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The Effect of Body Practices and Physical Exercise on Sexual Function of Menopausal Women. A Systematic Review with Meta-Analysis

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ABSTRACT

Objective: To review randomized clinical trials on Body Practices (BP) and Physical Exercise (PE) in menopausal women and describe their effect on sexual function.

Methods: Searches carried out electronically in five databases, with a temporal criterion of 10 years of publication, from August to September 2022. Methodological quality and risk of bias were assessed using the Cochrane collaboration scale and PEDro (Physiotherapy Evidence Database Physiotherapy Evidence Database) scale score.

Results: The majority of the studies presented a "'low" or "'uncertain" risk of bias. The instruments for assessing sexual function were heterogeneous. Interventions included mindfulness, relaxation hypnosis, Kegel exercises, yoga, and aerobic exercise, and generally lasted 12 weeks. Seven studies were included, of which six made up the meta-analysis, showing high heterogeneity ($I^2 = 94.2\%$; $p < 0.0001$). The analysis of subgroups with BP showed high heterogeneity ($I^2 = 94.2\%$; $p < 0.01$); interventions with PE presented more favorable results ($I^2 = 0\%$; 0; $p = 0.90$); the sexual function instruments showed high heterogeneity ($I^2 = 90\%$; $p < 0.01$); and instruments of quality of life and menopausal symptoms with domains of sexual function presented favorable results for BP and PE ($I^2 = 0\%$; $p = 0.63$). The funnel chart presents the studies in a dispersed manner, which implies publication bias.

Conclusions: Interventions with PE proved to be more efficient compared to BP, however, there are a low number of studies with PE, and those found are limited to aerobic training, without sufficient data on intensity, volume, and frequency. Further studies with PE are needed for the treatment of sexual function symptoms in order to more comprehensively describe their effect.

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Introduction

The climacteric period in a woman's life is characterized by hormonal (Minkin, 2019), physiological (Gracia & Freeman, 2018) and social (Hoga et al., 2015) alterations, and is often associated with changes in and worsening sexual function (Savukoski et al., 2022; Urrunaga-Pastor et al., 2022). With regard to the prevalence and most commonly reported symptoms, dyspareunia (12–45%), poor lubrication (25–30%), hypoactive sexual desire (40–55%), and orgasm disturbances (50%) stand out (Scavello et al., 2019; Simon et al., 2018; von Hippel et al., 2019). Although all these symptoms are related to this period of life, there are still some beliefs and taboos that women lose interest in sex and become asexual after menopause (Moghasemi et al., 2018; Parton et al., 2017). However, sexuality continues to be a very important element for women in middle age, since sexual activity is a marker of health and is related to quality of life (Cea García et al., 2022) and should be encouraged and stimulated by health professionals for this population, with continued searching for therapeutic treatments that are beneficial in these outcomes.

A cross-cultural study investigated the experiences of menopause symptoms, beliefs, attitudes,

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and therapies, and pointed out that women have limited understanding of the risks and benefits of therapies, requiring culturally appropriate education (Sayakhot et al., 2012). Non-drug therapies, highlighting alternative treatments (yoga, hypnosis, and others) and lifestyle changes (diet and exercise), have been studied for the population of menopausal women in the treatment of deleterious climacteric symptoms, with randomized clinical trials pointing to beneficial effects on somatic, psychological, and sexual symptoms (Carcelén-Fraile et al., 2022; Hao et al., 2021; Hettchen et al., 2021; Khoshbooii et al., 2021; Lu et al., 2020).

However, it should be noted that sexual function can worsen with advancing menopause. Genitourinary Syndrome of Menopause (GMS) affects around 27–84% of women, and consists of uncomfortable symptoms due to physical alterations caused by hypoestrogenism. In contrast to vasomotor symptoms that disappear over time, the symptoms of GMS evolve persistently and progressively (Mili et al., 2021; North American Menopause Society, 2020). That said, reviewing randomized clinical trials is an attractive proposition, in order to synthesize these findings and provide more concrete data in clinical decision-making and in directing future studies, particularly given the great impact that sexual dysfunction can have on the quality of life of menopausal women, affecting relationships, causing frustration and anguish, and possibly leading to anxiety and depression. Thus, although it is clear that sexual function can be improved after body practices and systematic physical exercise interventions, the type, intensity, and duration of these interventions are still uncertain. Therefore, the current systematic review with meta-analysis aims to review randomized clinical trials on body practices and physical exercise in menopausal women and describe their effect on sexual function.

Methods

Study design

This review was conducted in accordance with the guidelines of the Preferred reporting items for Systematic Reviews and Meta-analysis—PRISMA (Page et al., 2021) and is registered in PROSPERO (International Prospective Register of Systematic Reviews) (Booth et al., 2012) (CRD420223 54446). It is exempt from institutional review approval as it does not involve participation with human beings. The guiding question was formed through the acronym PICOS: What are the effects of body practices and physical exercise on the sexual function of women in menopause?

Search strategy

The search was carried out electronically in five databases (PubMed, SPORTDiscus, CINAHL, Web of Science, and Embase), from August 17, 2022 to September 20, 2022, using the Mesh Terms in Table 1. All titles and abstracts found in the electronic search were analyzed using the Rayyan application, developed by the Qatar Computing Research Institute (Ouzzani et al., 2016) by the researchers (DYF, JBBM, AGL), in a blind and independent way (Supplementary File 1).

