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Original Research

Effectiveness of a physical therapy program using peanut ball positions during the first stage of labor on maternal and neonatal outcomes: randomized clinical trial

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ABSTRACT

Background: Therapeutic exercises with the peanut ball may support the progress of vaginal birth.
Objective: To evaluate the effectiveness of a physical therapy program using peanut ball positioning during the first stage of labor on maternal and neonatal outcomes.
Methods: Randomized clinical trial involving women aged 18–40 years, in the first stage of active labor with low-risk pregnancies and singleton cephalic presentations. Participants were allocated to using 126 black, opaque, sealed, and sequentially numbered envelopes. Randomization was based on a computer-generated list. The intervention group used peanut ball positions, while the control group received standard care. Maternal fatigue was measured by the Maternal Perception of Fatigue in Labor Questionnaire (MCFQ), and maternal anxiety was measured by the State-Trait Anxiety Inventory (STAI).
Results: Compared with the control group, positioning with the peanut ball reduced maternal fatigue by 4.15 points (95% CI -7.08, -1.23), total labor duration by 188.2 min (95% CI -208.8, -95.6), and maternal anxiety by 3.56 points (95% CI -5.69, 1.43). It increased the incidence of vaginal birth (RR: 1.73, 95% CI 1.09, 2.28, Number needed to treat: 12).
Conclusions: A physical therapy program using peanut ball positioning reduces labor time, increases vaginal birth rates, and reduces caesarean section rates.
Trial registration: Brazilian Registry of Clinical Trials (ReBEC): RBR-7z7f5s. Registered on 11 February 2020.

Introduction

Fatigue during labor is influenced by physical, psychological, and emotional factors, and is a subjective, multifactorial experience. Increased fatigue may adversely affect maternal and neonatal outcomes and is most commonly experienced during the first and second stages of labor, accumulating as labor progresses.[1–3] Strategies reported in the literature to relieve fatigue include providing information during the antenatal period, involving family members to raise awareness,[4] performing strengthening exercises and yoga during pregnancy,[5] regular health professional assessments,[6] and education and support during labor, together with oral hydration, comfortable positioning, and non-pharmacological pain relief techniques.[7]

Among non-pharmacological resources, exercises using birthing balls have been shown to reduce fatigue, alleviate pain, and enhance maternal satisfaction during labor.[8–10] Various types of birthing balls are available. The peanut ball is designed to be positioned between the knees of the laboring person in lateral or dorsal recumbency. Made of plastic and shaped like a peanut shell, it is available in multiple sizes and can be adjusted according to the person's height.[11–12]

Therapeutic exercises with the peanut ball may support the progress of vaginal birth.[13] As one of the main indications for intrapartum caesarean section is failure to progress, peanut ball use may promote fetal descent, enhance pelvic opening, and contribute to labor progression.[12]

Most clinical trials on the use of the peanut ball during labor have

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been conducted in settings where epidural analgesia is routinely administered, a reality that does not correspond to the context of public obstetric care in Brazil or in several other countries.[11–13] National studies report low use of this intervention, with prevalences ranging from 6.5% to 15.8% in obstetric centres.[14,15] In contrast, in high-income countries such as the United States, approximately 80% of nulliparous women receive epidural analgesia during labor.[16]

A Brazilian trial involving 100 pregnant women without pharmacological analgesia at the time of randomization found no significant differences between groups regarding maternal fatigue or neonatal outcomes following peanut ball use.[17] Although a Brazilian study investigated the peanut ball during labor without analgesia, the present study focuses on maternal fatigue as the primary outcome and applies peanut ball positions exclusively during the first stage of labor. While non-pharmacological interventions are recognized to benefit labor, the specific effects of the peanut ball on maternal fatigue and broader maternal and neonatal outcomes remain unclear. Few studies have assessed these outcomes, and high-quality trials without prior analgesia are limited. Existing studies also vary considerably in exercise and positioning protocols. This study aimed to evaluate a physical therapy program using peanut ball positioning during the first stage of labor on maternal and neonatal outcomes.

Methods

This randomized clinical trial included allocation concealment, blinded outcome assessment, and intention-to-treat analysis. It was registered in the Brazilian Clinical Trials Registry (ReBEC; RBR-7z7f5s) and approved by the Research Ethics Committee of HOSPITAL AGAMENON MAGALHÃES – HAM (Approval: 3.670.938; CAEE: 20,693,719.0.0000.5197). All procedures followed institutional/national ethical standards and the 1964 Helsinki Declaration with amendments. The study adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for parallel-group randomized trials.[18]

Participants and recruitment

The study was conducted at Hospital João Murilo de Oliveira, located in Vitória de Santo Antão, Pernambuco, Brazil. Recruitment took place between February 2020 and December 2022. Inclusion criteria were: women aged 18–40 years; in the first stage of active labor; low-risk pregnancy; gestational age between 37 and 42 weeks; nulliparous, primiparous or multiparous; singleton cephalic presentation. Exclusion criteria included: intrauterine fetal death; planned caesarean section; use of psychoactive drugs; administration of epidural analgesia or synthetic oxytocin prior to randomization.

