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Pelvic Mobility Exercises in Labor and Delivery: A Scoping Review

Exercícios de mobilidade pélvica no trabalho de parto e parto: uma revisão de escopo

Ejercicios de movilidad pélvica durante el trabajo de parto y parto: una revisión de alcance

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Abstract: Introduction: A variety of exercises and positions used in assisting women during labor are associated with reducing labor time and promoting vaginal delivery. Objective: To map and characterize the use of pelvic mobility exercises in labor and delivery care. Methodology: A scoping review, outlined according to the Joanna Briggs Institute methodology and described in line with the PRISMA-ScR checklist. The inclusion criteria covered scientific articles, editorials, research notes, dissertations, and theses published up to August 2024, with no language restrictions. The search was conducted in electronic databases, as well as in dissertation and thesis repositories. The publications were selected using the Rayyan Web software by two independent reviewers in a blinded mode, and any potential conflicts were resolved by a third reviewer. Results: Twelve publications were identified that evaluated Swiss ball exercises, aerobic exercises, walking, squats, freedom of movement and upright positions, yoga, dance, abdominal and pelvic floor muscle training. Final considerations: The described pelvic mobility exercises showed results in reducing labor time, pain, and anxiety.

Keywords: pregnant women; exercise and movement techniques; pelvic diaphragm; labor, obstetric; complementary therapies.

Resumo: Introdução: Há uma variedade de exercícios e posicionamentos utilizados na assistência à parturientes que são associadas à redução do tempo de trabalho de parto e favorecimento do parto vaginal. Objetivo: Mapear e caracterizar o uso de exercícios de mobilidade pélvica na assistência do trabalho de parto e parto. Metodologia: Revisão de escopo, delineada conforme a metodologia do Instituto Joanna Briggs e descrita de acordo com o checklist PRISMA-ScR. Os critérios de inclusão abrangeram artigos científicos, editoriais e notas de pesquisa, dissertações e teses, publicados até agosto de 2024, sem restrição de idiomas. A busca foi conduzida em bases de dados eletrônicas, bem como repositórios de dissertações e teses. As publicações foram selecionadas com o auxílio do

software Rayyan Web por dois revisores independentes no modo cego, e os possíveis conflitos eram resolvidos por um terceiro revisor. Resultados: Foram identificadas 12 publicações que avaliaram exercícios sobre a bola suíça, exercícios aeróbicos, deambulação, agachamento, liberdade de movimentos e posições verticalizadas, yoga, dança, treinamento da musculatura abdominal e assoalho pélvico. Considerações Finais: Os exercícios de mobilidade pélvica descritos mostraram resultados de redução do tempo de trabalho de parto, da dor e da ansiedade.

Palavras-chave: gestantes; técnicas de exercício e de movimento; diafragma da pelve; trabalho de parto; terapias complementares.

Resumen: Introducción: Varios ejercicios y posiciones son utilizados en la asistencia a mujeres durante el trabajo de parto y se asocian con la reducción del tiempo de trabajo de parto y la promoción del parto vaginal. Objetivo: Identificar y caracterizar el uso de ejercicios de movilidad pélvica en la asistencia al trabajo de parto y en el parto. Metodología: Revisión de alcance, delineada según la metodología del Instituto Joanna Briggs y descrita de acuerdo con la lista de verificación PRISMA-ScR. Los criterios de inclusión abarcaron artículos científicos, editoriales, notas de investigación, disertaciones y tesis, publicadas hasta agosto de 2024, sin restricciones de idioma. La búsqueda se realizó en bases de datos electrónicas, así como en repositorios de disertaciones y tesis. Las publicaciones fueron seleccionadas con la ayuda del *software* Rayyan Web por dos revisores independientes en modo ciego, y los posibles conflictos se resolvían por un tercer revisor. Resultados: Se identificaron 12 publicaciones que evaluaron ejercicios sobre la pelota suiza, ejercicios aeróbicos, deambulación, sentadillas, libertad de movimiento y posiciones verticales, yoga, baile, entrenamiento de la musculatura abdominal y del suelo pélvico. Consideraciones finales: Los ejercicios de movilidad pélvica descriptos mostraron resultados en la reducción del tiempo de trabajo de parto, el dolor y la ansiedad.

Palabras clave: mujeres embarazadas; técnicas de ejercicio con movimientos; diafragma pélvico; trabajo de parto; terapias complementarias.

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Introduction

Labor and delivery care, currently institutionalized and conducted by obstetrics professionals, follows guidelines and protocols that aim to ensure safe, humanized, and harm-free care for the mother-baby binomial. However, over the years, women's autonomy

and active participation in delivery have been reduced, with less freedom of choice over their bodies and the delivery process. [1]

Access to humanized care and safe delivery may not be available to all pregnant women, being influenced by sociocultural and economic factors or by services that institutionally prioritize cesarean sections. [2] In 2019, the cesarean section rate in Brazil reached 56 % of births. In the private health sector, this number reached 88 %. [3] Although there are clinical and obstetric indications, the number of cesarean sections is disproportionate both in the public system and, especially, in the private system, including the scheduling of cesarean sections at the request of the pregnant woman. [3]

Over the past three decades, the World Health Organization (WHO) has proposed strategies that are considered good practices for delivery and birth care. These strategies seek to reduce unnecessary interventions and increase women's participation in the process. [4] One example is the delivery plan, a legal document encouraged by the WHO, in which the pregnant woman expresses her preferences and expectations for care during labor and delivery, such as the choice of non-pharmacological methods, freedom of movement, preferences for certain positions and the desire to be informed in advance about invasive procedures and interventions, among others. [5]