Eligibility criteria

Three researchers (DYF, JBBM, AGL) carried out the searches independently in August to September 2022 (August 17, 2022 to September 20, 2022). After removal of duplicates, the titles and abstracts of the studies were evaluated, and in sequence, the articles were read in full, to complete the process of selecting the studies according to the established inclusion criteria. Disagreements were resolved by a fourth researcher (JM). The eligibility criteria for the studies were: (a) menopausal women; (b)

Table 1. Eligibility criteria for inclusion of studies.

		Inclusion criteria	Exclusion criteria
P	Population	menopausal women	Men, diseases women receiving chemotherapy
I	Intervention	Body practices and/or PE	Physiotherapy
C	Comparison	Group control	No control group
O	Outcome	Effects of interventions on SF	No questionnaire for SF
S	Study	Randomized clinical trials	Reviews, transversal, pilots, qualitative

PE: physical exercise; SF: sexual function.

interventions with bodily practices and/or physical exercise; (c) including a control group; (d) use of questionnaires to analyze sexual function; (e) randomized clinical trials; (f) studies in English, Portuguese, and Spanish; and (g) temporal criterion of 10 years of publication (Table 1).

According to the National Consensus on Menopause (Sociedade Portuguesa de Ginecologia, 2021), menopause is defined as the last menstruation after a year of amenorrhea, while the climacteric period involves three phases (pre, peri, and post-menopause), which as a whole can be classified as "climacteric syndrome." For this study, menopausal women were included at any time of the three stages and no specific age group was adopted.

Body practices of stretching, flexibility, dance, yoga, Tai chi, Lian gong, Qigong, meditation, hypnosis, and acupuncture were considered, while for physical exercise, resistance, aerobic, and concurrent training were accepted.

Data extraction

Data were extracted using a structured and predefined model containing the following information: (a) review details (authorship and year); (b) title, (c) objective; (d) sample size, (e) location, (f) journal, (g) impact factor, (h) number of Web of Science citations, (i) funding, and (j) PEDro scale (Physiotherapy Evidence Database).

Methodological quality and risk of bias

To assess the methodological quality of the studies, the Cochrane Collaboration Scale (Higgins et al., 2011) assessed independently by two researchers (DYF, JAM). Any discrepancies were resolved by a third author (JBBM). The following criteria were evaluated: (1) random sequence generation, (2) allocation sequence concealment, (3) participant and investigator blinding, (4) outcome assessment blinding, (5) incomplete results, and (6) selective reports. The graphical presentation of the risk of bias assessment was generated by RevMan V.5.4.1. The studies were also scored using the PEDro scale, independently by two researchers (DYF, ALG). The PEDro scale scores from 0 to 10, where a higher score corresponds to higher quality (Sherrington et al., 2000).

Meta-analysis

To analyze the difference in effect between the intervention and control groups, the score in the post-intervention sexual function questionnaire was used as the primary outcome. For these continuous results, the difference in Means (*M*), Standard Deviations (*SD*), and sample sizes of each group were extracted and calculated as an estimate of effect. When these data were not available, the original authors of the study were contacted to request missing or incomplete information. Higgins and Green's I^2 was used to determine the effect heterogeneity of the studies, using a random effects model with 95% CI (Confidence Interval). I^2 values were interpreted as follows: 0–25% low heterogeneity; 25–50% average heterogeneity; >50% high heterogeneity. When the meta-analysis revealed heterogeneity, subgroup analyses were performed to determine the reason for clinical heterogeneity. Subgroup analyses were performed based on the type of PE (BP/PE), and on the sexual function instrument. The funnel plot method was used to measure publication bias. Forest and funnel data and graphical presentations were performed using R-package Meta (Viechtbauer, 2010).

Results

The initial search identified 1696 studies in the five databases, with no studies found in the gray literature. Of these, 1465 were in PubMed, 47 in SPORTDiscus, 150 in CINAHL, 18 in Web of Science, and 16 in Embase. In total, 56 duplicates were identified, which were excluded before starting the process of reading titles and abstracts. After reading the titles and abstracts, 1620 studies were excluded for not meeting the eligibility criteria. Of these, 22 potentially relevant studies were read in full, of which 15 did not meet the requirements for this study. Finally, seven randomized clinical trials were included, and six studies are part of the synthesis of this meta-analysis (Figure 1).

