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REVIEW ARTICLE

Obstetrics

Effects of the combination of exercise and education in the treatment of low back and/or pelvic pain in pregnant women: Systematic review and meta-analysis

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Abstract

Background: Lumbopelvic pain is considered the most frequent complication during pregnancy.

Objective: To compare whether the combination of exercise with education is more effective for the treatment of low back and/or pelvic pain (PP) than each of these interventions separately in pregnant women.

Search Strategy: A systematic review was performed in WOS, PEDro, PubMed, Cochrane, and ClinicalTrials.gov. The terms used were low back pain, PP, pregnancy, pregnant woman, exercise, exercise therapy, health education, and prenatal education.

Selection Criteria: The PICO question was then chosen as follows: P—population: pregnant women with nonspecific low back pain or PP; I—intervention: exercise therapy plus health education; C—control: only exercise therapy or only health education; O—outcome: characteristics of pain, disability, and kinesophobia; S—study designs: randomized controlled trial.

Data Collection and Analysis: Two reviewers independently screened articles for eligibility. The following inclusion criteria were applied for the selection of studies: (i) published in the past 10 years; (ii) exercise plus health education was administered compared with a group receiving either exercise or education alone; and (iii) the sample consisted of pregnant women with nonspecific low back pain or PP. This review excluded: (i) nonrandomized controlled trials; and (ii) articles whose full text was not available. The meta-analysis was performed using the random-effects model, due to the observed heterogeneity.

Main Results: A total of 13 articles were selected. There is a significant decrease in pain in the combination of exercise and education compared with education alone (standardized mean difference, −0.29 [95% confidence interval, −0.47 to −0.11]). With respect to disability, there is a significant decrease in the exercise and education group compared with the group that only addressed education (standardized mean

difference, −0.37 [95% CI, −0.60 to −0.14]). One article analyzed kinesophobia, reporting no significant changes.

Conclusion: The combination of exercise and education seems to be more effective in reducing pain and disability in pregnant women with low back and/or PP than the use of education alone. In kinesophobia, the results found are not significant.

KEYWORDS
exercise therapy, health education, low back pain, pelvic pain, pregnant woman

1 | BACKGROUND

Lumbopelvic pain during pregnancy is defined as recurrent or continuous pain around the lumbar spine or pelvis that lasts for more than 1 week.[1] Over 66% of pregnant women have low back pain (LBP) and almost 20% have pelvic pain (PP).[2] LBP is considered the most frequent complication during pregnancy.[2] The pain increases as pregnancy progresses, and it interferes with work performance, activities of daily living, and sleep.[2] Its aggravation can cause severe functional disability and decreased quality of life.[1] Furthermore, postpartum depressive symptoms are three times more prevalent in women who experience LBP during pregnancy than in those who do not.[3] Although pain is typically mild to moderate in intensity and is generally considered to have a favorable long-term prognosis, the rate of persistent pain for 2 years postpartum can be as high as 21%.[2] Risk factors associated with its appearance include young age, a history of LBP associated or not with pregnancy, heavy work, smoking, multiparity, weight gain during pregnancy, and a sedentary lifestyle.[2]

Nonpharmacological treatments for LBP and PP include therapeutic exercise.[4,5] Different reviews have concluded that physical activity decreases LBP and PP,[6–10] as well as the disability caused by LBP and PP.[6–8] The main clinical guidelines recommend physical activity during pregnancy to prevent these ailments.[11,12] Furthermore, educational interventions also have a positive effect on pregnant women with LBP, disability, or the need for sick leave.[13]

However, no review has analyzed whether the effect of the combination of exercise and education is more effective for the treatment of LBP and/or PP in pregnant women than each of these interventions separately.

1.1 | Objectives

The main objective of this review was to compare whether exercise in combination with education is more effective for the treatment of LBP and/or PP than each of these interventions independently on pregnant women. The secondary objectives were to analyze the effects on other variables related to pain, such as disability and kinesophobia.

2 | METHODS

This research was preemptively registered on PROSPERO under the code CRD42022321240, adhering to the guidelines set forth by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses).[14] More information is available in Table S1, as well as the reporting regulations in Prisma in Exercise, Rehabilitation, Sport Medicine and Sports Science (PERSIST)[15] and the recommendations from the Cochrane Collaboration.[16]

2.1 | Study selection

The study then proceeded to select its PICO question accordingly: P—population: pregnant women with nonspecific LBP or PP; I—intervention: exercise therapy (ET) plus health education (HE); C—control: only ET or only HE; O—outcome: characteristics of pain, disability and kinesophobia; S—study designs: randomized controlled trial.

2.2 | Search strategy

In February 2022, a comprehensive search of publications was undertaken across the following databases: Web of Science, PubMed, Scopus, PEDro, Cochrane, and ClinicalTrials.gov. The search strategy employed a variety of combinations with the following Medical Subject Headings [of the US National Library of Medicine] (MeSH): “low back pain”, “pelvic pain”, “pregnancy”, “pregnant woman”, “exercise”, “exercise therapy”, “health education”, and “prenatal education”. The search strategy, which is based on the targeted PICO question, can be found in Table S2.