Continuous education of health professionals is essential to ensure the implementation of these good practices, including the inclusion of non-pharmacological strategies that promote greater participation of pregnant women. Strategies such as pelvic mobility exercises and integrative practices in obstetrics can positively influence delivery outcomes and increase women's satisfaction. [6, 7]

The professionals who accompany pregnant women during prenatal care are responsible for preparing them for delivery, and may suggest exercises for articulating the pelvic region, such as walking, squats, dancing, foward lunge and reverse lunge exercises, as well as activities with a Swiss ball or peanut ball, exercises to strengthen the pelvic floor muscles and perineal massage.[8, 9] Some studies indicate that these exercises increase pain tolerance during labor, improve delivery dynamics and optimize contractions, cervical dilation, and baby's descent, resulting in shorter labor time. [9]

Among the exercises applied during labor is the Spinning Babies® method, which includes techniques such as forward-leaning inversion to stretch the uterine ligaments and side-lying release, which relaxes the pelvic floor and relieves pain. [10] These practices are already part of the routine of some obstetric services and aim to facilitate the rotation and descent of the baby into the maternal pelvis without the need for direct manipulation, promoting a smoother evolution of labor and greater participation of the pregnant woman. However, there is little evidence in the literature about the efficacy and effectiveness of these techniques. [10, 11]

A preliminary search conducted in June 2023 in the Cochrane Library, Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed) databases, and the Open Science Framework (OSF) platform found no systematic or scoping reviews that addressed these exercises and positions in labor. Considering the need to fill this gap and analyze existing studies, the present review aims to map and characterize the use of pelvic mobility exercises in labor and delivery care.

Methodology

This study followed the methodology proposed by the Joanna Briggs Institute (JBI) [12] for scoping reviews and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Extension for Scoping Reviews (PRISMA-ScR). The review was carried out in five stages: 1) definition of the review question; 2) identification of relevant studies that would enable the scope and purpose of the review; 3) selection of studies based on predefined criteria; 4) data mapping; 5) comparison, summary, and reporting of results. [13] The protocol for this review was registered on the Open Science Framework (OSF) platform under the DOI: 10.17605/OSF.IO/WM5JA.

The review question that guided the study was: "What is the available evidence on pelvic mobility exercises in labor and delivery?".

The inclusion criteria were: scientific articles with different methodologies and designs (randomized clinical trials, non-randomized clinical trials, cross-sectional studies, case studies, and experience reports), editorials, research notes, dissertations, and theses, without language restrictions or time limits, published until August 28, 2024. Publications were selected based on the mnemonic strategy PCC (Participant: pregnant women or parturients, Concept: types of pelvic mobility exercises applied by health professionals in labor and delivery). The context was omitted to avoid geographic or institutional limitations. Texts not available in full, studies that did not answer the review question, and research protocols were excluded.

The initial search was performed in the MEDLINE (PubMed) and CINAHL databases to identify articles related to the topic and their Medical Subject Headings (MeSH) descriptors, with the assistance of an academic librarian. The descriptors identified were: "labor, obstetric"; "labor stage, first"; "parturition"; "labor pain"; "delivery, obstetric"; "natural childbirth"; "cesarean section"; "exercise movement techniques"; "exercise therapy"; "exercises"; "physical therapy modalities"; "patient positioning"; "pelvic floor".

The search strategy, including all MeSH descriptors and related keywords, was adapted for each database (Table 1), namely: PubMed, PubMed Central, CINAHL, Web of Science, PeDro, Scopus, BVS, and Embase. The review also included unconventional literature (grey literature) from the ProQuest Dissertations and Thesis Global repositories.

Table 1 - Defining the search strategy with descriptors and keywords in each database

Database	Search	Search Strategies	Date N.º of articles
PUBMED	#1	*(((((((Labor, Obstetric[MeSH Terms]) OR ("Labor, Obstetric"[Title/Abstract] OR "Obstetric Labor"[Title/Abstract])) OR ((Labor Stage, First[MeSH Terms]) OR ("Labor Stage, First"[Title] OR "First Labor Stage"[Title] OR "Labor, First Stage"[Title] OR "First Stage Labor"[Title] OR "Cervical Dilatation"[Title] OR "Cervical Dilatations"[Title] OR "Dilatation, Cervical"[Title] OR "Dilatations, Cervical"[Title]))) OR ((Parturition[MeSH Terms]) OR (Parturition[Title/Abstract] OR Parturitions[Title/Abstract] OR Birth[Title/Abstract] OR Births[Title/Abstract] OR Childbirth[Title/Abstract] OR Childbirths[Title/Abstract]))) OR ((Labor Pain[MeSH Terms]) OR ("Labor Pain"[Title/Abstract] OR "Pain, Labor"[Title/Abstract] OR "Obstetric Pain"[Title/Abstract] OR "Pain, Obstetric"[Title/Abstract]))) OR*	28/08/2024 541,833