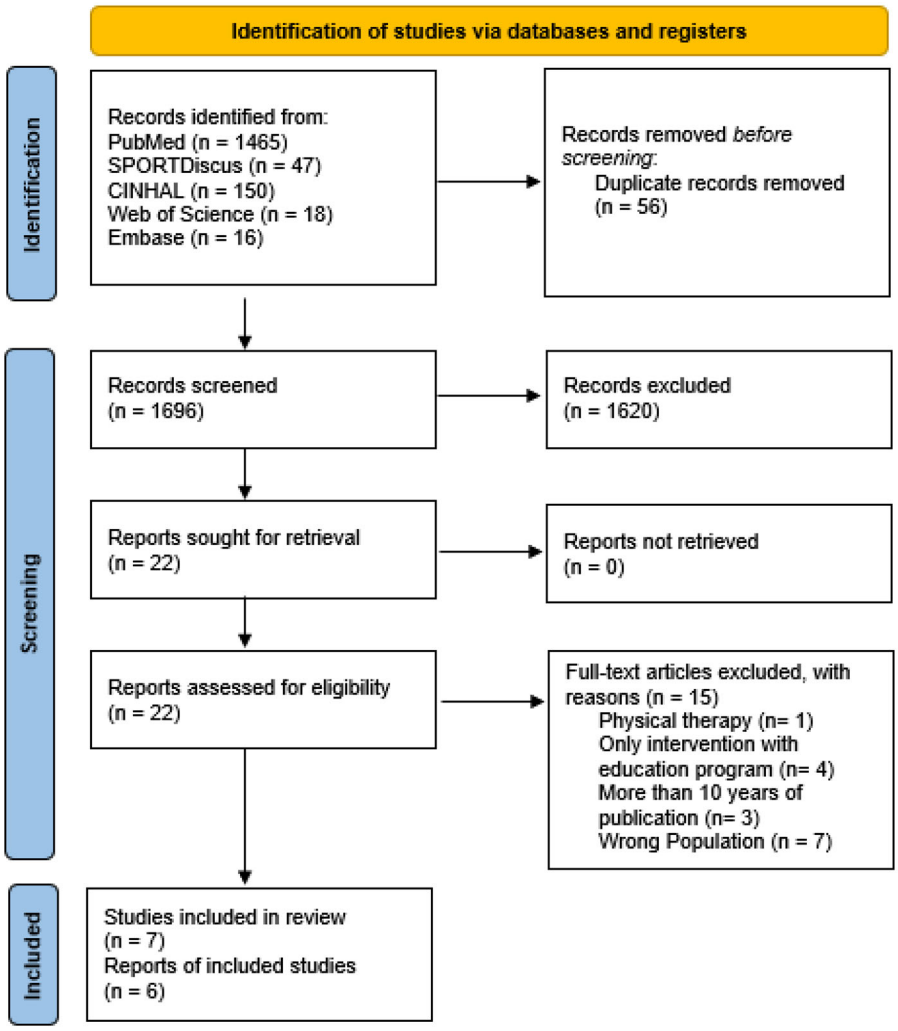

Figure 1. PRISMA flowchart.

Characteristics of the studies

The publication date of the included studies ranged from 2014 (Reed et al., 2014; Zhang et al., 2014) to 2022 (Khosravi et al., 2022), with journal impact factors ranging from 7.611 (Reed et al., 2014) to 0.337 (Johnson et al., 2016). The number of citations of articles on the Web of Science investigated on August 31, 2022 ranged from zero (newly published article) (Khosravi et al., 2022) to 52 (Reed et al., 2014). Considering the location of the studies, three were from Iran (Enjezab et al., 2019; Khosravi et al., 2022; Nazarpour et al., 2017) two from China (Xi et al., 2017; Zhang et al., 2014) and two from the United States (Johnson et al., 2016; Reed et al., 2014). Four studies declared no conflicts of interest (Enjezab et al., 2019; Nazarpour et al., 2017; Xi et al., 2017; Zhang et al., 2014), and three did not report this information (Johnson et al., 2016; Khosravi et al., 2022; Reed et al., 2014) (Table 2).

Population

Sample size of the included studies ranged from 60 (Xi et al., 2017) to 355 participants (Reed et al., 2014). In total, 1127 women were investigated, of which 590 received an intervention and 469 belonged to the control group.

With regard to the classification of menopause, of the seven studies that made up this review, two included women in menopause, one included women in natural menopause in the first 10 years of menopause (mean age 54 years) (Khosravi et al., 2022) and another with an age range of 40–62 years, who were in menopause or in the postmenopausal transition (Reed et al., 2014).

Table 2. Characteristics of the studies included in the systematic review.

Author, year	Title	Objective	N° of participants	Country	Journal	Impact factor	Citations WOS	Funding/support	PEDro
1 Khosravi et al. (2022)	Effectiveness of Kegel exercise and lubricant gel for improving sexual function in menopausal women: A randomized trial	To compare the effectiveness of Kegel exercise and lubricant gel on sexual function in menopausal women	150	Iran	European Journal of Obstetrics & Gynecology and Reproductive Biology	2.831	–	The authors received no financial support for the research, authorship, and/or publication of this article	8 points
2 Enjezab et al. (2019)	The effect of mindfulness-based cognitive therapy on quality of life in perimenopausal women	Determine the effectiveness of MBCT on the quality of life in perimenopausal women	73	Iran	Journal of Mid-life Health	1.15	7	The study was funded by the Shahid Sadoughi University of Medical Sciences in Yazd (grant No.5347)	7 points
3 Nazarpour et al. (2017)	Effects of sex education and Kegel exercises on the sexual function of postmenopausal women: A Randomized clinical trial	Compare two methods of intervention (formal sex education and Kegel exercises) with routine post-menopausal care services in a randomized clinical trial	145	Iran	Journal of Sexual Medicine	3.802	8	Shahid Beheshti University of Medical Sciences	7 points
4 Xi et al. (2017)	Effect of health education combining diet and exercise supervision in Chinese women with perimenopausal symptoms: A randomized controlled trial	Evaluate the effect of health education combining diet and exercise supervision on menopausal symptoms and diet/exercise habits	60	China	Climacteric	3.024	9	This research was funded by the China capital characteristic clinical application research project (No: Z131107002213088).	8 points
5 Johnson et al. (2016)	Hypnotic relaxation therapy and sexual function in postmenopausal women: Results of a randomized clinical trial	Report effects on the secondary outcome of sexual function in the participants of this randomized controlled trial	187	USA	International Journal of Clinical and Experimental Hypnosis	0.337	4	Supported in part by grants to Dr. Elkins from the National Center for Complementary and Alternative Medicine (U01AT004634) National Institutes of Health	6 points
6 Reed et al. (2014)	Menopausal quality of life: RCT of yoga, exercise, and omega-3 supplements	Determine the efficacy of 3 non-hormonal therapies for the improvement of menopause-related quality of life in women with vasomotor symptoms	355	USA	American Journal of Obstetrics & Gynecology	7.611	52	Not reported	8 points
7 Zhang et al. (2014)	Effects of physical exercise on health-related quality of life and blood lipids in perimenopausal women: a randomized placebo-controlled trial	Evaluate the treatment effects of physical exercise on menopausal symptoms in middle-aged female medical staff experiencing perimenopausal syndrome	157	China	Menopause	2.942	21	This research was funded by the Chinese Capital Medical Development Research Foundation (project no. 2009-2020)	6 points

