," "No," "Uncertain," and "Not Applicable" options. Two researchers independently evaluated the methodological quality of the studies and the results for all studies included in the meta-analysis were determined through discussion. The evaluation results of each study were presented as "Quality Score" in Table 1.

Data Synthesis

In this study, we used Comprehensive Meta-Analysis (CMA) Ver. 2 software for statistical analysis. Heterogeneity between studies was assessed using the Chi-square test and Higgins I^2 statistic. An I^2 value above 50% was seen as a significant indicator of heterogeneity. Studies with $I^2 \leq 50\%$ and p-value $> .1$ were examined using a fixed effects model, while studies with $I^2 > 50\%$ and p-value $> .1$ were assessed using a random effects model [17]. Furthermore, the Tau-squared (τ^2) statistic was used to analyze the variance and heterogeneity between

Table 1 Characteristics and Results of the Included Studies

Author/Year	Study Design	Sample size	Scale	Type of Therapeutic intervention	Patient population	Quality Score
Jalambadani et al. 2017 [19]	Quasi-experimental	Experimental group:90 Control group:90	Female Sexual Function Index (FSFI)	Education	Sexual dysfunction	Yes:8/9 No:0/9 Uncertain:1/9
Kamalak and Aksoy Derya 2023 [20]	Randomized Control	Experimental group:68 Control group:81	Female Sexual Function Index (FSFI)	Motivational interview	Sexual dysfunction	Yes:11/13 No:1/13 Uncertain:0/13 Not applicable:0/13
Mohammadi et al. 2024 [21]	Quasi-experimental	Experimental group:44 Control group:44	Female Sexual Function Index (FSFI)	Education	Sexual dysfunction	Yes:8/9 No:0/9 Uncertain:1/9
Nazarpour et al. 2017 [22]	Randomized Control	Experimental group:48 Control group:50	Female Sexual Function Index (FSFI))	Education	Sexual dysfunction	Yes:10/13 No:2/13 Uncertain:1/13 Not applicable:0/13
Nazarpour et al. 2018 [3]	Randomized Control	Experimental group:47 Control group:50	Female Sexual Function Index (FSFI)	Pelvic Floor Muscle Training	Sexual dysfunction	Yes:10/13 No:2/13 Uncertain:1/13 Not applicable:0/13

studies in more detail. To compare effect sizes obtained using different measurement tools, the standardized mean difference (SMD) with a 95% confidence interval (CI) was utilized. Forest plots were generated to display effect sizes with 95% CI, and the average of SMD values was computed to determine the overall effect size. The average D value was transformed into a Z score to assess its statistical significance. Funnel plots were employed to investigate and display publication bias, and any asymmetries in the funnel plot suggested potential publication bias. Additionally, Egger's test was used to objectively evaluate publication bias. Two-tailed p-values were calculated for all statistical analyses, with a significance level of 0.05 considered [18].

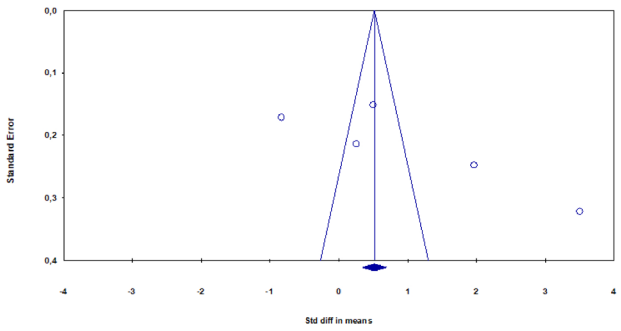

Figure 2 – Funnel plots of the studies

Results

Three of the studies included in the work were conducted in a randomized controlled experimental design, while two were conducted in a semi-experimental nature. The total sample size of the studies consists of 297 participants in the intervention group and 315 participants in the control group, totaling 612 participants (Table 1).

It has been determined that more than 50% of the items of the evidence quality assessment tool are met by all studies included in the meta-analysis (Table 1). This finding is important in terms of showing that the information presented in the meta-analysis is based on studies with an acceptable level of evidence quality.

Meta-Analysis Results of The Studies

In this study, we determined whether there is publication bias using (a) funnel plot (Figure 2) and (b) Egger's Regression Test [23].