		((Delivery, Obstetric[MeSH Terms]) OR ("Delivery, Obstetric"[Title/Abstract] OR "Deliveries, Obstetric"[Title/Abstract] OR "Obstetric Deliveries"[Title/Abstract] OR "Obstetric Delivery"[Title/Abstract]))) OR *((Natural Childbirth[MeSH Terms]) OR ("Natural Childbirth"[Title/Abstract] OR "Childbirth, Natural"[Title/Abstract] OR "Water Birth"[Title/Abstract] OR "Water Births"[Title/Abstract] OR "Waterbirth"[Title/Abstract] OR "Lamaze Technique"[Title/Abstract] OR "Technique, Lamaze"[Title/Abstract]))* OR *((Cesarean Section[MeSH Terms]) OR ("Cesarean Section"[Title/Abstract] OR "Cesarean Sections"[Title/Abstract] OR "Delivery, Abdominal"[Title/Abstract] OR "Abdominal Deliveries"[Title/Abstract] OR "Deliveries, Abdominal"[Title/Abstract] OR "Caesarean Section"[Title/Abstract] OR "Caesarean Sections"[Title/Abstract] OR "Abdominal Delivery"[Title/Abstract] OR "C-Section (OB) "[Title/Abstract] OR "C Section (OB) "[Title/Abstract] OR "C-Sections (OB) "[Title/Abstract] OR "Postcesarean Section"[Title/Abstract]))* ***Sort by:*** *Most Recent*	
PUBMED	#2	*((((((Exercise Movement Techniques[MeSH Terms])) OR ("Exercise Movement Techniques"[Title/Abstract] OR "Movement Techniques, Exercise"[Title/Abstract] OR "Exercise Movement Technics"[Title/Abstract] OR "Pilates-Based Exercises"[Title/Abstract] OR "Exercises, Pilates-Based"[Title/Abstract] OR "Pilates Based Exercises"[Title/Abstract] OR "Pilates Training"[Title/Abstract] OR "Training, Pilates"[Title/Abstract]))* OR *((Exercise Therapy[MeSH Terms]) OR ("Exercise Therapy"[Title/Abstract] OR "Remedial Exercise"[Title/Abstract] OR "Exercise, Remedial"[Title/Abstract] OR "Exercises, Remedial"[Title/Abstract] OR "Remedial Exercises"[Title/Abstract] OR "Therapy, Exercise"[Title/Abstract] OR "Exercise Therapies"[Title/Abstract] OR "Therapies, Exercise"[Title/Abstract] OR "Rehabilitation Exercise"[Title/Abstract] OR "Exercise, Rehabilitation"[Title/Abstract] OR "Exercises, Rehabilitation"[Title/Abstract] OR "Rehabilitation Exercises"[Title/Abstract])))* OR *((Exercises[MeSH Terms]) OR (Exercises[Title/Abstract] OR "Physical Activity"[Title/Abstract] OR "Activities, Physical"[Title/Abstract] OR "Activity, Physical"[Title/Abstract] OR "Physical Activities"[Title/Abstract] OR "Exercise, Physical"[Title/Abstract] OR "Exercises, Physical"[Title/Abstract] OR "Physical Exercise"[Title/Abstract] OR "Physical Exercises"[Title/Abstract] OR "Acute Exercise"[Title/Abstract] OR "Acute Exercises"[Title/Abstract] OR "Exercise, Acute"[Title/Abstract] OR "Exercises, Acute"[Title/Abstract] OR "Exercise, Isometric"[Title/Abstract] OR "Exercises, Isometric"[Title/Abstract] OR "Isometric Exercises"[Title/Abstract] OR "Isometric Exercise"[Title/Abstract] OR "Exercise, Aerobic"[Title/Abstract] OR "Aerobic Exercise"[Title/Abstract] OR "Aerobic Exercises"[Title/Abstract] OR "Exercises, Aerobic"[Title/Abstract] OR "Exercise Training"[Title/Abstract] OR "Exercise Trainings"[Title/Abstract] OR "Training, Exercise"[Title/Abstract] OR "Trainings, Exercise"[Title/Abstract])))* OR *((Physical Therapy Modalities[MeSH Terms]) OR ("Physical Therapy Modalities"[Title/Abstract] OR "Modalities, Physical Therapy"[Title/Abstract] OR "Modality, Physical Therapy"[Title/Abstract] OR "Physical Therapy Modality"[Title/Abstract] OR "Physiotherapy (Techniques) "[Title/Abstract] OR "Physiotherapies (Techniques) "[Title/Abstract] OR "Physical Therapy Techniques"[Title/Abstract] OR "Physical Therapy Technique"[Title/Abstract] OR "Techniques, Physical Therapy"[Title/Abstract] OR "Group Physiotherapy"[Title/Abstract] OR "Group Physiotherapies"[Title/Abstract] OR "Physiotherapies,*	28/08/2024 584,951

		Group"[Title/Abstract] OR "Physiotherapy, Group"[Title/Abstract] OR "Physical Therapy"[Title/Abstract] OR "Physical Therapies"[Title/Abstract] OR "Therapy, Physical"[Title/Abstract] OR "Neurological Physiotherapy"[Title/Abstract] OR "Physiotherapy, Neurological"[Title/Abstract] OR Neurophysiotherapy[Title/Abstract]))) OR *((Patient Positioning[MeSH Terms]) OR ("Patient Positioning"[Title/Abstract] OR "Patient Positionings"[Title/Abstract] OR "Positioning, Patient"[Title/Abstract] OR "Positionings, Patient"[Title/Abstract]))* ***Sort by:*** *Most Recent*	
PUBMED	#3	*(Pelvic Floor[MeSH Terms]) OR ("Pelvic Floor"[Title/Abstract] OR "Floor, Pelvic"[Title/Abstract] OR "Pelvic Diaphragm"[Title/Abstract] OR "Diaphragm, Pelvic"[Title/Abstract] OR "Diaphragms, Pelvic"[Title/Abstract] OR "Pelvic Diaphragms"[Title/Abstract])* ***Sort by:*** *Most Recent*	28/08/2024 14,947
PUBMED	#4	*#1 AND #2 AND #3*	28/08/2024 298
PUBMED CENTRAL (PMC)	#5	*#1 AND #2 AND #3*	28/08/2024 16
BVS	#6	*#1 AND #2 AND #3*	28/08/2024 408
CINAHAL	#7	*#1 AND #2 AND #3*	28/08/2024 209
WEB OF SCIENCE	#8	*#1 AND #2 AND #3*	28/08/2024 354
SCOPUS	#9	*#1 AND #2 AND #3*	28/08/2024 479
EMBASE	#10	*('kinesiotherapy'/syn OR 'exercise'/syn OR physiotherapy:ti,ab,kw OR 'patient positioning'/syn) AND 'pelvic floor'/syn AND ('labor'/syn OR 'labor stage 1'/syn OR 'birth'/syn OR 'labor pain'/syn OR 'obstetric delivery'/exp OR 'natural childbirth'/syn OR 'cesarean section'/syn) AND ([embase]/lim NOT ([embase]/lim AND [medline]/lim) OR ([medline]/lim NOT ([embase]/lim AND [medline]/lim) NOT ([embase classic]/lim AND [medline]/lim)))*	28/08/2024 557
PROQUEST Dissertations and Thesis Global	#11	*#1 AND #2 AND #3*	28/08/2024 20