WOS: Web of Science; MBCT: mindfulness-based cognitive therapy; USA: United States of America.

Three studies investigated perimenopause: two of these included women aged 40–55 years with ≥15 points on the Kupperman Index (Xi et al., 2017; Zhang et al., 2014), and the third included women aged 45–55 years, with ≥15 points on the Kupperman Index, and whose menses had become irregular in the last year or at most two years since the last menses (Enjezab et al., 2019). Lastly, two studies included postmenopausal women, one with women experiencing hot flashes in the age range of 39–75 years (Johnson et al., 2016), and another with participants aged 40–60 years with natural menopause, and menopausal for up to 3 years (Nazarpour et al., 2017).

Interventions, control group, duration, frequency, time, and intensity

With regard to the presence of qualified and certified professionals to administer the interventions; three studies did not report whether or not there was training supervision (Johnson et al., 2016; Nazarpour et al., 2017; Xi et al., 2017), in one study supervision was given by a doctor of clinical psychology (Enjezab et al., 2019), in another the exercise was supervised by trained and certified professionals (Reed et al., 2014), and in one study pre-training was given at the beginning of the intervention of 60 min for the Kegel exercise, and 45 min for the lubricating gel group, in a personal way with the participants, including explanations (class) and slides, but the authors did not report which type of professional, and if during the intervention there was supervision or not (Khosravi et al., 2022).

Regarding the interventions; one study investigated the practice of Mindfulness (Enjezab et al., 2019), one relaxation hypnosis (Johnson et al., 2016), two studies included Kegel exercises, one of which had two intervention arms (one exercise group with Kegel and another group with lubricating gel) (Khosravi et al., 2022) and the other, in addition to the Kegel intervention, included a group with sex education (Nazarpour et al., 2017), one study investigated yoga and exercise (cardiovascular conditioning training session) (Reed et al., 2014), one health education combining diet and exercise supervision, in which the type of exercise was not restricted, and participants could choose between dancing, swimming, running, badminton, walking with long strides, or other aerobic activities (Xi et al., 2017), and finally, one study included aerobic exercise (walking with large steps) (Zhang et al., 2014).

In five of the included studies, the control group did not receive interventions and maintained their usual activities (Enjezab et al., 2019; Johnson et al., 2016; Khosravi et al., 2022; Xi et al., 2017; Zhang et al., 2014), in another the participants received general educational material about menopause (Nazarpour et al., 2017), and in another this group maintained their usual activity, and were simultaneously randomly assigned to 1.8 g/day of omega-3 or placebo capsules (Reed et al., 2014).

The durations of the interventions were similar in six studies, with 12-week interventions; only in one study the duration was eight weeks (Enjezab et al., 2019). With regard to frequency, two studies did not report this information (Nazarpour et al., 2017; Reed et al., 2014), two studies reported that the frequency was greater than or equal to three times a week (Xi et al., 2017; Zhang et al., 2014), one study reported a frequency of five times a week (Johnson et al., 2016), one seven times a week (Khosravi et al., 2022), and finally one study reported a frequency of once a week (Enjezab et al., 2019). As for the length of time of the intervention sessions, three studies did not report this information (Johnson et al., 2016; Khosravi et al., 2022; Nazarpour et al., 2017), one study reported 120 min per session (Enjezab et al., 2019), one ≥30 min (Xi et al., 2017), one 30 min (Zhang et al., 2014), and one study included two intervention arms (yoga and exercise) in which the yoga was 90 min per session and the exercise 40–60 min (Reed et al., 2014). Finally, regarding the intensity, four studies did not report this information (Enjezab et al., 2019; Johnson et al., 2016; Nazarpour et al., 2017; Zhang et al., 2014) one study with Kegel exercises included 30 repetitions a day (Khosravi et al., 2022), in another the intensity was 170 BPM of any exercise (Xi et al., 2017), and one study included aerobic exercise, with progression of 50–60% of the HRM in the first month, evolving to 60–70% of the HRM (Reed et al., 2014) (Table 3).

Table 3. Characteristics of the interventions of the included studies.