Randomization and blinding

Participants were allocated to either the intervention or control group using 126 black, opaque, sealed, and sequentially numbered envelopes, prepared by an independent statistician uninvolved in the trial. Randomization was based on a computer-generated list using the Random Allocation Software version 1.0. Control group participants received routine obstetric care and were evaluated at the same predefined stages as the intervention group. Maternal and neonatal outcomes were collected by a blinded investigator prior to hospital discharge. Due to the nature of the intervention, it was not possible to blind the participants and the physical therapists involved in the implementation of the protocol.

Research team and training

The research team included physical therapists and physical therapy students, all trained by a physical therapist with 11 years of labor support experience. Training focused on implementing the physical therapy positioning protocol using the peanut ball, ensuring consistent intervention delivery and assessment while minimising bias.

Procedures

Eligible participants were identified in the obstetric unit and assessed against inclusion/exclusion criteria.

Sample size

The sample size for the maternal fatigue outcome was calculated based on a pilot study with 40 participants,[19] which identified a mean fatigue score of 37.9 (SD 9.7) in the peanut ball group and 43.4 (SD 11.9) in the control group. This pilot study was conducted by the same research team, at the same institution, and with participants with similar characteristics to those of the present clinical trial. Sample size estimation was performed using OpenEpi version 3.0, resulting in a required sample of 124 participants. Data were collected from 126 participants, with 63 allocated to each group.

Intervention

Participants in the intervention group received physical therapy positioning with the peanut ball according to the study protocol. Positions were tailored to fetal station and maternal pelvic position and introduced after obstetric assessment once active labor was established.

Active labor was defined as cervical dilation of 5–10 cm with regular uterine contractions for at least 10 min. Early pushing urge was characterised as a spontaneous urge to bear down prior to full cervical dilation (8–10 cm), with the fetus still at a high station.[20] Fetal station was assessed using De Lee's classification[21] and recorded in the partograph. Participants were encouraged to remain in each position for 30 min but were allowed to change positions freely to maintain a natural and woman-centred environment. When vertical positions were no longer preferred, participants were encouraged to use the peanut ball. At least three different positions were adopted, with a total peanut ball use time of up to 90 minutes. Duration was recorded using a stopwatch. The positioning protocol was published by Delgado et al. in 2022.[19]

The control group received the usual care provided by the obstetric service.

Positioning protocol based on labor progression

The peanut ball positioning program was developed in accordance with labor progression, considering fetal station, position, and presence of early pushing urge. Experienced physical therapists were responsible for developing the positioning protocol involving pelvic biomechanics. Through the use of the peanut ball, rotations of the lower limbs facilitate fetal descent in the pelvis. Furthermore, the use of the ball as a means of rest constitutes a non-pharmacological intervention for managing fatigue and supporting the progression of labor.

According to fetal station (De Lee station −5 to −1)

When the fetal presenting part was in the upper pelvis (De Lee station −5 to −1), positions with hip abduction and external rotation were used with the peanut ball. These facilitate sacroiliac joint opening, promote sacral counternutation, and increase pelvic inlet dimensions, aiding fetal descent.

According to fetal position

For fetuses in right occiput posterior (ROP), left occiput posterior (LOP), right occiput transverse (ROT), or left occiput transverse (LOT) positions in the upper pelvis, gravity-reducing lateral positions with the

peanut ball between the legs were used. Positioning was guided by the occiput orientation, with hips abducted and externally rotated, aiming to facilitate fetal rotation and increase the pelvic inlet.

In cases of early pushing urge with high fetal station

If the woman reported an urge to push before reaching 8–10 cm dilation, with the fetus still high, a lateral decubitus position was encouraged using the peanut ball. This posture aimed to reduce fetal pressure on the pelvic floor and mitigate premature bearing down.

According to fetal station (De Lee station +1 to +5)

When the fetal presenting part was located in the lower pelvis (De Lee station +1 to +5), positions involving hip abduction and either neutral or internal rotation were encouraged using the peanut ball. These positions are intended to increase the dimensions of the pelvic outlet and facilitate sacral nutation.

According to fetal position

For fetuses in the lower pelvis presenting as right or left occiput posterior (ROP/LOP) or right or left occiput transverse (ROT/LOT), gravity-reducing postures were adopted, specifically lateral decubitus with the peanut ball between the legs. Lateral positioning was guided by fetal occiput orientation, with hips maintained in abduction and neutral rotation. This posture facilitates fetal rotation, promotes sacral nutation, and increases pelvic outlet dimensions.

Exercises according to fetal station

When the fetal presenting part was in the lower pelvis (De Lee station +1 to +5), positions with hip abduction and neutral or internal rotation were encouraged using the peanut ball. These positions increase pelvic outlet dimensions and facilitate sacral nutation.

Exercises according to fetal position

For fetuses in the lower pelvis in right or left occiput posterior (ROP/LOP) or transverse (ROT/LOT) positions, gravity-reducing postures were used, specifically lateral decubitus with the peanut ball between the legs. Lateral positioning was determined by fetal occiput orientation, with hips in abduction and neutral rotation. This posture facilitates fetal rotation, enhances sacroiliac joint opening, promotes sacral nutation, and increases pelvic outlet dimensions. Additional figures are available in the Supplementary Material.