After the search, all the retrieved studies were collected and exported to the Rayyan web application, and duplicates were removed. Blinding in Rayyan was activated, and two reviewers independently analyzed and selected the studies using the titles and abstracts, according to the inclusion and exclusion criteria. At the end of this stage, a third reviewer was called in to mediate any conflicts when blinding was removed.

The selected studies went on to a second stage of screening and full reading, being analyzed according to the eligibility criteria. After reading, disagreements were resolved through discussion and consensus among the three reviewers.

The final sample was coded, and the extracted information was recorded in a spreadsheet in Microsoft® Word 2019, containing: order number, database, type of

publication, title, authors, year of publication, objective, study design, country of origin, sample characteristics, description of the pelvic mobility exercises evaluated in the labor and delivery, professionals who performed the evaluations and the results described.

For data analysis, the frequency and focus of interest of each publication were considered, with a descriptive approach, in light of the key concepts of the present review on pelvic mobility exercises in labor and delivery care.

Results

A total of 2,341 studies were identified, of which 1,051 were duplicates. Of the remaining 1,290, 1,243 were excluded because they did not meet the eligibility criteria. Thus, after reading 47 studies in full, 11 were selected because they met the established criteria and answered the research question. In addition, one additional publication was included, extracted from the references of the primary texts. Therefore, the final sample of this review consisted of 12 studies. The publication selection process is illustrated in the flowchart below (Figure 1):