	Author, year	Type of intervention	Intensity	Duration	Standardized self-rating scales
1	Khosravi et al. (2022)	Kegel exercise and lubricant gel	–	12 weeks (7 days a week with 30 reps 3 times a day)	Sexual function (FSFI)
2	Enjezab et al. (2019)	Mindfulness-based cognitive therapy	–	8 weeks (120 min once a week)	Quality of life (MENQOL)
3	Nazarpour et al. (2017)	Sex education and Kegel exercises	–	12 weeks	Sexual function (FSFI)
4	Xi et al. (2017)	Any physical exercise	Vigorous (170 beats/min)	12 weeks (≥30 min a day, ≥3 days a week)	Menopausal symptoms (KMI)
5	Johnson et al. (2016)	Hypnotic relaxation	–	12 weeks (5 days a week)	Sexual function (SAQ)
6	Reed et al. (2014)	Yoga and exercise	Moderate (yoga: 50–60% first month, 60–70%; exercise: 125–145 beats/min)	12 weeks (yoga: 90 min; exercise: 40–60 min)	Quality of life (MENQOL)
7	Zhang et al. (2014)	Aerobic	Moderate	12 weeks (30 min session, ≥3	Menopausal symptoms (KMI)

FSFI: Female Sexual Function Index; MENQOL: Menopause-Specific Quality of Life; KMI: Kupperman Menopause Index; SAQ: Sexual Activity Questionnaire.

Methodological quality and risk of bias

The studies had an average of 7.14 points on the PEDro scale (Supplementary File 2), with the best score being 8 points (Khosravi et al., 2022; Reed et al., 2014; Xi et al., 2017), and the lowest score 6 points (Johnson et al., 2016; Zhang et al., 2014). The critical point for scoring was in relation to three study blinding items, such as "all subjects participated blindly in the study," "all therapists who administered therapy did so blindly," and "all evaluators who measured at least one key result did so blindly," since, when it comes to an exercise, there is no way to blind these items.

It was observed that the randomized clinical trials included in this study showed a higher risk of bias in relation to "allocation sequence concealment," since the majority were classified as uncertain because they did not present enough information for evaluation. However, the categories with the lowest risk of bias were "incomplete outcome data," which describes whether data related to outcomes are complete for each main outcome, including losses and exclusion from the analysis, and "other sources of bias," which includes any other bias that does not fit in a previous domain of the tool.

Figure 2 illustrates the summary of the risk of bias assessment. On the left (risk of bias graph) an overall risk of bias for each domain is shown, the green color demonstrates the number of studies assessed as low risk, the yellow area as uncertain risk, and the red color as high risk. On the right (risk of bias summary) the risk of bias for each domain in each study is shown.

Tools employed

The instruments used to assess sexual function were heterogeneous, two studies used the Female Sexual Function Index (FSFI) (Khosravi et al., 2022; Nazarpour et al., 2017), two used the Menopause-Specific Quality of Life (MENQOL) (Enjezab et al., 2019; Reed et al., 2014), two the Kupperman Menopause Index (KMI) (Xi et al., 2017; Zhang et al., 2014), and one the Sexual Activity Questionnaire (SAQ) (Johnson et al., 2016).

Meta-analysis

A total of six studies that investigated sexual function were included in the meta-analysis. The *M* and *SD* were not reported in only one study and were not available after contacting the authors, in this case, this study was excluded from the analysis because it presented only the median value and interquartile ranges (Xi et al., 2017). All studies included a control group, so the meta-analysis presents the post-intervention results for both groups. Three studies included two intervention groups: (1) a—Kegel exercise and b—lubricating gel (Khosravi et al., 2022); (2) a—Kegel exercise and b—sex education (Nazarpour et al., 2017); and (3) a—yoga and b—aerobic exercise (Reed et al., 2014), thus all were considered. The results are shown in Figures 3 and 4.

In general, the studies showed high heterogeneity ($I^2 = 94.2\%$), with 95%CI (0.2642–2.0258; $p < 0.0001$), standardized mean difference (MD = 1.15), and $\hat{\tau}^2 = 1.6615$. Due to the high heterogeneity, the subgroup analysis was performed as