2.3 | Eligibility criteria

Once duplicate entries were removed, two independent reviewers examined the articles for appropriateness. If disagreements arose, a third reviewer made the final decision on the inclusion of a study. Study selection was guided by the following inclusion criteria: (i)

published in the past 10 years; (ii) exercise (i.e. yoga, Pilates, back school, aerobic, functional exercises) plus HE (i.e. ergonomics, healthy living tips, cognitive behavioral therapy, educational interventions) was administered compared with a group receiving either exercise or education alone; and (iii) the sample consisted of pregnant women with nonspecific LBP or PP. This review excluded: (i) nonrandomized controlled trials; and (ii) articles whose full text was not available.

2.4 | Data extraction

After completing the screening process, and extracting, obtaining, and reviewing titles and abstracts based on the predefined inclusion criteria, full texts of the selected abstracts were secured. Full texts of titles and abstracts that did not provide adequate information concerning the inclusion criteria were also acquired. Titles and abstracts lacking sufficient information regarding the inclusion criteria were also obtained in full text. Full-text articles that adhered to the inclusion criteria were chosen by the two reviewers utilizing a data extraction form. Both reviewers independently extracted data from the included studies using a custom-made data extraction table in Microsoft Excel. In case of disagreement, both reviewers debated until an agreement was reached.

For an in-depth analysis, data such as demographic information (title, authors, journal, and year), sample characteristics (age, sex, inclusion and exclusion criteria, and number of participants), specifics of the study (duration of the intervention, adverse events, methods of exercise, and HE), and results obtained (variables analyzed, instruments used, and time of follow-up) were extracted. To effectively represent both the characteristics of the studies and the extracted data, tables were utilized.

2.5 | Assessment of risk of bias

The quality of the studies was assessed using the Jadad and PEDro scales. The risk of bias was assessed using the Cochrane Collaboration Toolkit.

2.6 | Data synthesis

Standardized mean differences (SMDs) and their corresponding 95% confidence intervals (CIs) were computed as the difference in means between groups after the intervention, divided by the pooled standard deviation.[17] Such data were not readily available within the study,

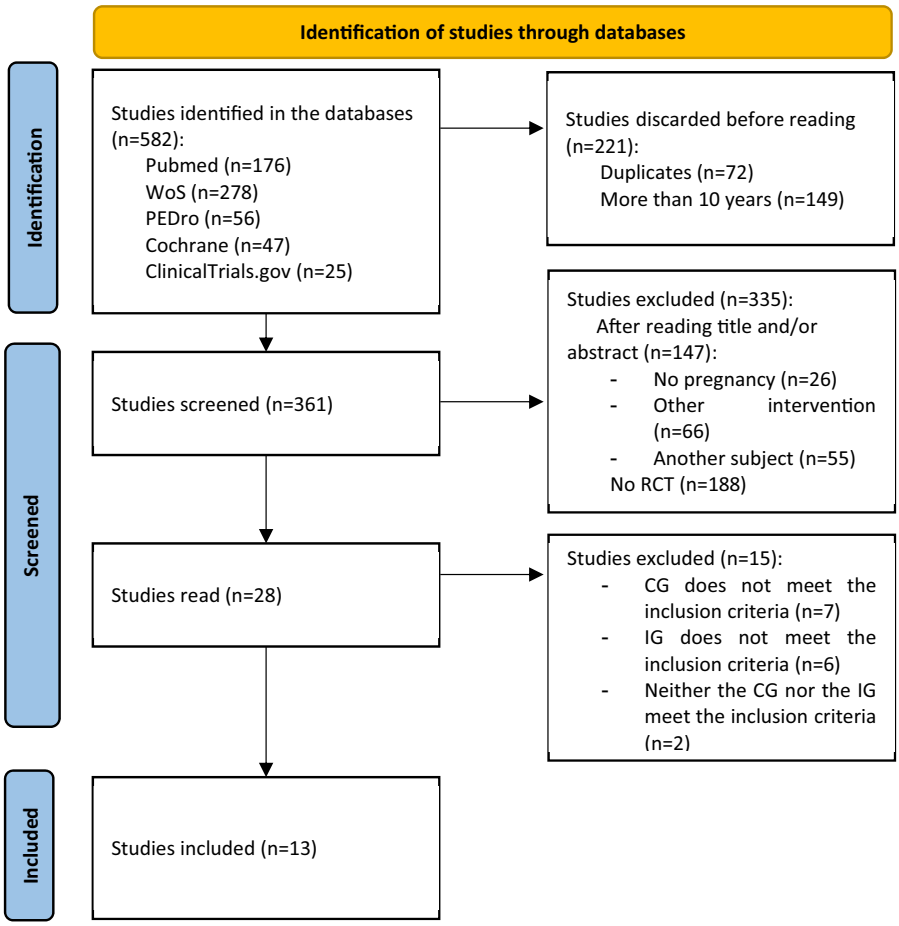

FIGURE 1 Study flowchart. CG, control group; IG, intervention group; RCT, randomized controlled trial.