In this dataset, the intercept (B0) obtained using the Egger method is calculated as 19.08976, with a 95% confidence

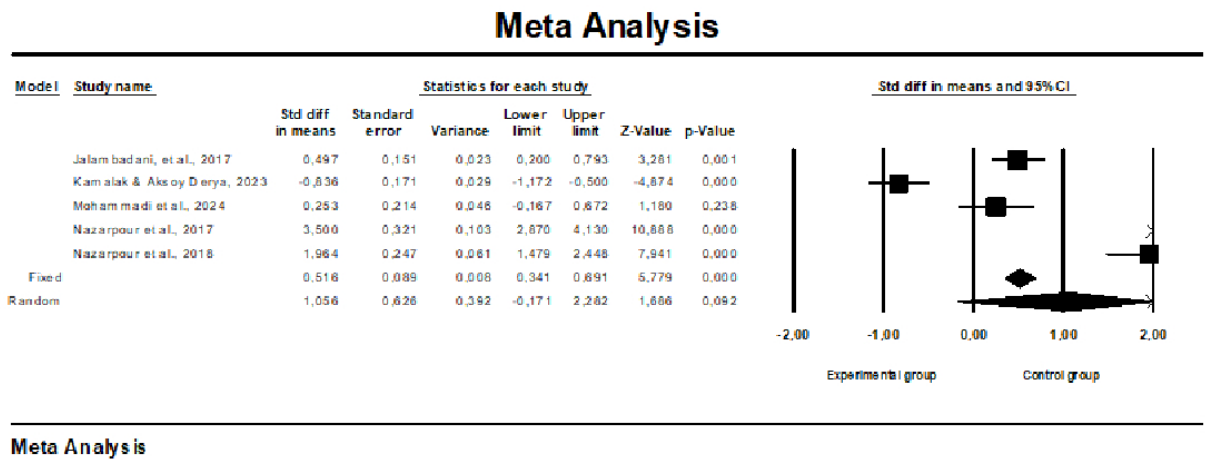

Figure 3 – Forest graph related to studies

Table 2 Moderator Results on the Effect of Therapeutic Interventions Applied to Women with Sexual Dysfunction in the Postmenopausal Period

Moderator	The number of studies	Effect size	Standard error	Lower limit	Upper limit	p
Type of therapeutic intervention						
Education	3	0.891	0.467	-0.024	1.807	0.056
Motivational interview	1	-0.836	0.171	-1.172	-0.500	<0.001
Pelvic Floor Muscle Training	1	3.500	0.321	2.870	4.130	<0.000
Total	5	0.197	0.144	-0.085	0.479	0.170

interval ranging from -8.85373 to 47.03326. The calculated t value is 2.17411, degrees of freedom (df) is 3, and the two-tailed p value is 0.11800. These results indicate that publication bias is not statistically significant (p = 0.11800).

Three randomized controlled trials (RCT) with 612 participants, and 2 quasi-experimental studies measured post-intervention sexual function scores using the Female Sexual Function Index (FSFI) [3,19,20,21,22]. The meta-analysis based on the findings of these studies (SMD: 1.056, 95% CI: -0.171 to 2.282; Z= 1.686, p = 0.092) supports that therapeutic interventions in the postmenopausal period do not have a statistically significant effect on sexual dysfunction. Additionally, a high level of heterogeneity was found among the studies (I2= 97.827) (Figure 3).

The average effect size values of the therapeutic intervention applied in the study were found to be 0.197 (CI -0.085 to 0.479, p>0.05). This result indicates that it is not statistically significant. However, the effect of PFMT is quite high (3.500) and the p-value is significant (p < 0.000), which shows that pelvic floor muscle exercises have a strong effect (Table 2).

Discussion

In this study, our goal was to assess the impact of therapeutic interventions on sexual function in postmenopausal women. In line with the study hypotheses, the overall findings indicated that therapeutic interventions did not lead to a statistically significant improvement in sexual function, thereby supporting the null hypothesis (H0) and not fully confirming the alternative hypothesis (H1). Our findings indicated that, in general, therapeutic interventions were not effective. The overall effect size for the sexual function variable was determined to be Cohen's d = 1.056 (high level). However, further analysis revealed that pelvic floor muscle training (PFMT) had a stronger effect compared to other interventions, and this difference was statistically significant. This finding suggests that while H1 was not supported for therapeutic interventions as a whole, it was partially supported in the context of PFMT as a specific intervention. These results suggest that PFMT may be a more effective approach to improving sexual function in postmenopausal women.

Importantly, the discrepancy between the non-significant overall pooled effect and the strong positive effect observed in the PFMT subgroup indicates that the effectiveness of therapeutic interventions is highly dependent on intervention type. When interventions with low or inconsistent effects are combined with PFMT in the overall analysis, the pooled estimate may fail to reach statistical significance despite the presence of a highly effective subgroup.

The ineffectiveness of some interventions highlights the need for further research to explore why certain therapeutic approaches did not yield positive outcomes. The rejection of H1 at the overall level may be explained by the heterogeneity of intervention types included in the analysis, particularly education-based programs or motivational interviewing, which may not have been sufficiently tailored to the specific physiological and psychosocial needs of postmenopausal women. In addition, factors such as the duration, intensity, and timing of interventions may have influenced their efficacy.