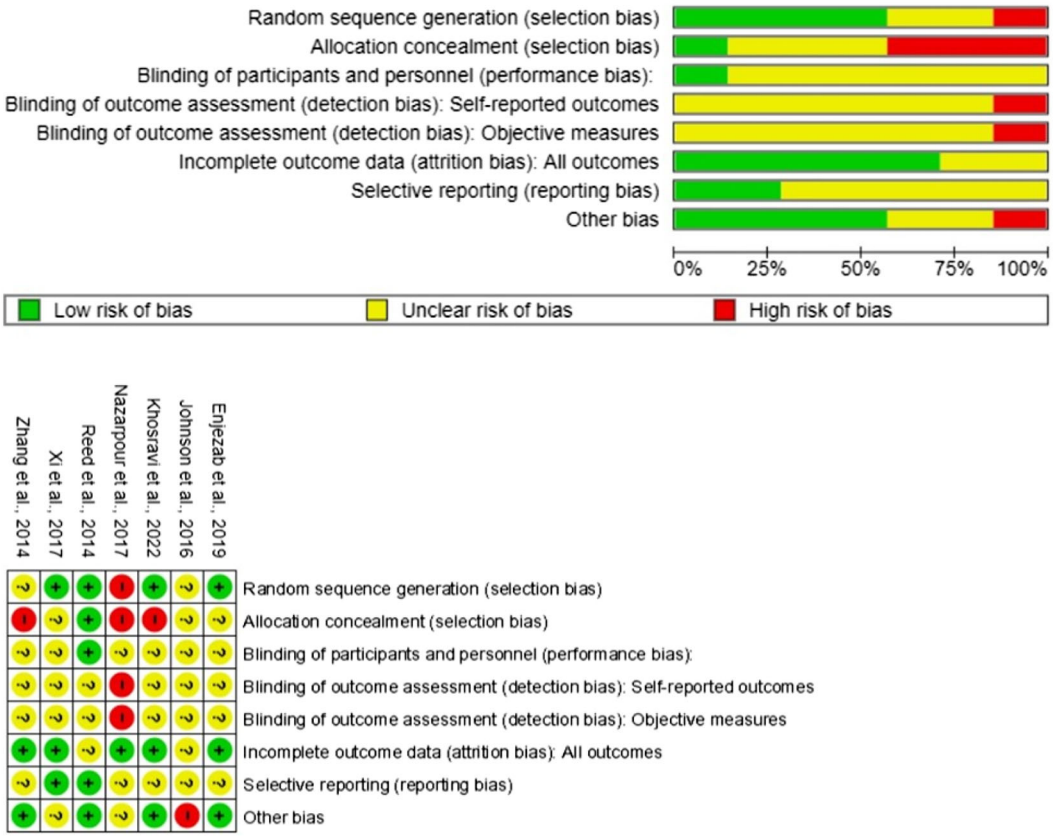

Figure 2. Graph and summary of the risk of bias assessment of the included randomized clinical trials.

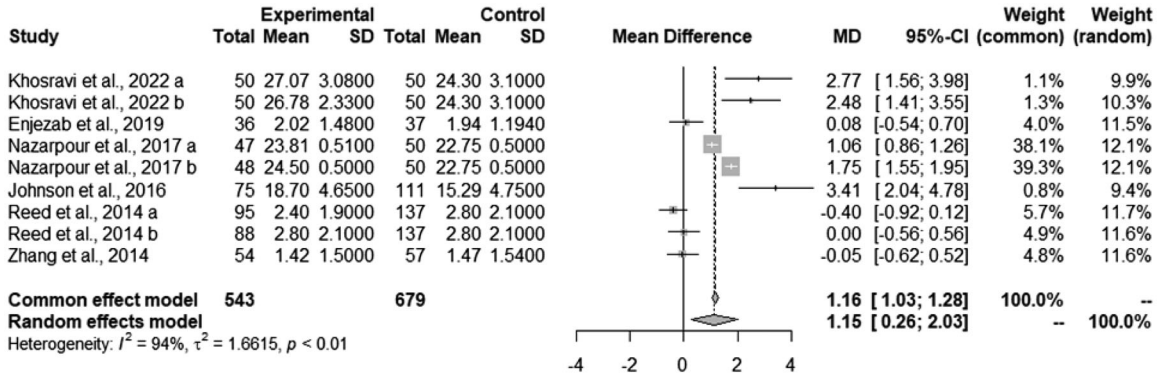

Figure 3. Forest plot of sexual function after body practices/exercise interventions in menopausal women.

follows: (a) only interventions with body practices, which still showed high heterogeneity ($I^2 = 94.2\%$; MD = 1.50; $\tau^2 = 1.7273$; $p < 0.01$); (b) only interventions with PE, which did not show heterogeneity, with more favorable results for PE compared to the control ($I^2 = 0\%$; MD = −0.02; $\tau^2 = 0$; $p = 0.90$); (c) sexual function instruments—FSFI and SAQ, which showed high heterogeneity ($I^2 = 90\%$; MD = 2.12; $\tau^2 = 0.6532$; $p < 0.01$); and (d) instruments of quality of life and menopausal symptoms with domains of sexual function—MENQOL and KMI, which did not show heterogeneity, with more favorable results for body practices and PE compared to the control ($I^2 = 0\%$; MD = −0.11; $\tau^2 = 0$; $p = 0.63$). Furthermore, the funnel chart (Figure 5) presented the studies in a dispersed manner, which implies publication bias.

Discussion

Detailed discussion based on the results of the interventions

This systematic review with meta-analysis aimed to review randomized clinical trials on body