the authors were contacted via email for the required information. The interpretation of effect sizes was as follows, based on specific cutoff values: 0 to 0.2 signified a very small effect; 0.2 to 0.5 denoted a small effect; 0.5 to 0.8 represented a moderate effect; and anything over 0.8 indicated a strong effect.[18] The same increments were applicable for negative values. A significance level was set to $P < 0.05$. The I^2 statistic was used to assess the extent of heterogeneity, with percentages indicating the degree of heterogeneity as follows: 25% equates to low, 50% equates to medium, and 75% equates to high heterogeneity. Due to the detected heterogeneity, the random-effects model was used in the meta-analysis. Comprehensive Meta-Analysis (CMA) V2 software (Biostat, Inc.) was used for conducting these analyses.

3 | RESULTS

3.1 | Studies selection

Of the 582 search results obtained, 361 were deemed suitable for inclusion following the removal of duplicates. Of these 361 papers, 335 were excluded after an initial screening of titles and abstracts. After the first full-text evaluation of all potential studies, the Kappa score for the first and second reviewers was recorded at 0.85, indicating almost perfect methodological quality.[19] After careful evaluation, all 13 full-text articles that were considered for eligibility were ultimately included in the synthesis (Figure 1).

3.2 | Risk of bias of included studies

The methodological quality of the studies was three points or higher on the Jadad scale in 92.3% of the studies,[1,3–5,20–27] with none of the studies obtaining zero points. The most common methodological shortcoming was the absence of blinding.[1,3–5,20,21,23,24,26] More details can be found in Table S3. At the same time, all studies obtained five or more points on the PEDro scale, with a mean score of 6.4 points (Table 1). According to the PEDro scale, the studies have good methodological quality.[28]

The risk of bias[30] was low in four of its components for three articles.[3,22,27] For the remaining articles, the measurement of the outcome was a high risk,[1,4,5,20,21,23–26,29] and an unclear risk in deviations from the intended interventions was found in all of the articles.[1,3–5,20–27,29] One of the articles showed some concerns in terms of the randomization process[29] (Figure 2).

3.3 | Participants

A total of 2488 pregnant women with LBP or PP participated in the 13 studies, with a mean age of 29.2 years (Table 2). In nine of the 13 articles, the participants began the intervention between week 16 and 24 of gestation.[1,5,20-23,25,27,29] In one study, the participants were under 30 weeks pregnant,[3] two studies included patients between

TABLE 1 Assessment of the selected articles according to the PEDro scale.

	1	2	3	4	5	6	7	8	9	10	11	Score
Yildirim et al. (2022)[27]	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	7
Sarkar et al. (2021)[4]	Yes	Yes	No	Yes	No	No	No	Yes	No	Yes	Yes	5
Sonmezer et al. (2020)[22]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	7
Holden et al. (2019)[24]	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes	5
Mirmolaei et al. (2018)[29]	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	7
Abu et al. (2017)[26]	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes	5
Backhaussen et al. (2017)[21]	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	6
Kokic et al. (2017)[3]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	7
Ozdemir et al. (2015)[1]	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	6
Haakstad et al. (2015)[25]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	8
Miquelutti et al. (2013)[23]	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	8
Eggen et al. (2012)[5]	Yes	Yes	No	Yes	No	No	No	Yes	No	Yes	Yes	5
Stafne et al. (2012)[20]	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	7

Note: 1 indicates selection criteria, 2: random assignment, 3: blind assignment, 4: similar groups, 5: blinded patients, 6: blinded therapists, 7: blinded assessors, 8: adequate follow-up, 9: intention to treat, 10: comparison between groups, and 11: specific measures of variability.