Outcome measures

Primary outcome

The primary outcome was maternal fatigue, assessed using the Maternal Perception of Fatigue in Labor Questionnaire (MCFQ) in interviews before the intervention and at the end of the first labor stage (10 cm cervical dilatation). Responses were recorded on a 5-point Likert scale (1 = not at all to 5 = extremely). The Brazilian Portuguese MCFQ is validated, with good psychometric properties (Cronbach's alpha = 0.84) and responsiveness. Fatigue is classified as low (15–50) or high (51–75), with a minimal clinically important difference of 7 points.[22]

Secondary maternal outcomes

Labor duration was recorded from admission, defined as cervical dilatation ≥5 cm with regular effective uterine contractions, until birth. Vaginal examinations were conducted prior to randomization by the attending obstetrician. Effective contractions were defined as painful and regular uterine contractions.[23]

Pain intensity was assessed using a 0–10 Visual Analogue Scale (VAS), where 0 = no pain and 10 = worst imaginable pain. Maternal satisfaction with labor was assessed using the same 0–10 VAS, where 0 = lowest and 10 = highest satisfaction.[24] Pain was assessed at baseline and at 30, 60, and 90 min. Maternal satisfaction was assessed within 24 h postpartum, reflecting the overall labor and birth experience.

Maternal anxiety was assessed using the 19-item State-Trait Anxiety Inventory (STAI), administered before the intervention and at the end of the first stage of labor. This instrument has been adapted and validated for use during labor in an interview format and demonstrates good psychometric properties. Internal validity analysis revealed that the items grouped into two factors, with consistency indices of 0.83 for factor 1 (presence of anxiety) and 0.72 for factor 2 (absence of anxiety). Responses were recorded on a 4-point Likert scale: 1 = not at all, 2 = *a* little, 3 = quite a bit, and 4 = very much, resulting in a total score range from 19 to 76 points.[25]

Perineal trauma was identified via clinical examination by the attending physician or midwife and classified as: first-degree (skin and/or vaginal mucosa), second-degree (perineal muscle, excluding anal sphincter), third-degree (involving external and/or internal anal sphincter), and fourth-degree (extending to rectal mucosa).[26]

Data related to labor characteristics, such as use of synthetic oxytocin, epidural analgesia, incidence of vaginal birth or caesarean section, episiotomy and the need for perineal suturing, were recorded by the research team.

Neonatal outcomes

Neonatal outcomes included Apgar score at five minutes of life, need for neonatal resuscitation, and requirement for admission to the neonatal intensive care unit.

Adverse outcomes

The care team documented any unexpected or undesirable clinical events potentially related to the intervention in the medical records. These records were subsequently reviewed by the researchers during data collection.

Data analysis

A statistician who was blinded to group allocation conducted the data analysis. Groups were identified solely as A and B until the completion of the analysis, at which point the allocation code was broken and the group identities were revealed.

For maternal clinical and biological characteristics, data analysis was performed according to the distribution type. Measures of central tendency (means or medians) and dispersion (standard deviation or interquartile range) were used for continuous variables, while absolute and relative frequencies were used for categorical variables. Student's *t*-test was applied to compare means when data were normally distributed and variances were equal between groups. In cases where these assumptions were not met, the Mann–Whitney *U* test was used. The chi-squared test was used to compare categorical variables; Fisher's exact test was employed where appropriate.

For dichotomous outcomes, relative risk (RR) was reported with a 95% confidence interval (CI). When clinically relevant effects were observed, the number needed to treat (NNT) was also calculated, along with its 95% CI. All analyses followed the intention-to-treat principle, and statistical significance was set at $p < 0.05$.

Results

Of 625 women assessed, 499 were excluded based on the inclusion and exclusion criteria. A total of 126 participants were randomized (63 per group). There were no losses to follow-up or post-randomization exclusions, and all participants received the allocated intervention. Further details are provided in Fig. 1.