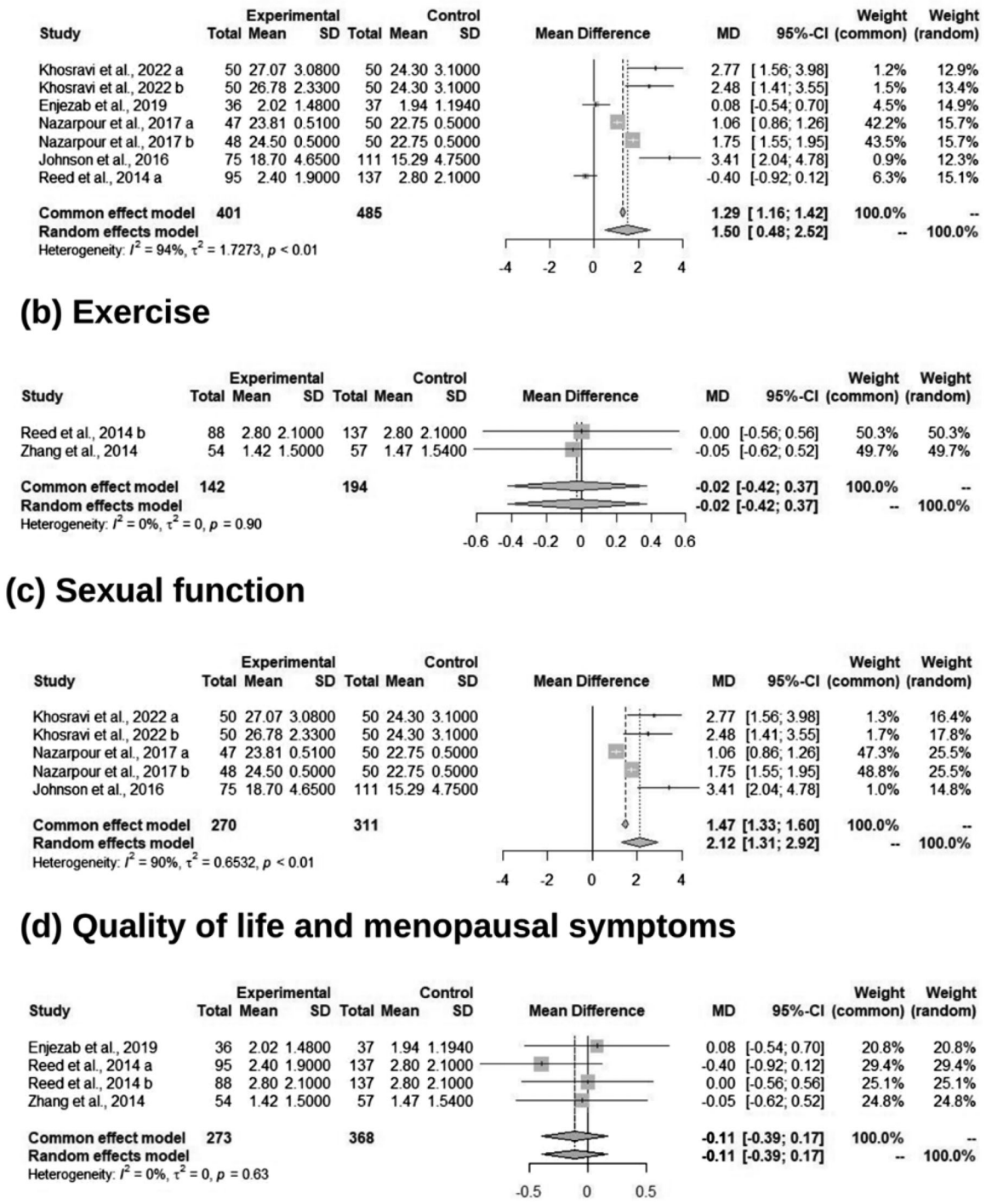

Figure 4. Forest plot of subgroups: (a) only studies with body practices; (b) only exercise studies; (c) studies that included questionnaires regarding sexual function; (d) studies that included quality of life questionnaires and menopausal symptoms in the analysis of sexual function.

practices and physical exercise in menopausal women and describe their effect on sexual function. Seven randomized clinical trials were included, with six in the meta-analysis, totaling 1127 menopausal women who were analyzed.

With regard to body practices, four modalities were included, namely Mindfulness, yoga, relaxation hypnosis, and Kegel (Enjezab et al., 2019; Johnson et al., 2016; Khosravi et al., 2022; Nazarpour et al., 2017; Reed et al., 2014).

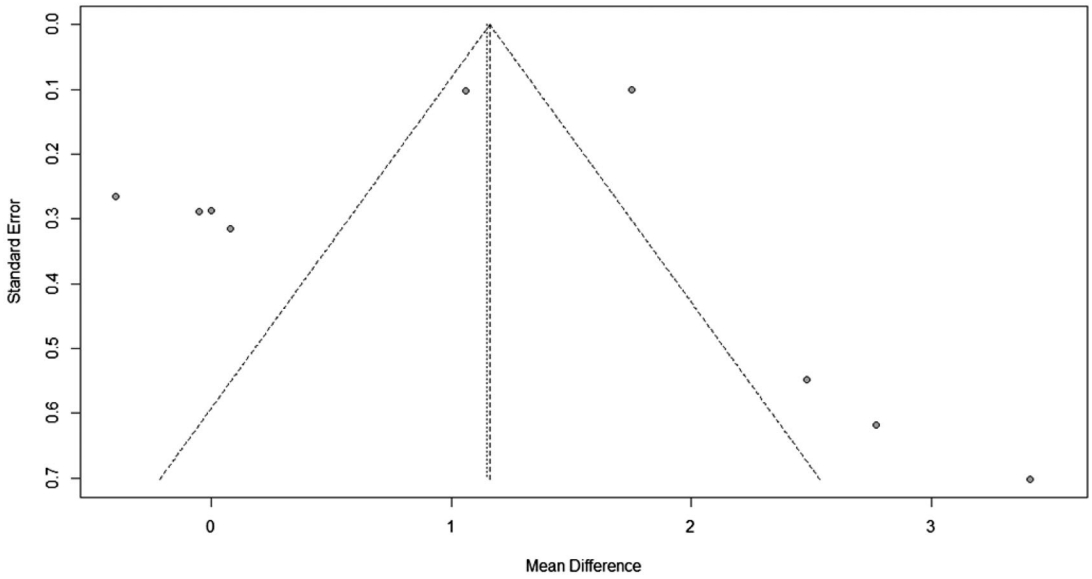

Figure 5. Funnel plot of sexual function.