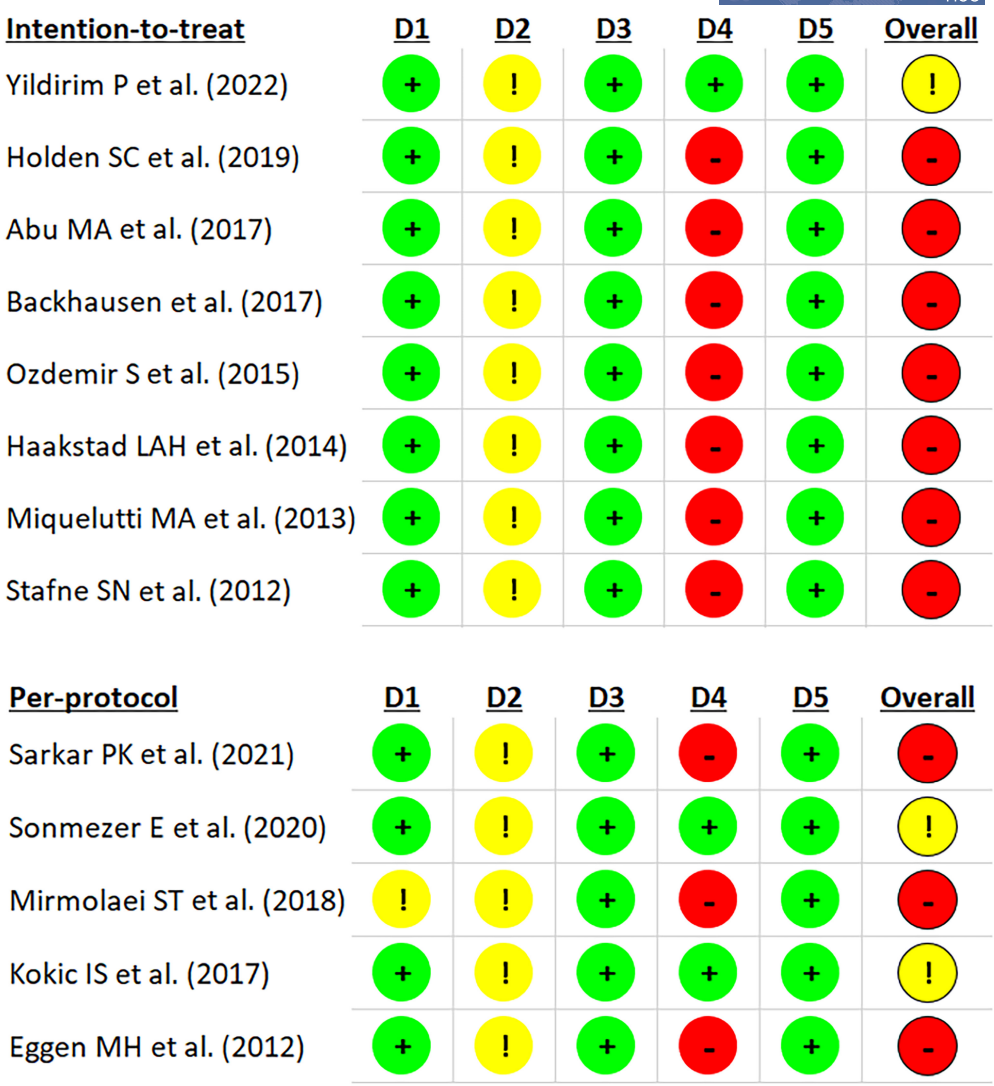

FIGURE 2 Summary of all risk-of-bias articles. D1, randomization process; D2, deviations from the intended interventions; D3, missing outcome data; D4, measurement of the outcome; D5, selection of the reported result.

week 12 and 26,[4,24] and another study included patients between week 17 and 28.[26] Regarding the area of pain, five of the studies were focused on LBP;[4,21,22,24,26] of the remaining eight articles, three of them evaluated pain within the group of lumbopelvic pain[20,23,29] and five assessed LBP and PP separately.[1,3,5,25,27] No adverse effects were reported by any of the participants in the studies. In some studies, the postpartum period was also assessed, although the main intervention was performed during pregnancy.[4,24]

3.4 | Study characteristics

The mean number of supervised sessions was 11.4, although there was great diversity in the frequency of sessions per week, with the most common range of session time being 30 to 60 min.[3,5,20-25,27] In the interventions, a combination of different exercises were usually performed, mainly strengthening,[1,3-5,20-24] stretching,[1,3-5,20,23,26,29] aerobic,[1,3-5,21,22] relaxation,[3-5,20,24-26] specific pelvic floor exercises[3,20,23,25,26,29] and Pilates.[22,27] Regarding education, the most common education intervention was behavioral education,[4,20-22,24,26] information and recommendations on the LBP,[1,5,20,22-24,26,27] childbirth information,[23,24] physical activity recommendation.[1,4,5,20,21,24,27] and nutrition guidelines.[4,20,24] More details on the type of exercise and education are provided in Table S4. All interventions included in this study compared the combination of ET plus HE versus HE alone .[1,3-5,20-23,25,27,29] The interventions were performed mainly by physiotherapists and/or midwives;[1,4,5,20-23,29] three of the studies did not specify the professional conducting the intervention.[3,25,27]

3.5 | Synthesis of results of effects on pain, disability, and kinesiophobia

All included studies assessed the effects of the interventions on pain.[1,3–5,20–23,25,27,29] To this end, most studies used the visual analog scale[1,4,20–24,26,27] and Numerical Pain Rating.[3,5] The meta-analysis

TABLE 2 Characteristics of the studies included in the review.