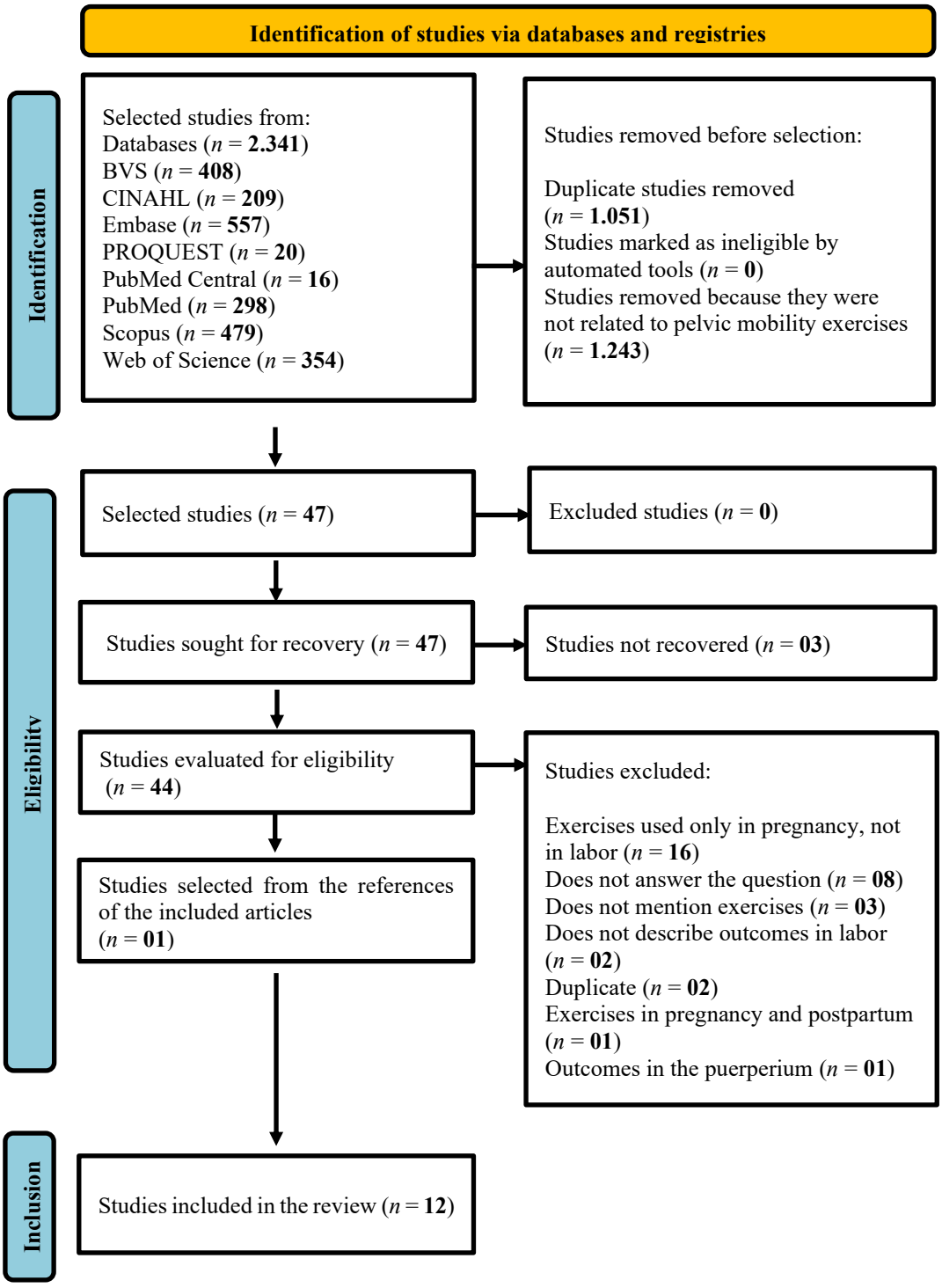

Figure 1. Selection flowchart according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Extension for Scoping Reviews (PRISMA-ScR) criteria. Source: Prepared by the authors, based on PRISMA-ScR.

Among the included studies, seven were published in the last five years (2019 to 2024), [8, 9, 14, 15, 17, 20, 21] two between 2014 and 2018, [19, 23] and the others between 1997 and 2013. [16, 18, 22] The studies were published in English, [8, 14-19, 21-23] Portuguese [9] and Spanish, [20] six from Brazil, [8, 9, 14, 15, 18, 23] two from the United States [21, 22] and the others from Canada, [16] Norway, [17] India, [19] and El Salvador. [20]

Although these are not recommended categorizations for scoping reviews, the risks of bias and the level of evidence of the studies were verified. The JBI Appraisal Tools were used to analyze the methodological quality and risk of bias. [24] The JBI Appraisal Tools allowed us to identify low risks of bias in the selected studies, with nine [8, 9, 14, 15, 17-19, 21, 23] considered to be of high quality, two [16, 22] of moderate quality, and one [20] of low quality. The Agency for Healthcare Research and Quality criteria were used to identify the level of evidence, with three studies [5, 17, 23] classified as level of evidence II, one [19] as level III, another [9] as level V, and seven [8, 14, 16, 18, 20-22] as level VI.

The total population of the included studies was 936 participants. Three literature review studies [18, 21, 25] did not discriminate the sample of the studies evaluated, and two [21, 22] studies were based on expert opinions. Study samples were selected based on the following inclusion criteria: low-risk pregnant women, [15, 18, 19, 23] nulliparous/primiparous women, [17, 18, 23] and yoga practitioners. [14] One study established cervical dilation between 3 and 8 cm as the criterion, [15] while another considered dilation between 4 and 5 cm. [23]

Among the professionals who carried out the evaluations, four studies involved nurses, [9, 15, 19, 22] one had an obstetric nurse, [8] another had a midwife, [14] two had physiotherapists, [18, 23] and the others did not identify the professionals. [16, 17, 20, 21] The other data and the summary of the included studies are described in Table 2.

Table 2 – Summary of studies included in the review

Authors **Year of publication**	**Objective**	**Type of study** **Sample** **Intervention**	**Main results**
Costa ACM, Prata JA, Oliveira KR, Silva CRF, Progianti JM, Mouta RJO, et al. 2023 [8]	Identify non-invasive technologies and care strategies used by obstetric nurses to encourage freedom of movement and positioning during the birthing process.	Qualitative study. Sample: 20 obstetric nurses. Use of non-invasive technologies in labor care.	The professionals reported encouraging walking, performing pelvic movements, such as squatting or using specific positions for pelvic rocking, birthing chair, and the position of support during expulsion. The encouragement of freedom of movement and different positions during labor was considered to promote autonomy and ensure safe and respectful care.
Biana CB, Cecagno D, Porto AR, Cecagno S, Marques V de A, Soares MC. 2020 [9]	Identify non-pharmacological therapies applied during pregnancy and labor.	Integrative review. Sample: 41 studies published between 2008 and 2018. Evaluated studies of PME: four studies on exercises for training the PF muscles and three studies on the use of the Swiss ball.	PF muscle training exercises showed inconclusive effects on the type of delivery, frequency of perineal tears, and neonatal variables. Pelvic exercises on the Swiss ball associated with a hot bath had a potent effect on reducing labor time, anxiety, pain and increasing vaginal delivery.

