**Journal of Health and Nutrition Research**
Vol. 5, No. 2, 2026, pg. 968-975, https://doi.org/10.56303/jhnresearch.v5i2.1009
Journal homepage: https://journalmpci.com/index.php/jhnr/index

e-ISSN: **2829-9760**

# The Effectiveness of Acupressure Versus Birth Ball on Reducing Labor Pain and Shortening the First Stage of Labor: A Comparative Study

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**ORIGINAL ARTICLES**

*Submitted: 27 October 2025*

*Accepted: 20 May 2026*

*Published: 01 August 2026*

***Keywords:***
*Acupressure, Birth Ball, First Stage of Labor, Labor Pain, Non-pharmacological Interventions*

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**ABSTRACT**

Childbirth is a physiological process involving significant physical, emotional, and hormonal changes. Severe, uncontrolled labor pain can lead to an unpleasant experience and complications, including prolonged labor fetal distress and postpartum hemorrhage. A holistic approach incorporating non-pharmacological methods, such as birth ball exercises and acupressure at LI4 (Large Intestine 4) and SP6 (Spleen 6) points, may alleviate pain by modulating endorphin and cortisol levels, thereby optimizing labor. This quasi-experimental study with a pretest-posttest control group design aimed to compare the effectiveness of acupressure and birth ball exercises on pain intensity and the duration of the first stage of labor. Conducted at the independent midwifery practice Iin Sepnita between March and August 2025, it recruited 48 participants via purposive sampling (24 per group) based on inclusion criteria. Data were collected using a Visual Analogue Scale (VAS), an active phase observation sheet, and a partograph. Analysis employed descriptive statistics and the Mann-Whitney U test. Results demonstrated that birth ball exercise was more effective than acupressure in reducing pain intensity and shortening the first stage of labor. This finding is supported by significantly lower mean ranks in the birth ball group for both posttes pain (17.96 vs. 31.04; p = 0.001) and labor duration (18.50 vs. 30.50; p = 0.003). Notably, the mean duration of labor in the birth ball group was 1.10 hours shorter than in the acupressure group.

**Key Messages:**

- This quasi-experimental study indicates that birth ball exercises are significantly more effective than acupressure at reducing pain intensity and shortening the duration of the first stage of labor, suggesting that the birth ball may be a preferable non-pharmacological option for intrapartum care management

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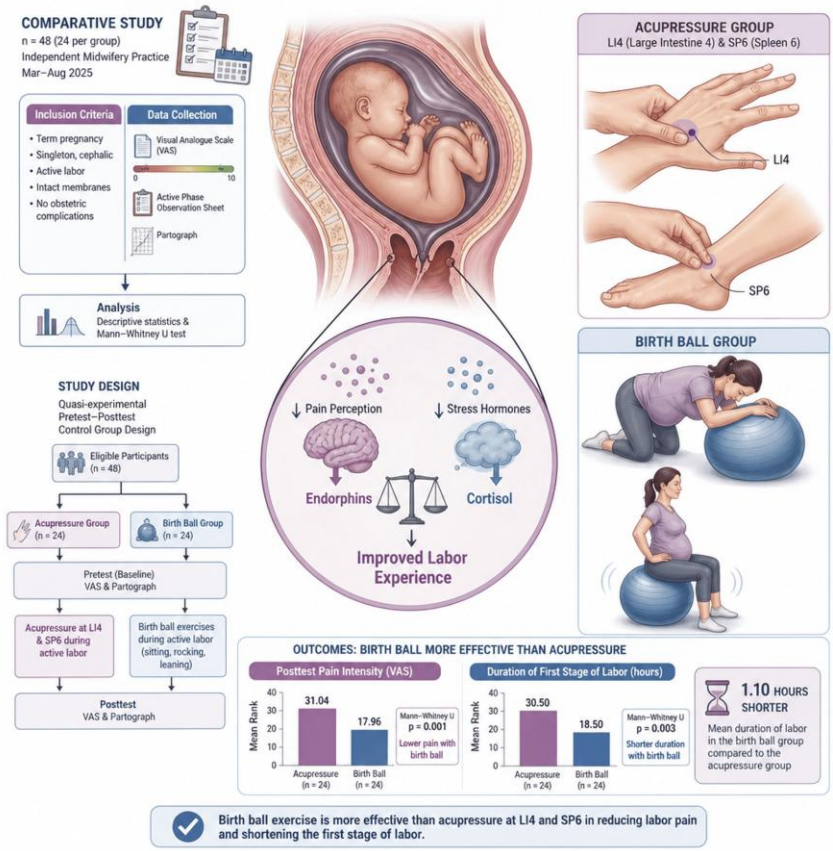
## GRAPHICAL ABSTRACT




## INTRODUCTION

Labor pain is a complex, subjective, and multidimensional experience influenced by physiological, psychological, and environmental factors. During the first stage of labor, uterine contractions and cervical dilation stimulate visceral afferent fibers, causing severe discomfort for the laboring womans (1). Despite its natural progression, labor frequently involves significant distress for instance. Marsilia and Kubilawati (2022) reported that 52% of women in the first stage of labor experience moderate pain, while 48% suffer from severe pain (2). Pharmacological interventions are effective in managing this pain, they often carry risks of adverse maternal and fetal side effects, such as respiratory depression, prolonged labor, and altered fetal heart rates. Consequently, there is a growing global interest in non-pharmacological pain relief methods that promote a more natural, empowering, and safe birthing experience (3).