Authors	Area of pain	Initial sample	Intervention	Supervisor	Age (years)	Weeks	Sessions per week	Measurements	Results
Yildirim et al. (2022)[27]	LBP and PP	34	G1 (n = 17): ET + HE G2 (n = 17): HE		G1: 30.8 (SD ± 7) G2: 28.8 (SD ± 5.6)	12	G1: 2 Pilates class (60 min) per week plus standard care and education G2: Standard care and education	RMDQ, VAS	G1 significantly improved pain versus G2 G1 significantly improved disability versus G2
Sarkar et al. (2021)[4]	LBP	156	G1 (n = 54): ET + HE G2 (n = 52): ET + HE G3 (n = 50): HE	PT	G1: 28.5 (SD ± 4.1) G2: 27.54 (SD ± 3.2) G3: 27.7 (SD ± 3.6)	24	G1: 1, 20–30 min session explaining exercise. Exercising at home G2: Do the exercises at home for 20–30 min without explanation G3: Standard care	VAS	G1 significantly improved pain versus G2 G1 significantly improved pain versus G3 G2 significantly improved pain versus G3 G1 significantly improved leg cramps versus G2 G1 significantly improved leg cramps versus G3 G2 significantly improved leg cramps versus G3
Sonmezer et al. (2020)[22]	LBP	50	G1 (n = 26): ET + HE G2 (n = 24): HE	PT	G1: 29 (SD ± 2.8) G2: 28 (SD ± 2.1)	8	G1: face-to-face Pilates 2 days a week 60–70 min plus education G2: education (ergonomics, LBP)	ODQ, LBRQ, VAS, NHP, PB	G1 significantly improved disability versus G2 G1 significantly improved pain versus G2 G1 significantly improved pain sleep and physical mobility versus G2 G1 significantly improved in lumbopelvic stabilization versus G2
Holden et al. (2019)[24]	LBP	20	G1 (n = 11): ET + HE G2 (n = 9): HE	GP	G1: 29.6 (SD ± 5.1) G2: 33.4 (SD ± 3.5)	12	G1: 1 yoga class (60 min) per week and it is recommended to do it every day at home G2: 1 weekly educational support	RMDQ, VAS, PSI, EDPS, SF12, SSPPP, CSEI	G1 significantly improved pain versus G2 G1 significantly improved disability versus G2 G1 significantly improved confidence in their ability and feeling safe in childbirth versus G2
Mirmolaei et al. (2018)[29]	LPP	171	G1 (n = 88) HE + ET G2 (n = 83) HE	PT	G1: 26.5 (SD ± 3.9) G2: 25.6 (SD ± 3.5)	12	G1: 1 face-to-face class of education and exercise at home every day G2: Standard care	VAS, ODI	G1 significantly improved pain versus G2 G1 significantly improved disability versus G2
Backhaussen et al. (2017)[21]	LBP	516	G1 (n = 258): ET + HE G2 (n = 258): HE	MW	G1: 31.4 (SD ± 4.3) G2: 30.6 (SD ± 4.1)	12	G1: 1 face-to-face session. Two sessions per week with no supervision 45 min. Explanatory exercise booklet Prenatal care G2: Prenatal care	LBRS, RMDQ, EQ-5D, VAS, sick leave	G1 significantly improved LBP versus G2 G1 no significant differences about sick leave versus G2 G1 did not significantly improve disability versus G2 G1 no differences versus general health G2 G1 no differences versus general pain G2
Abu et al. (2017)[26]	LBP and PP	145	G1 (n = 73): FT + ET + HE + paracetamol G2 (n = 72): HE + paracetamol	PT	29 (SD ± 3.5)	6	G1: 2 h exercise session, exercise at home the rest of the weeks. Information and pamphlet for back and posture care G2: Information and pamphlet for back and posture care	VAS, ODQ, n[a] analgesics	G1 significantly improved pain versus G2 G1 reduction in disability versus G2 G1 took significantly less paracetamol versus G2

TABLE 2 (Continued).

Authors	Area of pain	Initial sample	Intervention	Supervisor	Age (years)	Weeks	Sessions per week	Measurements	Results
Kokic et al. (2017)[3]	LPP	42	G1 (n = 22) HE + ET G2 (n = 23) HE		G1: 32.8 (SD ± 3.6) G2: 32.2 (SD ± 4.9)	6	G1: 50–55 min of face-to-face exercise 2 days a week and 30 min of walking every day G2: Prenatal care	NRS, RMDQ, PGQ, PPAQ	G1 significantly improved pain intensity versus G2 G1 significantly improved disability versus G2 G1 significantly improved pelvic pain versus G2 G1 significantly improved high intensity total activity and above (≥1.5 METs) versus G2 G1 significantly improved in moderate activity (3.0–5.9 METs) versus G2 G1 significantly improved in the type of activity such as sport/exercise and transport activity versus G2 G1 significantly improved in the type of activity such as sport/exercise and transport activity versus G2
Ozdemir et al. (2015)[1]	LPP	96	G1 (n = 48): ET + HE G2 (n = 48): HE	MW	G1: 29.2 (SD ± 4.2) G2: 30.1 (SD ± 4.3)	4	G1: 45 min 1 day a week advice and 30 min at home 3 days a week G2: Standard care	VAS, ODI	G1 significantly improved pain versus G2 at rest and exercise G1 significantly improved disability versus G2
Haakstad et al. (2015)[25]	LBP and PP	105	G1 (n = 52): ET + HE G2 (n = 53): HE	GP	G1–G2: 30.7 (SD ± 4)	12	G1: 2 or 3 days a week 60 min face-to-face exercise and 30 min at home the rest of the days G2: standard care	Questions about pain and disability ad hoc	G1 no significant differences about pain versus G2 G1 no significant differences about disability versus G2
Miquelutti et al. (2013)[23]	LBP and PP	197	G1 (n = 97): HE + ET G2 (n = 100): HE	PT, MW or GP	G1: 22.9 (SD ± 4.6) G2: 22.9 (SD ± 5.1)	14–20	G1: 50-min face-to-face session once a month until week 30, every 15 days until week 36, and weekly until delivery. Exercise at home every day 30 min G2: education sessions	VAS, STAI, PPAQ, PFQ	G1 and G2 show no differences about pain G1 and G2 show no differences about anxiety G1 significantly improved UI versus G2 G1 significantly increased the level of sport/exercise versus G2
Eggen et al. (2012)[5]	LPP	257	G1 (n = 129) ET + HE G2 (n = 128) HE	G1: PT G2: MW Questionary: MW	G1: 30.6 (SD ± 4.8) G2: 30.0 (SD ± 4.8)	16–20	G1: 60 min one day a week and three exercises at home every day G2: standard care one time every 4 weeks	NRS, RMDQ, prevalence, SF8	G1 and G2 showed no significant differences about pain intensity G1 and G2 showed no significant differences about disability G1 and G2 showed no significant differences about pain prevalence G1 and G2 showed no significant differences about quality of live