Campos EA, Narchi NZ, Moreno G. 2020 [14]	Understanding women's meanings and perceptions about practicing yoga during pregnancy.	Qualitative study. Sample: nine pregnant women who have been practicing yoga for at least one month. Yoga.	Yoga practice provided physical and psychosocial benefits for women, including strengthening of the PF, pain relief, improved breathing, and reduced stress and anxiety in labor.
Melo PDS, Barbieri M, Westphal F, Fustinoni SM, Henrique AJ, Francisco AA, Gabrielloni MC. 2020 [15]	Analyzing the effects of a hot bath, perineal exercises with a Swissball or both during labor on maternal and perinatal parameters.	Randomized clinical trial. Sample: 101 pregnant women divided into three groups. Interventions: hot bath (n =33); Swiss ball exercises (n =35); and both interventions combined (n =33). Data were collected before and 30 minutes after the interventions.	An increase in cervical dilation was observed in all groups after the intervention (Mean/SD: 6.15 [1.55], 6.31 [1.55], 6.30 [1.86], p <0.001). The hot bath alone resulted in an increase in the number of uterine contractions (Mean/SD: 2.76 [0.87] to 3.06 [0.75], p = 0.041) compared to the Swiss ball intervention alone (Mean/SD: 3.14 [0.88] to 3.34 [0.94], p = 0.167). There were no significant differences for the other maternal and perinatal parameters.
Flynn P, Franiek J, Janssen P, Hannah WJ, Klein MC. 1997 [16]	Understanding which factors influence perineal integrity were modifiable by doctors and pregnant women.	Narrative review of the literature. Sample: 16 studies. Studies evaluated: seven on a variety of positions in labor and delivery, namely: upright, semi-seated, and on the birthing chair, all evaluated during the expulsive period.	The authors concluded that women should be encouraged to adopt the delivery positions of their choice. They recommended cautious use of the birthing chair associated with the valsalva maneuver in prolonged expulsion due to greater evidence of perineal edema and timely episiotomy.
Haakstad LAH, Bø K. 2020 [17]	Investigating the effect of supervised group exercise, including pelvic floor muscle training, on the course of labor and type of delivery.	Randomized clinical trial. Sample: 105 nulliparous women divided into two groups. EG: aerobic exercises for 60 min, 2x per week (a total of 24 sessions), until delivery (n =52). CG received usual care (n =53).	The analyses showed a shorter duration of active labor in the EG (6.8 ± 5.5h) versus CG (9.8 ± 5.4h), with a mean difference between the groups of 3.1h (95 % CI 0.31–5.9, p = 0.029). The normal vaginal delivery rate was 85.7 % in the IG and 62.3% in the CG (p = 0.051).
Miquelutti MA, Cecatti JG, Makuch MY. 2013 [18]	Reporting the experience of labor described by nulliparous women who participated and did not participate in a systematic DPP.	Qualitative study Sample: 21 pregnant women divided into two groups For the EG (n =11), the DPP activities were stretching exercises, exercises on the Swiss ball, walking, training of the PF muscles, breathing, and relaxation techniques. For the CG (n =10), routine care was provided.	Women in the DPP reported that they maintained self-control during labor and used breathing exercises, ball exercises, massages, baths, and upright positions to control pain. They also reported satisfaction with their delivery experience. Approximately 50 % of women who did not participate in the DPP activities reported difficulty maintaining control during labor, and were more likely to report dissatisfaction with labor.

Prince EJ, Seshan V. 2015 [19]	Determining the effect during labor of approved and selected prenatal exercises in primiparous.	Quasi-experimental study. Sample: 600 primiparous women divided into two groups. The EG (n =300) received a structured teaching program with breathing exercises, training of the PF muscles for pregnancy, labor, and delivery. The CG (n =300) received routine care from the unit.	In the EG, 74 % of women reported moderate pain and 26 %, severe pain. While in the CG, 95.7 % presented severe pain and only 4.4 % presented mild to moderate pain. The mean pain score of the EG (M = 7.0, SD = 1.0) was lower than that of the CG (M = 8.8, SD = 1.3), $p < 0.01$.
Martínez EES, Maricarme N, Serrano O, Barrios NEC, Gordon GP, Cornejo FSV, García ZG. 2022 [20]	Describing the application of the Swiss ball as a non-pharmacological measure in pain management and its effects on the evolution of labor.	Narrative review of the literature. Sample: not provided. Studies evaluated: exercises using the Swiss ball in labor and delivery.	The authors described that light exercises on the Swiss ball promote muscle relaxation and are associated with pelvic expansion, descent of the fetal presentation, and may be a non-pharmacological strategy for reducing labor time and pain control.
Toberna CP, Horter D, Heslin K, Forgie MM, Malloy E, Kram JJF. 2020 [21]	N/A	Expert opinion. Sample: N/A. Approach: application of dance in labor and delivery.	The authors described that after evaluating the evidence in the literature, they concluded that low-impact dancing can reduce pain and duration of labor, while increasing women's satisfaction with the delivery experience
Tupler J. 2000 [22]	N/A	Expert opinion. Sample: N/A. Approach: Strengthening, stretching, and relaxing the abdominal and pelvic floor muscles, necessary for delivery.	The author describes that strengthening the transverse abdominal muscle provides strength and endurance at the expulsive moment of labor. Strong abdominal muscles associated with relaxation of the PF muscles are important for pushing labor and delivery, and explain the importance of these muscles not being contracted simultaneously.
Gallo RBS, Santana LS, Marcolin AC, Duarte G, Quintana SM. 2017 [23]	Analyzing whether a combination of different non-pharmacological interventions on the outcomes of labor and delivery.	Randomized clinical trial. Sample: 80 pregnant women divided into two groups. For the EG (n =40), a set of three combined exercises was applied, lasting approximately 40 minutes; use of the Swiss ball at 4 to 5 cm of cervical dilation; lumbosacral massage at 5 to 6 cm of dilation; and a hot bath at ≥ 7 cm of dilation. The CG (n =40) received usual care in the maternity ward.	EG showed lower pain scores on VAS immediately after: ball exercises (MD -24 mm, 95 % CI -34 to -15), massage (-14 mm, 95 % CI -25 to -4), and bath (-17 mm, 95 % CI -29 to -5). Other significant benefits were reduced fear, anxiety, first period (MD -72 minutes, 95 % CI -148 to -5 min), expulsive period (MD -18 min, 95 % CI -30 to -5) and increased vaginal delivery (EG 32 [80 %] versus CG 26 [65 %], RR 1.23, 95 % CI 0.93 to 1.62).