These practices showed high heterogeneity, and the intensity, volume, and frequency were very different from each other. Mindfulness practice had the shortest duration of all interventions, taking place for 8 weeks compared to all the other interventions, which were 12 weeks (Enjezab et al., 2019), yoga and hypnosis did not provide enough information regarding the practice (Johnson et al., 2016; Reed et al., 2014), likewise for Kegel, one study did not report intervention data (Nazarpour et al., 2017), and the other reported volumes of 30 repetitions three times a day (Khosravi et al., 2022). Considering physical exercise, only aerobic exercises were found, namely cardiovascular conditioning training and brisk walking (Reed et al., 2014; Xi et al., 2017; Zhang et al., 2014). Unlike body practices, exercise did not show heterogeneity in the meta-analysis, being a more favorable practice for intervention groups when compared to controls. The intensity, volume, and frequency were better specified in these modalities, only the study with cardiovascular conditioning training did not contain this information (Reed et al., 2014).

With respect to the instruments to assess sexual function, different questionnaires were applied in the seven studies that made up this meta-analysis, which generated controversial results. Specific sexual function questionnaires (FSFI and SAQ) showed high heterogeneity in the results, whereas the quality of life and menopausal symptoms questionnaires with domains of sexual function (MENQOL and KMI) did not show heterogeneity and demonstrated more favorable results for body practices and exercise. Despite the heterogeneity, body practices and physical exercise proved to be safe therapies, capable of improving the scenario of sexual dysfunction in women's lives, reinforcing the importance of remaining active during the menopausal period, since physical inactivity, on the other hand, can lead to a decrease in quality of life and an increase in negative emotions and attitudes, further adding to the symptomatology in general (Heidari et al., 2019; Javadpour et al., 2021).

Limitations

The heterogeneity of the studies is shown to be a major limitation for data analysis. Despite this, the evidence from the studies included in this meta-analysis indicate that body practices and PE in this period are of great importance for sexual function. Data from a systematic review that aimed to investigate the effects of different exercise programs on sexual function and quality of sexual life related to menopausal symptoms, corroborate this information. The authors reported positive effects and evidence to support PE as a strategy to improve sexual function and quality of sexual life related to menopausal symptoms, although there was limited evidence and the conclusion indicates that more studies are needed on

this topic (Carcelén-Fraile et al., 2020). Another limitation was that we were not able to obtain M and SD data for inclusion in the meta-analysis, referring to a study that used aerobic training, however, this same study did not specify the intensity, duration, and frequency, or even the modality in a detailed way, and the type of exercise was not restricted, the participants could choose between dancing, swimming, running, badminton, walking with long strides or other aerobic activities, thus limiting more concrete data on what PE the participants actually performed (Xi et al., 2017). Furthermore, even though this was not the objective of this meta-analysis, two studies presented three intervention arms in addition to the control group and body practice, including an intervention with lubricating gel and sex education (Khosravi et al., 2022; Nazarpour et al., 2017), which may have led to an increase in the heterogeneity of these interventions. Furthermore, due to the low number of included studies, it was not possible to perform the Egger test on the funnel graph for analysis of publication bias, which requires a minimum number of ten studies for calculation, however, even just viewing the graph, the dispersion between the studies can be seen, which is also a limitation. Finally, no studies with resistance training were found, and for aerobic training, little information was reported regarding the intensity, no adequate evolution and progression of the training were shown, and no studies presented a pre-defined protocol.

Strengths and recommendations

As far as we know, in the researched literature, this is the first study to include body practices and PE and their effects on the sexual function of menopausal women. The search was comprehensive, with a relevant number of women analyzed. It is noteworthy that this meta-analysis was able to evaluate studies from different locations and women in different periods of menopause (climacteric syndrome). The journals had a good overall impact factor, studies were well cited in the Web of Science, and the methodological quality of the included studies was good, with a low risk of bias.

The findings of this review of great relevance for health professionals who work with the population of menopausal women. These results can help in clinical decision-making regarding the choice of body practices and PE for sexual function, however, it is emphasized that the findings must be interpreted with caution, due to heterogeneity and non-standardization regarding intensities, volume, and frequency.

Implications for future research

There is a need to develop protocols that include body practices and more PE modalities, making possible standardizations regarding the characteristics of the interventions. This information will be of great use to researchers, aiming to promote better alternative treatments for the urogenital symptoms of women in menopause.

Conclusion

Body practices showed great heterogeneity in the results. Interventions with PE on the other hand appeared to be more efficient, however, a low number of studies included PE, limited only to aerobic training, without sufficient data on intensity, volume, and frequency. More studies with PE are necessary for the treatment of the symptomatology of sexual function of women in menopause. In addition, the need for protocol studies for the outcome of sexual function in women in menopause is emphasized, since it was not possible to describe the effects in a reliable way due to the heterogeneity of the instruments and analyses, in addition to the lack of standardization, for better understanding regarding the characteristics of the interventions.

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Author contributions

All authors made substantial contributions to the conception and design of the study, or data acquisition, or data analysis and interpretation, drafting the article or revising it critically for important intellectual content, and approval of

the version to be published and all subsequent versions. DYF and JBBM conducted the conception and design of the study, or acquisition of data, or analysis and interpretation of data. DYF, JBBM, JAM, and AGL conducted drafting the article and revising it critically for important intellectual content. DYF, JBBM, JAM, AGL, and ACAG conducted the final approval of the version to be submitted.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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