(Continues)

TABLE 2 (Continued).

Authors	Area of pain	Initial sample	Intervention	Supervisor	Age (years)	Weeks	Sessions per week	Measurements	Results
Stafne et al. (2012)[20]	LPP	855	G1 (n = 429): ET + HE G2 (n = 426): HE	G1: PT G2: MW or GP	G1: 30.5 (SD ± 4.4) G2: 30.4 (SD ± 4.3)	12	G1: One group session per week of 60 min and 2 at home of 45 min written recommendations G2: written recommendations	VAS, DRI, prevalence, mFABQ	G1 significantly improved LB sick leave versus G2 G1 and G2 showed no significant differences about pain intensity G1 and G2 showed no significant differences about disability G1 and G2 showed no significant differences about prevalence G1 and G2 showed no significant differences about fear G1 and G2 showed no significant differences about weight G1 and G2 showed no significant differences about body mass index

Abbreviations: CSEI, Childbirth Self-Efficacy Inventory; DRI, Disability Rating Index; EDPS, Edinburgh Postnatal Depression Scale; EQ-5D, EuroQol Questionnaire on General Health; ET, exercise therapy; GP, general practitioner/family physician/family doctor; HE, health education; LBP, low back pain; LBRS, Low Back Rating Scale; LPP, lumbo-pelvic pain; mFABQ, Modified Fear-Avoidance Beliefs Questionnaire; MW, midwife/matron/matrona; NHP, Nottingham Health Profile; NRS, Numerical Pain Rating Scale; ODI, Oswestry disability index; ODQ, Oswestry Disability Questionnaire; PB, pressure biofeedback; PFQ, Pelvic Floor Questionnaire; PGQ, Pelvic Gridle Questionnaire; PPAQ, Pregnancy Physical Activity Questionnaire; PSI, Pregnancy Symptom Inventory; PT, physical therapist; RMDQ, Roland-Morris Disability Questionnaire; SC, standard care; SD, standard deviation; SF-12, 12-Item Short-Form Survey; SSPPP, stress subscale of the prenatal psychosocial profile; STAI, State–Trait Anxiety Inventory; SF8, 8-item Short-Form Health Survey; VAS, visual analog scale.

results indicate a statistically significant decrease in pain score in the ET plus HE group with respect to the ET group and the HE group, with an SMD of −0.29 (95% CI, −0.47 to −0.11 [P = 0.002]; I^2 = 83.39%) (Figure 3).

Of the articles included in this review, 11 assessed disability.[1,3,5,20–22,25,27,29] The most frequently used scales to assess disability were the Roland-Morris Disability Questionnaire[3,5,21,24,27] and the Oswestry Disability Questionnaire.[22,26,29] The meta-analysis results indicate a statistically significant decrease in disability score in the ET plus HE group compared with the ET group and the HE group, with an SMD of −0.37 (95% CI, −0.60 to −0.14 [P = 0.002]; I^2 = 79.11%) (Figure 3).

Only the article by Stafne et al.[20] assessed kinesophobia using the Modified Fear-Avoidance Beliefs Questionnaire, reporting no significant differences between the two groups.

4 | DISCUSSION

The objective of this review was to compare whether ET in combination with HE is more effective in the treatment of LBP and/or PP than each of these interventions independently in pregnant women, as well as to analyze the effects on other variables related to pain, such as disability and kinesophobia. The results seem to indicate that theoretical-practical interventions have better results in the treatment of LBP and PP than only practical or theoretical interventions.