PME: Pelvic mobility exercises; PF: Pelvic floor; SD: Standard deviation; EG: Experimental group; CG: Control group; DPP: Delivery preparation program; N/A: Not applicable; VAS: Visual analogue scale, graduated from 0 to 100 mm (millimeters); MD: Mean difference; CI: Confidence interval.

Based on the established search strategy, the following practices were selected and evaluated: pelvic floor exercises with a Swiss ball, [9, 15, 18, 20, 23] aerobic exercises, [17] walking, [8, 18] squatting, [8] freedom of movement and upright positions, [16] yoga, [14] dancing, [21] abdominal muscle training exercises, [22] and pelvic floor muscle training exercises. [9, 18, 19, 22] In six studies (Table 3), [8, 9, 15, 20, 21, 23] the exercises were characterized. Some mentioned the intervention performed, but did not provide details about the exercise. [14, 16-19, 22]

Table 3 – Characterization of labor exercises

Exercise type	Description
Squat [8]	Squat with both feet and knees facing outwards (external rotation of the femur), with a support bar for the upper limbs, and squat down to a 90° angle between the pelvis and the femur. The knees should not exceed the tips of the toes, so the correct position of the buttocks should be kept backwards.
Pelvic floor exercises with the Swiss ball [9, 15, 20, 23]	a) Sitting on the ball, legs bent at a 90-degree angle, knees apart, and soles of feet flat on the floor. Make circular movements in both directions, sideways, forwards, and backwards; b) Four-legged position, hugging the ball placed on the bed or mat, rolling forwards and backwards (resting the buttocks on the heels); c) Standing in front of the ball, hug the ball (in contact with a hard surface such as a bed, table, etc.) to relax and relieve lower back tension.
Dance [21]	Combining rhythmic pelvic and body movements, such as expanding the hip circles, loosening and relaxing the pelvis and pelvic floor muscles, similar to “belly dancing”.

Discussion

This scoping review aimed to map the published evidence on pelvic mobility exercises in assisting labor and delivery, which help to optimize the rotation and descent of the baby in the maternal pelvis, in addition to providing greater freedom of movement for the woman.

The results of the studies evaluated indicated that the main outcomes include a reduction in labor time, due to increased uterine contractions and accelerated cervical dilation, [9, 17, 20-23] and decreased pain and anxiety. [9, 14, 15, 19-23] A clinical trial with aerobic exercises [17] showed a reduction of 186 minutes, and another with exercises on the Swiss ball [23] of 72 minutes in the time of the first period and 18 minutes in the second period (expulsive); the others did not quantify the labor time. [8, 9, 14-16, 18-22]

Three studies related pelvic mobility exercises (aerobic or Swiss ball movements) to increased vaginal deliveries; in one study [17], the vaginal delivery rate was 85.7 % versus 62.3 % in women without exercise ($p = 0.051$); in another study [23], the rate was 80 % versus 65 % (RR 1.23, 95 % CI 0.93 to 1.62); and in another [9], this information was not clear. No study reported complications or undesirable effects in their samples.

Exercises using the Swiss ball were the most evaluated in the selected studies, which have variations that work the pelvic joints, favoring the evolution of labor. Some variations include the woman sitting with the ball resting next to her body, which provides relaxation

and stretching; sitting on the ball resting on a front bar, performing forward and backward movements, lateral movements to the right and left, and/or propulsion and rotation movements; standing, resting on the ball on a hard surface at trunk level; or in a four-legged position with the trunk resting on the ball. [20]

Using different positions and movements with the Swiss ball during labor helps to engage, descend, and rotate the fetal head. When combined with upright positions, the ball can help align the mother's and baby's bodies, correct fetal presentation, reduce labor time, and improve pain control, avoiding invasive procedures. [9, 15, 20, 23] In one study, [15] parturients were instructed to perform propulsion and rotation movements on a Swiss ball, with or without the use of a hot bath. In both scenarios, an acceleration of cervical dilation and a reduction in the time of the active phase of labor were observed.

Upright positions, Swiss ball exercises, and shower bathing were considered low-cost non-pharmacological strategies in the evaluated studies, promoting relaxation of the pelvic floor muscles, comfort, and greater pain control for parturients. [9, 15] Other authors [25] also described that upright positions, walking and shower bathing resulted in reduced pain and were associated with an increase in the number of vaginal deliveries. [9]

The combination of Swiss ball exercises, lumbosacral massage, and breathing techniques has been identified as an important strategy to reduce pain, fear, and anxiety in parturients. [9, 23] However, the isolated use of lumbosacral massage, [23, 25, 26] or combined with breathing techniques and pelvic floor muscle relaxation, has also been shown to be effective in reducing pain levels. [9, 19] These strategies are frequently used in labor care and are considered highly effective in reducing analgesic use and avoiding early analgesia. [23]

In one study, [8] obstetric nurses reported encouraging freedom of movement, promoting pelvic joint exercises, such as hip swaying with a sense of the free pelvis, demonstrating circular movements to the left and right, forward and backward, and laterally (asking the parturient to imagine how a sieve moves), walking, squats, pelvic rocking (horseback type) and the four-support position during the expulsive period, described as promoting the woman's autonomy and ensuring safe and respectful care. However, a review [16] recommended caution in the use of birthing chair in upright positions, due to the increased risk of perineal edema.