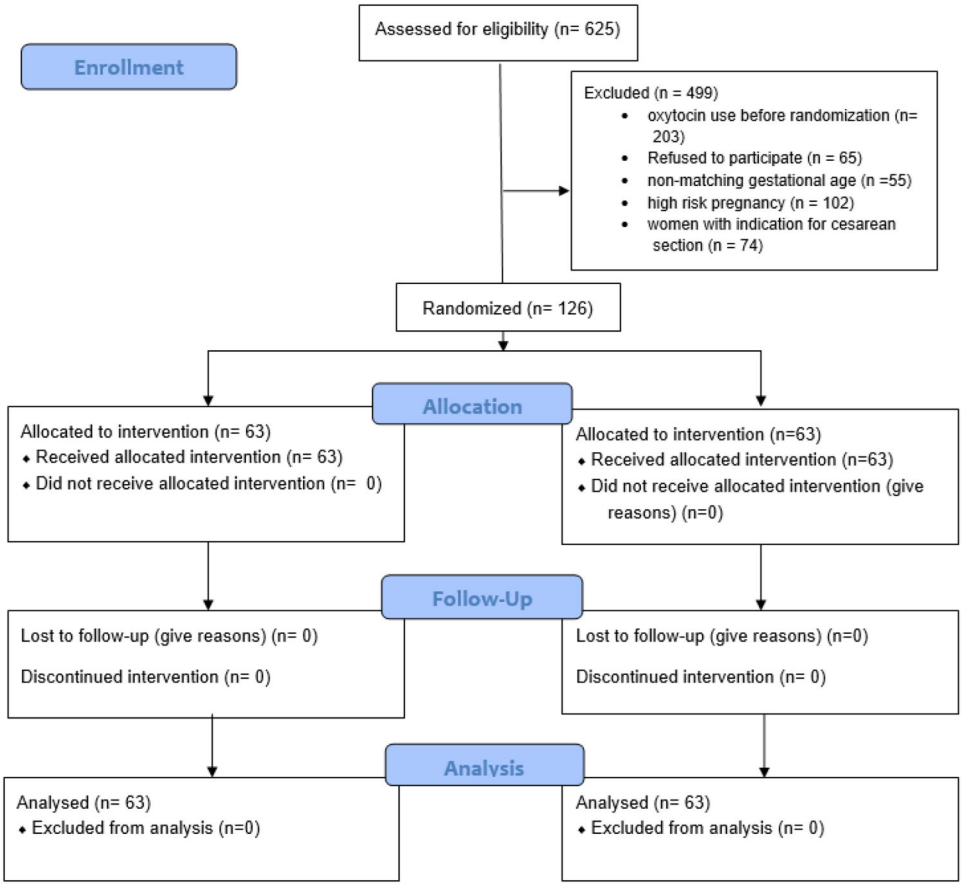

Fig. 1. Flow of participants through the study.
Source: CONSORT 2025

Table 1
Sociodemographic and obstetric characteristics of participants.

Variables	EG (n = 63) Mean (SD)	CG(n = 63) Mean (SD).
Age, years	22.9(5)	21.9(5)
BMI, kg/m²	28.5(4)	28.4(4)
Pregnancies	2.1(1)	1.9(1)
Parity	0.9(1)	0.8(1)
Primipara	49 (38.9%)	54 (42.8%)
Multiparous	14 (11.1%)	9 (7.2%)
Gestational age	39.2(1.4)	38.9(1)
	N (%)	**N (%)**
Origin		
Interior PE*	57 (45.2)	61 (48.4)
Others	6 (4.8)	2 (1.6)
Marital status		
Single	28 (22.2)	29 (23.0)
Married	24 (19.0)	17 (13.5)
Other	10 (8.7)	17 (13.5)
Education		
< 8 years	11 (8.7)	17 (13.5)
≥ 8 years	52 (41.2)	46 (36.5)
Income		
< 1 SM**	39 (31.0)	35 (27.8)
≥ 1 SM	24 (19.1)	28 (22.2)
Occupation		
Home	44 (34.9)	33 (26.2)
Other	19 (15.1)	30 (23.8)

SD- Standard Deviation; EG- Experimental Group; CG- Control Group.
* Interior PE- Interior of the state of Pernambuco, Brazil
** SM-Minimum Wage- R$ 1212.00.

Participant characteristics

Table 1 presents the distribution of sociodemographic and obstetric characteristics of the study participants. The mean age of participants was 22.9 years in the experimental group (EG) and 21.9 years in the control group (CG). The mean number of pregnancies was 2.1(1.4) in the EG and 1.9(1.9) in the CG. Mean parity was 0.9(1.3) in the EG and 0.8 (1.5) in the CG, while the mean gestational age was 39.2(1.4) weeks and 38.9(1.6) weeks, respectively. Among the participants, 38.9% in the EG and 42.8% in the CG were primiparous, while 11.1% and 7.2%, respectively, were multiparous.

Intervention effect

Primary outcome

The primary outcome demonstrated that the experimental intervention reduced maternal fatigue by 4.15 points (95% confidence interval [CI]: −7.08 to −1.23) on a scale ranging from 15 to 75 (Table 2).

Secondary maternal outcomes

The total duration of labor was 310 min (SD 300) in the experimental group and 480 min (SD 371) in the control group, representing a reduction of 188.2 min in favour of the intervention group (Table 2).

The experimental intervention also reduced maternal anxiety by 3.56 points on a scale of 18 to 72 (95% confidence interval [CI]: −5.69 to −1.43) (Table 2).

The implementation of the positioning program using the peanut ball reduced pain intensity by 0.684 points on a 0–10 scale, 90 min after the intervention (95% confidence interval [CI]: −1.35 to −0.0232) (Table 3).

Table 2
Effects of the intervention on fatigue (Maternal Perception of Childbirth Fatigue Questionnaire- MCFQ), anxiety (State-Trait Anxiety Inventory- STAI), maternal satisfaction and duration of labor.

Outcome	EG (n = 63) Mean (SD)	CG (n = 63) Mean (SD)	MD	EG vs. CG 95%CI	P-value
*MCFQ**					
Baseline	37.2(8)	37.3 (8.9)	-	-	-
Follow-up 1	**33.0 (7.42)**	**37.2 (9.9)**	**−4.15**	**−7.08 to −1.23**	**0.006**
*Duration of Labor*** *(minutes)*	**310 (300)**	**480 (371)**	**−188.2**	**−208.8 to −95.6**	**<0.001**
*STAI***					
Baseline	43.0 (7.34)	41.3 (7.97)	-	-	-
Follow-up 1	**40.4 (7.19)**	**43.4 (6.12)**	**−3.56**	**−5.69 to −1.43**	**0.001**
Maternal satisfaction	10(1)	9(1)	−1.00	−1.00 to 0.00	<0.001

EG- Experimental group; CG- Control group; MD- Mean difference between groups; 95%CI-.
95% confidence interval; Follow-up 1 corresponds to 90 min after the intervention.
* Maternal Perception of Labor Fatigue Questionnaire.
** State-Trait Anxiety Inventory.