4.1 | Comparison with existing literature

The positive effects on the pain variable in the group combining ET and HE may be due to the multifactorial origin of back pain: biophysical factors, such as lack of strength or flexibility of the spinal musculature;[31,32] psychological factors, such as fear or stress; and even social factors, such as false beliefs about pain, or work-related issues.[33,34] The four studies included in this review that did not obtain significant differences for the pain variable coincide with low adherence or unsupervised sessions.[5,20,23,25] Several studies performed in a nonpregnant population found that supervised exercise obtains better results than unsupervised exercise.[35] A lack of supervision, together with low adherence, may justify the fact that significant improvements were not obtained in these studies.[5,20,23,25]

The perceived improvement in disability in the combined ET and HE group is consistent, since disability is strongly related to pain,[36] fundamentally due to the relationship between physical (e.g. neural activation) and psychosocial (e.g. motivation) components.[36] Different reviews have confirmed the benefits of ET in pregnant women.[6–10] There is also a review that concludes that HE is beneficial for reducing LBP and improving disability in pregnant women.[13] It is worth mentioning that three studies showed improvements, although these were not significant, since the exercise was not supervised.[21,26,29] In the three studies in which there

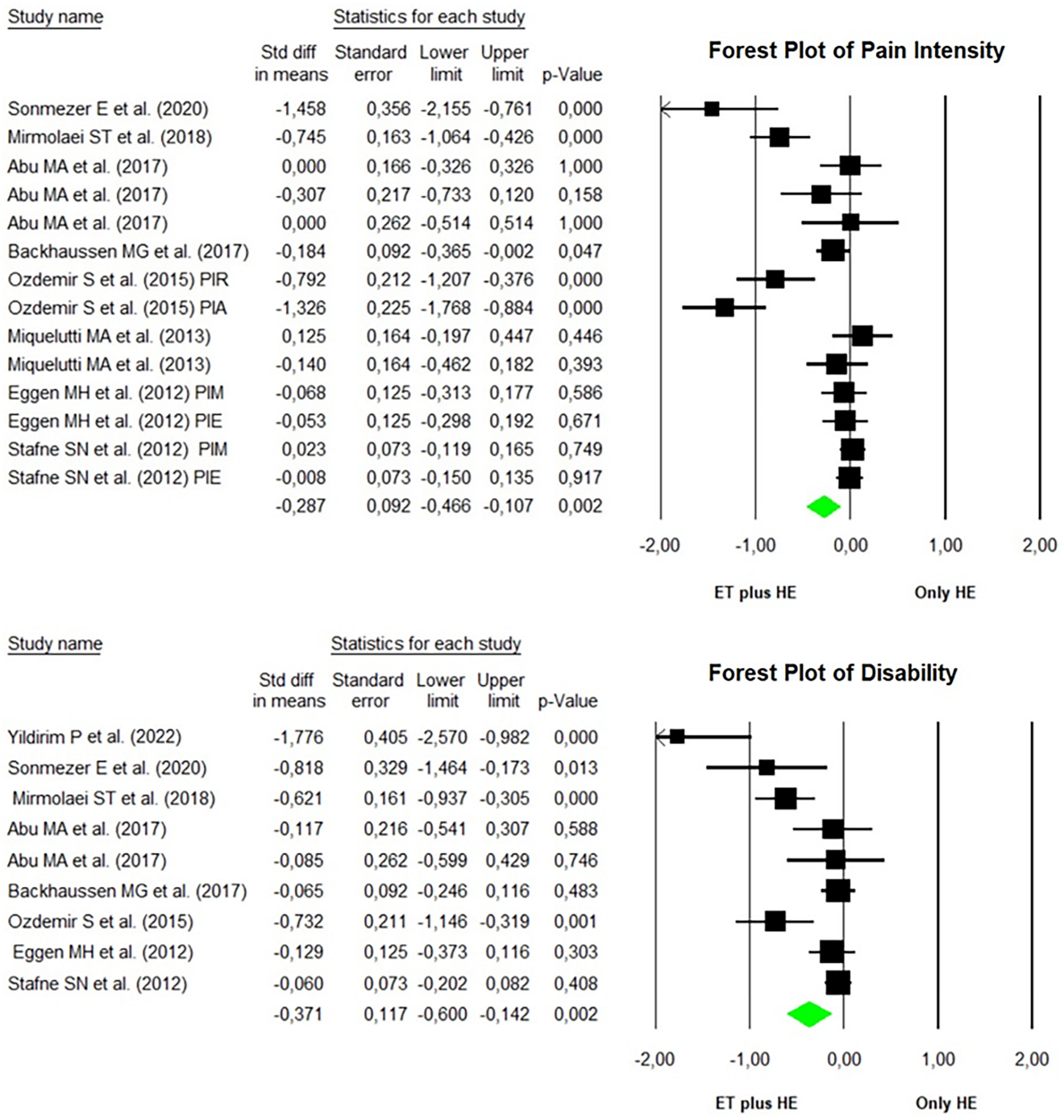

FIGURE 3 Forest plots of meta-analysis results. ET, exercise therapy; HE, health education; PIA, pain intensity in activity; PIE, pain intensity in the evening; PIM, pain intensity in the morning; PIR, pain intensity in relaxation.