The very high level of heterogeneity observed in this meta-analysis (I^2 = 97.827%) further suggests that the included studies differed substantially in terms of intervention content, implementation strategies, and outcome assessment methods, which may have diluted the overall pooled effect. Such extreme heterogeneity indicates that the pooled results should be interpreted with caution, as they likely reflect variability between studies rather than a uniform intervention effect.

Even though initial treatment approaches for sexual dysfunction related to menopause concentrate on factors that can be changed, there are currently numerous hormonal and non-hormonal, local and systemic treatment options accessible. However, the partial support of H1 observed for PFMT underscores the importance of incorporating physical and function-oriented interventions into holistic treatment models, as evidenced by the stronger effect of PFMT in our study. Treatment should be individualized taking into account the severity of symptoms, potential side effects, and personal preferences [24]. In a randomized controlled study by Stojanovska and colleagues [25] evaluating the effectiveness of exercise on menopausal symptoms, it was reported that exercise had positive effects on sexual symptoms. In a meta-analysis examining the effects of exercise on quality of life in women with menopausal symptoms, the most common interventions for menopausal and urinary symptoms were determined to be yoga and PFMT, respectively. These findings support the importance of physical interventions like PFMT, which were found to be more effective in our study as well.

The apparent contradiction between the strong effect of PFMT and the non-significant overall effect of therapeutic interventions can be explained by the relatively low or inconsistent effects observed in non-PFMT interventions, such as education-based or motivational approaches, which may have contributed to the attenuation of the pooled estimate. Therefore, the overall non-significant result should not be interpreted as evidence that all therapeutic interventions are ineffective, but rather that intervention-specific effects must be considered when interpreting meta-analytic findings.

Although studies have reported that therapeutic interventions alleviate vasomotor symptoms and are effective in improving overall menopausal symptoms [26,27], they do not appear to have the same positive effects on sexual function during the postmenopausal period. This discrepancy further supports the acceptance of H0 for general therapeutic interventions in relation to sexual function outcomes. A possible reason for this may be that such interventions are generally not initiated during the premenopausal or early menopausal stages. Since sexual dysfunction in the postmenopausal period is influenced

by long-term hormonal, physiological, and psychosocial changes, interventions started at a later stage may have limited effectiveness. Therefore, the timing of therapeutic interventions may be a critical factor in achieving meaningful improvements in sexual function during the postmenopausal period.

Limitation of studies

There are several limitations to this meta-analysis. Firstly, the number of available studies evaluating therapeutic interventions for postmenopausal sexual dysfunction is limited, which restricts the breadth of the analysis and the generalizability of the findings. Secondly, a number of the included studies had small sample sizes, potentially reducing the statistical power and reliability of the pooled results. The inclusion of only five studies may also have limited the robustness of subgroup analyses and increased the uncertainty of the estimated effect sizes. Thirdly, the included studies demonstrated considerable clinical and methodological heterogeneity in terms of intervention types, outcome measures, and follow-up durations. This high heterogeneity ($I^2 = 97.827\%$) may have influenced the magnitude and direction of the pooled effect estimates and complicates the interpretation of the overall meta-analytic findings. In addition, although publication bias was assessed using funnel plots and Egger's regression test, the inclusion of only five studies limits the reliability and interpretability of these methods. Therefore, the absence of statistically significant publication bias should be interpreted with caution. Finally, the lack of prior comprehensive meta-analyses in this area limited the scope of the discussion and comparison with earlier evidence.

Conclusion

This meta-analysis suggests that, overall, therapeutic interventions applied during the postmenopausal period do not lead to significant improvements in sexual function. However, subgroup analysis revealed that pelvic floor muscle training (PFMT) demonstrated greater effectiveness compared to other therapeutic approaches. This finding highlights PFMT as a potentially valuable non-pharmacological intervention for postmenopausal women experiencing sexual dysfunction, particularly in clinical settings where safe, low-cost, and accessible interventions are prioritized. Nevertheless, due to the limited number of studies and the substantial heterogeneity among them, these results should be interpreted with caution. From a clinical perspective, the findings suggest that interventions targeting pelvic floor function may offer more consistent benefits than generalized therapeutic approaches in postmenopausal sexual health management.

In terms of contribution to the existing literature, this meta-analysis provides a comparative synthesis of therapeutic interventions for postmenopausal sexual dysfunction and identifies PFMT as a distinct intervention with a stronger effect size despite the overall non-significant pooled effect. Future research should focus on investigating the methodological limitations and the underlying reasons for the low or inconsistent effects observed in therapeutic interventions other than PFMT, in order to better understand their limited effectiveness and to optimize intervention strategies. Further high-quality randomized controlled trials with larger samples and standardized outcome measures are needed to confirm these findings and guide clinical practice.

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