Table 3
Effects of intervention on pain intensity.

Outcome EVA	EG (n = 63) Mean (SD)	CG (n = 63) Mean (SD)	MD	EG vs. CG 95%CI	P-value
Baseline	6.35(2.84)	6.32(3.06)	-	-	-
Follow-up 1	6.64(3.06)	7.20(2.54)	−0.559	−1.22 to 0.1004	0.097
Follow-up 2	7.19(2.74)	7.75(2.38)	−0.559	−1.22 to 0.1004	0.097
Follow-up 3	**7.54 (2.77)**	**8.23 (2.17)**	**−0.684**	**−1.35 to −0.0232**	**0.04**

EG- Experimental group; CG- Control group; MD- Mean difference between groups; 95%CI-95% confidence interval. Follow-up 1- 30 min after the intervention; Follow-up 2- 60 min after the intervention; Follow-up 3- 90 min after the intervention.

The experimental group showed a 73% higher incidence of vaginal delivery compared to the control group. The physical therapy program reduced the risk of cesarean section by 60% (Table 4).

No differences were observed between the groups for the outcomes of third- and fourth-degree perineal trauma, episiotomy, the need for perineal suturing, use of synthetic oxytocin, and epidural analgesia. There were no instrumental deliveries in either group.

No significant differences in neonatal outcomes were observed between groups. No neonate required resuscitation or neonatal intensive care, and only one in the experimental group had a fifth-minute Apgar score <7. (Table 4).

Discussion

Considering the relevance of non-pharmacological interventions during labor, this study shows that a physical therapy program using the peanut ball during the first stage of labor, compared with usual care, reduces maternal fatigue by 4.15 points, shortens total labor duration by 188.2 min, decreases maternal anxiety and pain intensity 90 min after the intervention, and increases vaginal delivery rates while lowering the risk of caesarean section.

When compared to the literature, the findings on maternal fatigue

Table 4
Effects of intervention on maternal and neonatal outcomes.

Outcome	EG (n = 63) n (%)	CG (n = 63) n (%)	Estimativas RR	95% CI	NNT	p-value*
Vaginal delivery	**54 (42.9)**	**43 (34.1)**	**1.73**	**1.09 to 2.28**	**12**	**0.02**
Caesarean section	**9 (7.1)**	**20 (15.9)**	**0.40**	**0.17 to 0.89**	**12**	**0.02**
Perineal trauma ≥ 3	3 (2.4)	2 (1.6)	0.67	0.11 to 3.85	-	0.64
Episiotomy	9 (7.1)	14 (11.1)	1.59	0.71 to 3.16	-	0.24
Perineal suturing	28 (22.2)	28 (22.2)	1.00	0.67 to 1.48	-	1.000
Use of oxytocin	23 (18.3)	22 (17.5)	0.94	0.50 to 1.66	-	0.85
Epidural analgesia	13 (10.3)	14 (11.1)	1.09	0.50 to 2.19	-	0.82
Neonatal admission	0 (0.0)	0 (0.0)	-	-	-	-
Neonatal resuscitation	0 (0.0)	0 (0.0)	-	-	-	-
5-minute Apgar score < 7	1 (0.8)	0 (0.0)	-	-	-	-

EG- Experimental Group; CG- Control Group; RR-Relative risk; 95%IC: 95% Confidence intervals; NNT- Number needed to treat.
* Chi-square test.

present conflicting results. Two clinical trials investigating the use of the peanut ball without analgesia during labor reported divergent outcomes. A study conducted in Brazil, which used the MCFQ, did not find a reduction in maternal fatigue with the use of the peanut ball.[14] On the other hand, a clinical trial that evaluated positioning with the peanut ball during the first stage of labor demonstrated a reduction in maternal fatigue, as measured by the Visual Analogue Fatigue Scale (VAS-F), by 3.3 points immediately after the intervention and 5.8 points 15 min after its conclusion.[27]

The current study demonstrated a reduction of 4.15 points in maternal fatigue after the use of a peanut ball during labor. However, the observed reduction did not reach the minimum clinically important difference of 7 points established by the MCFQ.

Maternal fatigue during labor tends to increase due to intensified uterine contractions, muscle cramps in the lower limbs, and gastrointestinal and respiratory discomforts. Additional contributing factors include excessive use of synthetic oxytocin and unsupervised physical activity.[21-22] The use of a physical therapy protocol with the peanut ball during labor can improve maternal comfort and support labor progression, particularly for those who prefer to rest or avoid upright positions. By offering body support and enabling active rest without hindering fetal descent, the peanut ball may help reduce maternal fatigue.