was no improvement in terms of disability, there was no improvement in pain either,[5,20,25] thus there could be a relationship, since other authors have found a relationship between the chronicity of LBP and disability in patients.[37] No clear relationship was observed between the type of activity and the improvement in disability.[3] However, in a high percentage of the articles, strengthening exercise is part of the training performed,[1,3–5,20,23,25–27,29] as well as aerobic exercise,[1,3–5,20,23,25] which are the exercises recommended by the guides.[11,12] Many of the studies also implemented stretching exercises,[1,3–5,20,23,24,26,29] as is stated in the guidelines as an optional recommendation.[11,12] In one of the articles,[21] they discuss exercises in water to improve pain, a technique that can be used later in labor to also relieve pain.[38]

At the same time, disability is related to kinesiophobia.[39] In fact, patients with LBP and high levels of kinesiophobia have a 41% increased risk of developing disability.[39] Nevertheless, of all of the articles included in this review, only Stafne et al.[20] specifically analyzed this variable, in which no significant differences were found.[20] Furthermore,

they concluded that there is still a cross-cultural myth that pregnant women should be inactive and rest to protect the safety of the fetus,[20] despite recommendations from health professionals that pregnant women should exercise and have an active lifestyle.[20,29]

Currently, the biopsychosocial model is the recommended paradigm for LBP treatment.[40] For this reason, the latest clinical intervention guidelines for the treatment and prevention of LBP during pregnancy recommend ET and HE as key elements in clinical interventions in LBP.[11,12]

It should be taken into account that the coronavirus disease 2019 (COVID-19) pandemic occurred during the years 2020 to 2022 and it would be necessary to know whether any woman who was absent during a study had the disease.[41] Pregnant women with COVID-19 were also identified as a vulnerable or higher-risk population, as they are at higher risk for developing severe illness, hospitalization, intensive care unit (ICU) admission, and death compared with nonpregnant women.[41] Vaccination appears to be the most cost-effective strategy to prevent adverse maternal and fetal outcomes in the event of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.[41] Anti–SARS-CoV-2 vaccination coverage among pregnant women was initially lower than in the general population of the same age.[41] As observed in the study by Maranto et al., anti–SAR-CoV-2 vaccines were not fully accepted among the obstetric population.[41] The reasons behind the low acceptance of vaccination are mainly found in the low level of knowledge about the disease and the lack of recommendations from health care providers, which raised doubts about the safety, efficacy, and benefits of the vaccine.[41] Another study by Maranto et al. should be highlighted wherein the findings supported the statement that newborns of mothers with confirmed or suspected SARS-CoV-2 are mostly asymptomatic and, therefore, their state is not associated with worse clinical outcomes,[42] unlike the Zika virus, which is currently concerning the health system because it crosses the placenta in all gestational periods and may cause microcephaly.[43]

One point that we have not considered and that affects a large portion of women is endometriosis, and, if this is present, could cause LBP. The prevalence of endometriosis ranges between 6% and 10%, while the incidence is believed to be above 33% for patients with acute PP. The main symptoms for affected women include chronic PP, dysmenorrhea, infertility, and deep dyspareunia. In these cases, lifestyle could be related to reducing pain, although there is no consistent evidence in this regard.[44]

4.2 | Strengths and limitations

It should be noted that this is the first meta-analysis to look at the effects of ET and HE compared with ET alone or HE alone in the treatment of LBP and/or PP during pregnancy. Among the limitations of this study, the authors acknowledge that we did not take into account differentiated analyses by age subgroups, nor did we include studies that compared the combination of exercise and education with usual medical care or with passive physiotherapy interventions. It is also worth mentioning that, due to the high heterogeneity of the analyzed studies, it was not possible to establish which ET and HE interventions were the most effective, as well as the most appropriate frequency and duration of the sessions. Furthermore, no studies were found comparing only ET with ET plus HE. In view of the above, further research is necessary to compare the effects of the different interventions, with the aim of developing specific protocols for the treatment of LBP and PP in pregnant women.

5 | CONCLUSIONS

The analyzed studies suggest that the combination of ET and HE is more effective in treating LBP and/or PP during pregnancy than each of these interventions alone. A clear improvement was also found in disability but not in kinesophobia, which has been poorly investigated, and the results found are not significant.

5.1 | Implications

The obtained results may help health care professionals increase the effectiveness of their clinical interventions and thus reduce the serious socioeconomic impact of LBP and PP on pregnant women.

AUTHOR CONTRIBUTIONS

Helena Diez-Buil, Pablo Hernandez-Lucas, Raquel Leirós-Rodríguez, and Olatz Echeverría-García conceptualized and designed the study, drafted the initial manuscript, designed the data collection instruments, collected data, performed the initial analyses, and critically reviewed the manuscript for important intellectual content. All authors have read and agreed to the published version of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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