Another study [18] implemented a delivery preparation program, including stretching exercises, Swiss ball exercises, walking, pelvic floor muscle training, breathing, and relaxation techniques. This study [18] showed that pregnant women had greater control and confidence in using these strategies as labor progressed. The delivery preparation program, [18] which integrated pelvic mobility exercises and dance practice [21] (a combination of pelvic and body movements), associated these activities with the reduction of pain and fear, in addition to increasing women's satisfaction during labor and delivery. [18, 21] The practice of dance during pregnancy is recommended because it strengthens the pelvic floor muscles, which can reduce postpartum complications, such as urinary incontinence and organ prolapse. [21]

The World Health Organization (WHO) and the Brazilian Ministry of Health (MS) recommend freedom of movement and upright positions during labor and delivery, as well as the adoption of non-pharmacological methods for pain relief, as they provide comfort, humanize delivery care, and reduce unnecessary interventions. [27]

A study carried out by experts [22] described the training of the abdominal muscles and pelvic floor, with exercises that combine the contraction of the transverse abdominal muscle and the relaxation of the pelvic floor, in addition to breathing with an open glottis to

facilitate labor. This strategy, using exhalation with an open glottis, leads to the lifting of the diaphragmatic muscle, abdominal contraction, and relaxation of the pelvic floor, which promotes the relaxation of the soft tissues and uterine ligaments, helping the baby to descend. Training the abdominal muscles is also associated with the prevention of lower back pain and abdominal diastasis. [22, 28]

The practice of yoga was evaluated in a study [14] in which the authors reported several benefits for pregnant women during labor and delivery, such as breathing control, reducing anxiety, stress, and pain, as well as strengthening the pelvic floor muscles. Some yoga postures act on the joints, ligaments, and soft tissues of the hip region, [29] increasing pelvic diameters, which can favor the evolution of labor and reduce stressful factors for the parturient, as well as avoiding unnecessary interventions. [14]

Two studies [9, 16] evaluated another strategy: perineal massage for the prevention of lacerations during delivery and the reduction of episiotomy. One of the studies showed a lower incidence of lacerations, [18] while the other did not find significant results, [16] although it recommended the practice for women who wished it and the performance of timely episiotomy. Episiotomy is a surgical incision made in the vulvoperineal region to enlarge the opening at the time of the baby's head passage. However, routine use of episiotomy does not reduce the risk of severe perineal trauma or the risk of stress urinary incontinence, and it also increases blood loss. [30] Another recommendation for reducing perineal trauma is to maintain physiological pushing with the glottis open during the expulsion, a practice that also avoids prolonging this phase. [16]

Women in labor need adequate care and appropriate management of environmental factors in order to meet their needs and provide a better delivery experience. Obstetricians can use less invasive and non-pharmacological strategies to reduce the time of the active phase of labor or the expulsive period, provide greater control of pain, fear and anxiety, and favor vaginal delivery. The studies included in this review highlight these practices and can stimulate discussions about the care provided in obstetric centers, in addition to suggesting good practices that can be implemented.

Vaginal delivery is associated with better safety indicators compared to cesarean section, such as reduced post-delivery complications, strengthening of the mother-baby bond, lower risk of infections, contribution to the baby's cardiac and respiratory stabilization and greater participation of the woman in the birthing process. [31] However, professionals must ensure maternal and fetal safety parameters during care, while valuing the woman's wishes and anxieties regarding her delivery, promoting humanized care and avoiding unnecessary interventions, especially the indiscriminate practice of cesarean sections.

The limitations of this review may be related to the heterogeneity of the included studies, due to different pelvic mobility exercises and study designs, which made it difficult to summarize the results. Another limitation was the small number of publications with pelvic mobility exercises applied and with outcomes in labor and delivery; thus, most of the studies selected in the databases presented only results of exercises to prepare for delivery in prenatal care and were not eligible for this scoping review.

Although it is not a general rule for scoping reviews, the prevalence of studies classified with levels of evidence between III and VI, according to the GRADE system, [32] is considered a low recommendation for care practice. However, most of the studies evaluated (75 %) [8, 9, 14, 15, 17-19, 21, 23] were considered of high quality by the JBI Appraisal

Tools, therefore, with a low risk of bias. Exercises have also been shown to be a safe form of delivery care, since they did not negatively interfere with maternal and perinatal parameters.

This study mapped different pelvic mobility exercises indicated for labor and delivery. These strategies are widely used in obstetric centers and delivery homes, especially by obstetric nurses, midwives, and physiotherapists, which makes the discussion relevant for clinical and obstetric practice. However, this work also highlights gaps in the literature on care practices, such as the set of exercises called Spinning Babies® [10, 11] or the De Gasquet Method®, [33] developed by the physician and yoga teacher Dr. Bernadette de Gasquet, which proposes a holistic approach involving different positions associated with breathing for pregnancy, labor and delivery. Therefore, there is a need for high-quality randomized clinical trials and/or new research in the literature so that these strategies can be included in institutional protocols.

Final Considerations

Pelvic mobility exercises are essential for women's active participation in labor and delivery, as well as helping to reduce invasive and pharmacological procedures and increasing women's satisfaction. Among the exercises identified in this scoping review are: pelvic exercises with a Swiss ball, aerobic exercises, walking, squats, freedom of movement and upright positions, yoga, dance, and abdominal and pelvic floor muscle training. These practices showed a relationship with a reduction in the duration of labor and the expulsion period, as well as promoting greater control of pain, anxiety, and fear. Pelvic exercises under the Swiss ball and aerobic exercises were associated with an increase in the vaginal delivery rate.

The results demonstrated the potential of different strategies, without causing adverse harm to delivery care. However, there is still a gap concerning some exercises and positions used in the routine of obstetric centers in Brazil and other countries, which were not found in this review. This may be related to the databases used or the lack of published studies on these strategies, indicating the need for future investigations in the literature.

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