The absence of a clinically important difference in MCFQ scores may reflect the protocol's focus on passive positioning and the limited follow-up to the first stage of labor. In contrast, active pelvic movement using a Swiss ball has shown greater effectiveness, with an 18-point MCFQ reduction.[8]

The parturients in the intervention group exhibited a reduction of 188.2 min in total labor time, an increase of 73% in the incidence of vaginal deliveries with a NNT of 12, and a 60% reduction in the risk of caesarean section with a NNT of 12. These findings may be related to the peanut ball's ability to allow positioning with flexed knees, simulating the squatting position, and facilitating frequent position changes during labor, even when the parturient is lying down, which helps with fetal descent and rotation, consequently reducing labor duration.[28]

The reduction in labor duration can also bring numerous benefits to clinical practice, including a decrease in healthcare costs due to reduced hospitalisation periods, lower consumption of human resources, and greater turnover of beds in obstetric centres.[29]

The experimental group showed a 3.56-point reduction in STAI scores; however, this did not reach the minimum clinically important difference. Anxiety is known to correlate strongly with increased pain and fatigue.[30] Stressful stimuli trigger instinctive defence responses, such as fear and anxiety, involving multiple brain structures. In such states, activation of the neural axis stimulates the sympathetic and peripheral nervous systems, leading to physiological changes that may negatively affect labor progression.[31]

Similarly, pain during labor tends to progressively increase, from the onset of the active phase to the expulsive phase.[32] The parturients in this study who underwent the experimental intervention showed a reduction of 0.68 points on a scale from zero to ten in pain levels after peanut ball use. It is possible that combining this tool with other non-pharmacological pain relief methods during labor, such as immersion baths, relaxation techniques, massage, acupuncture,[33] transcutaneous electrical nerve stimulation (TENS) ,[34] and the Swiss ball,[8] could lead to greater pain reduction and better outcomes regarding fatigue and anxiety during labor.

No significant differences were observed between groups in episiotomy, perineal suturing, synthetic oxytocin use, epidural analgesia, third- and fourth-degree lacerations, or maternal childbirth satisfaction. In Brazil, labor management remains largely interventionist, which may have influenced episiotomy and oxytocin outcomes. A study conducted with 1163 Brazilian obstetricians revealed that the episiotomy rate in routine labor assistance was, on average, 40%,[35] despite evidence-based recommendations that discourage the systematic performance of this procedure.[36]

This study has some limitations. Due to the nature of the intervention, it was not possible to blind the participants. In addition, the analysis of the duration of the first and second stages of labor could not be conducted separately. Moreover, there may be variability in the vaginal examination for assessing cervical dilation, which may introduce classification bias. Future studies are recommended to evaluate the effectiveness of non-pharmacological interventions during labor, allied with the use of the peanut ball.

This study did not identify adverse effects on maternal or neonatal outcomes and highlighted the ease of applying the protocol. Moreover, the peanut ball can be easily reused by other parturients, making the intervention feasible during labor.

Conclusion

A peanut ball physical therapy program during the first stage of labor, compared with usual care, reduces maternal fatigue, labor duration, and anxiety, while increasing vaginal delivery rates and lowering caesarean risk. These results highlight the peanut ball as an easily implemented non-pharmacological tool that promotes maternal well-being and may inform future childbirth guidelines. Study strengths include the sample size and the standardized protocol applied by trained physical therapists and students, underscoring the key role of physical therapists in labor care.

Declaration of competing interest

The authors declare no competing interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjpt.2026.101580.

References

1. Tzeng YL, Yang YL, Kuo PC, Lin YC, Chen SL. Pain, anxiety, and fatigue during labor: a prospective, repeated measures study. *J Nurs Res*. 2017;25(1):59–67. https://doi.org/10.1097/jnr.0000000000000165. PMID: 28072678.
2. Pugh LC, Milligan R. A framework for the study of childbearing fatigue. *ANS Adv Nurs Sci*. 1993;15(4):60–70. https://doi.org/10.1097/00012272-199306000-00007. PMID: 8512305.
3. Tzeng YL, Kuo SY, Tsai SH. [Childbirth-related fatigue during labor: an important but overlooked symptom]. *Hu Li Za Zhi*. 2013;60(6):16–21. https://doi.org/10.6224/JN.60.6.16. ChinesePMID: 24310549.
4. Chien LY, Ko YL. Fatigue during pregnancy predicts caesarean deliveries. *J Adv Nurs*. 2004;45(5):487–494. https://doi.org/10.1046/j.1365-2648.2003.02931.x. PMID: 15009351.
5. Parks PL, Lenz ER, Milligan RA, Han HR. What happens when fatigue lingers for 18 months after delivery? *J Obstet Gynecol Neonatal Nurs*. 1999;28(1):87–93. https://doi.org/10.1111/j.1552-6909.1999.tb01969.x. PMID: 9924869.
6. Reeves N, Potempa K, Gallo A. Fatigue in early pregnancy. An exploratory study. *J Nurse Midwifery*. 1991;36(5):303–309. https://doi.org/10.1016/0091-2182(91)90045-q. PMID: 1757816.
7. ACOG Committee Opinion No. 766: approaches to limit intervention during labor and birth. *Obstet Gynecol*. 2019;133(2):e164–e173. https://doi.org/10.1097/AOG.0000000000003074. PMID: 30575638.
8. Delgado A, Amorim MM, Oliveira ADAP, Souza Amorim KC, Selva MW, Silva YE, et al. Active pelvic movements on a Swiss ball reduced labor duration, pain, fatigue and anxiety in parturient women: a randomized trial. *J Physiother*. 2024;70(1):25–32. https://doi.org/10.1016/j.jphys.2023.11.001. Epub 2023 Nov 29. PMID: 38036399.
9. Delgado-García BE, Orts-Cortés MI, Poveda-Bernabeu A, Caballero-Pérez P. Ensayo clínico controlado y aleatorizado para determinar los efectos del uso de pelotas de parto durante el trabajo de parto /randomizes controlled clinical trial to determine the effects of the use of birth balls during labor. *Enferm clín (Ed impr)*. 2025;22(1):35–40. https://doi.org/10.1016/j.enfcli.2011.07.001, 2012 Jan-Feb [citedAvailable from https://pesquisa.bvsalud.org/portal/resource/pt/ibc-97448.
10. Taavoni S, Abdolahian S, Haghani H, Neysani L. Effect of birth ball usage on pain in the active phase of labor: a randomized controlled trial. *J Midwifery Womens Health*. 2011;56(2):137–140. https://doi.org/10.1111/j.1542-2011.2010.00013.x. Epub 2011 Feb 28. PMID: 21429078.
11. Roth C, Dent SA, Parfitt SE, Hering SL, Bay RC. Randomized controlled trial of use of the peanut ball during labor. *MCN Am J Matern Child Nurs*. 2016;41(3):140–146. https://doi.org/10.1097/NMC.0000000000000232. PMID: 26859467.
12. Tussey CM, Botsios E, Gerkin RD, Kelly LA, Gamez J, Mensik J. Reducing length of labor and cesarean surgery rate using a peanut ball for women laboring with an epidural. *J Perinat Educ*. 2015;24(1):16–24. https://doi.org/10.1891/1058-1243.24.1.16. PMID: 26937158; PMCID: PMC4748987.
13. Mercier RJ, Kwan M. Impact of peanut ball device on the duration of active labor: a randomized control trial. *Am J Perinatol*. 2018;35(10):1006–1011. https://doi.org/10.1055/s-0038-1636531. Epub 2018 Mar 6. PMID: 29510425.
14. Souza MR, Carneiro JL, Farias LM, Costa CC, Vasconcelos CM, Lima MO, Damasceno AK. Neuraxial analgesia in labor: effects on maternal and neonatal outcomes. *Acta Paul Enferm*. 2024;37:1–9. https://doi.org/10.37689/acta-ape/2024AO0002103.
15. Calcagno J, Iribarren S, Villarreal C, Oliveira P, Ávila A. Prevalence of prescription and effectiveness of analgesia for treating vaginal delivery pain. *Rev Bras Enferm*. 2024;77(5):1–11. https://doi.org/10.1590/0034-7167-2023-0327pt.
16. Seijmonsbergen-Schermers A, Akker T, Rydahl E, Beeckman K, Bogaerts A, Binfa L, Frith L, Gross M, Misselwitz B, Halfdańsdo' ttir B, Daly D, Corcoran P, Calleja-Agius J, Calleja N, Gatt M, Britt Vika Nilsen A, Declercq E, Gissler M, Heino A, Lindgren H, Jonge A. Variations in use of childbirth interventions in 13 high-income countries: a multinational cross-sectional study. *PLoS Med*. 2020;17(5):1–33. https://doi.org/10.1371/journal.pmed.1003103.
17. de Sena Fraga CD, de Araújo RC, de Sá L, Santos Bertoldo AJ, Rodarti Pitangui AC. Use of a peanut ball, positioning and pelvic mobility in parturient women shortens labor and improves maternal satisfaction with childbirth: a randomized trial. *J Physiother*. 2024;70(2):134–141. https://doi.org/10.1016/j.jphys.2024.02.017. Epub 2024 Mar 16. PMID: 38494404.
18. Hopewell S, Chan AW, Collins GS, Hróbjartsson A, Moher D, Schulz KF, Tunn R, Aggarwal R, Berkwits M, Berlin JA, Bhandari N, Butcher NJ, Campbell MK, Chidebe RCW, Elbourne D, Farmer A, Fergusson DA, Golub RM, Goodman SN, Hoffmann TC, Ioannidis JPA, Kahan BC, Knowles RL, Lamb SE, Lewis S, Loder E, Offringa M, Ravaud P, Richards DP, Rockhold FW, Schriger DL, Siegfried NL, Staniszewska S, Taylor RS, Thabane L, Torgerson D, Vohra S, White IR, Boutron I. CONSORT 2025 statement: updated guideline for reporting randomized trials. *BMJ*. 2025;14, e081123. https://doi.org/10.1136/bmj-2024-081123, 389PMID: 40228833; PMCID: PMC11995449.
19. Delgado AM, Silva RCB, Medeiros PJA, Melo RS, Oliveira ALB. Peanut ball use for reducing maternal fatigue during labor: protocol for a randomized clinical trial. *RSD [Internet]*. 2022;11(11). https://doi.org/10.33448/rsd-v11i11.33852 [cited 2025 Jan 15]e436111133852. Available from https://rsdjournal.org/index.php/rsd/article/view/33852.
20. World Health Organization. *WHO recommendations: Intrapartum Care For a Positive Childbirth Experience*. Geneva: World Health Organization; 2018. Available from https://www.ncbi.nlm.nih.gov/books/NBK513809/.

21. Noguera C, Colmenares M, Changir A, Hoegl J, Araujo K, Veroes J. Relación entre ángulo de progresión con parámetros clínicos en el comportamiento del descenso cefálico durante el trabajo de parto/relationship between the angle of progression with clinical parameters in the behavior of head descent during labor. *Rev Venez Ultrason Med [Internet]*. 2022;NS2(1):10–17. https://doi.org/10.57097/REVUM.2022.2.1.3 [cited 2025 Jan 15]Available from https://www.researchgate.net/publication/364390992.
22. Delgado A, Oliveira PDNF, Góes PSA, Lemos A. Development and analysis of measurement properties of the "maternal perception of childbirth fatigue questionnaire" (MCFQ). *Braz J Phys Ther*. 2019;23(2):125–131. https://doi.org/10.1016/j.bjpt.2019.01.004. Epub 2019 Jan 19. PMID: 30685203; PMCID: PMC6428916.
23. Ministry of Health (Brazil). *National Guideline for Normal Birth Care. Preliminary version*. Brasília, DF: Ministry of Health; 2022. Available from https://www.gov.br/saude/pt-br/assuntos/pcdt/a/assistencia-ao-parto-normal-diretriz-nacional/view. Accessed on: Sep 01, 2025.
24. Gift AG. Visual analogue scales: measurement of subjective phenomena. *Nurs Res*. 1989;38(5):286–288. Available from https://www.scopus.com/record/display.uri?eid=2-s2.0-0024465922&origin=inward.
25. Delgado AM, Freire AD, Wanderley EL, Lemos A. Analysis of the construct validity and internal consistency of the State-trait anxiety inventory (STAI) State-anxiety (S-Anxiety) scale for pregnant women during labor. *Rev Bras Ginecol Obstet*. 2016;38(11):531–537. https://doi.org/10.1055/s-0036-1593894. Epub 2016 Nov 3. PMID: 27813038; PMCID: PMC10309495.
26. Cunningham FG, MacDonald PC, Gant NF, Leveno KJ, Gilstrap LC, Hankins GDV, et al. *Williams Obstetrícia*. 20th ed. Rio de Janeiro: Guanabara Koogan; 2000: 281–298.
27. Alan Dikmen H, Gönenç İM, Ataş AN. Effects of peanut ball use on perceived labor pain, fatigue, and mother's perception of childbirth: a randomized controlled trial. *Arch Gynecol Obstet*. 2024. https://doi.org/10.1007/s00404-024-07656-2. Epub ahead of print. PMID: 39103620.
28. Grenvik JM, Coleman LA, Berghella V. Birthing balls to decrease labor pain and peanut balls to decrease length of labor: what is the evidence? *Am J Obstet Gynecol*. 2023;228(5S):S1270–S1273. https://doi.org/10.1016/j.ajog.2023.02.014. Epub 2023 Mar 21. PMID: 36948997.
29. Dalmoro C, Rosa R, Bordin R. Normal delivery and cesarean section: cost per brazilian regions, 2015. *Rev Assoc Med Bras (1992)*. 2018;64(11):1045–1049. https://doi.org/10.1590/1806-9282.64.11.1045. PMID: 30570059.
30. Tzeng YL, Chao YM, Kuo SY, Teng YK. Childbirth-related fatigue trajectories during labor. *J Adv Nurs*. 2008;63(3):240–249. https://doi.org/10.1111/j.1365-2648.2008.04732.x. PMID: 18702771.
31. Margis R, Picon P, Cosner AF, Silveira R de O. Relationship between stressors, stress and anxiety. *Rev Psychiatry Rio Gd Sul [Internet]*. 2003;25:65–74. https://doi.org/10.1590/S0101-81082003000400008 [cited 2025 Jan 15]Available from https://www.scielo.br/j/rprs/a/Jfqm4RbzpJhbxskLSCzmgjb/?lang=pt.
32. Alves Neto O. *Labor pain. In: alves Neto O, Costa CMC, Teixeira MJ, editors. Pain: Principles and Practice*. Porto Alegre: Artmed; 2009:858–866.
33. Nori W, Kassim MAK, Helmi ZR, Pantazi AC, Brezeanu D, Brezeanu AM, Penciu RC, Serbanescu L. Non-pharmacological pain management in labor: a systematic review. *J Clin Med*. 2023;12:7203. https://doi.org/10.3390/jcm12237203.
34. Bedwell C, Dowswell T, Neilson JP, Lavender T. The use of transcutaneous electrical nerve stimulation (TENS) for pain relief in labor: a review of the evidence. *Midwifery*. 2011;27(5):e141–e148. https://doi.org/10.1016/j.midw.2009.12.004. Epub 2010 Feb 18. PMID: 20170995.
35. Cunha CMP, Katz L, Lemos A. Amorim MM. Knowledge, attitude and practice of Brazilian obstetricians regarding episiotomy. *Rev Bras Ginecol Obstet*. 2019;41(11):636–646. https://doi.org/10.1055/s-0039-3400314. Epub 2019 Nov 19. PMID: 31745956; PMCID: PMC10316827.
36. Brazil. Ministry of Health. Secretariat of Science, Technology and Strategic Inputs. *Department of Health Technology Assessment and Management. National guidelines For Assistance During Normal childbirth: Summary Version [electronic resource]*. Brasília: Ministry of Health; 2017:51. Available from http://bvsms.saude.gov.br/bvs/publicacoes/diretrizes_nacionais_assistencia_parto_normal.pdf.