Among the various non-pharmacological strategies, acupressure and the use of a birth ball have emerged as accessible, low-cost, and non-invasive options. To avoid the side effects that often come with clinical pain medications, many obstetric settings now look toward non-invasive comfort measures. Birth ball exercises and targeted acupressure at the LI4 (Hegu) and SP6 (Sanyinjiao) points have become highly practical options, offering a safe way to lessen a woman's labor pain while actively supporting the body's natural progress (3). Acupressure is hypothesized to work via the gate-control theory and the release of endogenous opioids, which modulates the pain threshold and promotes labor progress (4),(5),(6). Meanwhile, birth ball therapy facilitates the active phase by encouraging upright positioning and pelvic mobility, which physically assists fetal descent and reduces lumbosacral pressure. Both interventions have been widely studied and are recognized for their potential to reduce pain intensity, facilitate maternal comfort, and promote more efficient labor progression (7), (8), (9), (10), (11), (12).

The independent midwifery practice of Iin Sepnita provides normal birth services but has not yet implemented acupressure as a non-pharmacological pain management technique. Instead, a birthing ball method has been offered to 24 women in labor between January 11 and February 8, 2025.



https://doi.org/10.56303/jhnresearch.v5i2.1009

Few studies have directly compared the effects of these two modalities against each other. In particular, direct comparative investigations assessing the relative effectiveness of acupressure and birth ball use within the context of comprehensive labor pain management and the duration of the active phase of the first stage of labor remain notably scarce. This study is therefore expected to generate robust empirical evidence regarding which modality is more effective, thereby informing evidence-based clinical practice and ultimately enhancing the quality of maternity care.

## METHODS

This study employed a quantitative research design with a quasi-experimental approach using a pretest-posttest control group design. The study was conducted in a normal childbirth setting at the Independent Midwifery Practice Iin Sepnita, located in North Cikarang, Bekasi Regency. The research was carried out from March 2025 to August 2025.

The population of this study consisted of women who gave birth normally at at the Independent Midwifery Practice . The total population of normal deliveries from January to February was 24 women who met the inclusion criteria: term pregnancy (≥37 weeks), cervical dilation of 4 cm at the initial examination, occipital presentation, and absence of complications. The sample was selected using a purposive sampling technique, including all women who met the inclusion criteria in a 1:1 ratio 24 normal laboring women in the control group who received birth ball exercises and 24 normal laboring women in the intervention group who received acupressure treatment.

Respondents were divided into two groups: the intervention group received acupressure at the LI4 and SP6 points. Acupressure was applied cyclically during alternating 30 minute intervals (30 minutes of intervention followed by a 30 minute rest period) over a total span of 2 hours. Deep, circular digital pressure was applied to each point for 30 seconds during the peak of each uterine contraction. The intensity of the pressure was standardized to cause the blanching of the provider's fingernails (13) While the control group performed birth ball exercises consisting of four standardized movements (14), (15), (16). This standardized 60 minute birth ball systematically combines rhythmic bouncing, pelvic tilting, hip rotation, and forward leaning (9), (17), (18). Together, these movements leverage gravity and pelvic mobility to alleviate maternal spinal pressure, facilitate optimal fetal rotation, and accelerate fetal descent during labor. The pretest pain measurement was conducted before the intervention at 4 cm cervical dilation using the Visual Analogue Scale (VAS), while the posttest pain measurement was performed when dilation reached 8 cm. The duration of the active phase of the first stage of labor was measured in hours, based on the partograph records from 4 cm to 10 cm dilation.

Univariate data analysis employed descriptive statistics in the form of mean values, while bivariate analysis was applied to compare the birth ball and acupressure groups. The Shapiro–Wilk test revealed that the data were not normally distributed ($p < 0.05$), thus failing to meet the assumptions for parametric testing. Therefore, the non-parametric Mann–Whitney U test was used as the bivariate analysis method to compare pain reduction scores and the duration of the active phase of the first stage of labor between the birth ball and acupressure groups.

### CODE OF HEALTH ETHICS

This study obtained ethical clearance approval from the Ethics Committee of Universitas Medika Suherman through the DIGITEP application, under ethical approval letter No: 002545/UNIVERSITAS MEDIKA SUHERMAN/2025.

## RESULTS

Based on table 1, the mean score of pain intensity during the pretest in the birth ball group was 5.50 ± 0.780, while the posttest mean was 3.79 ± 0.658, indicating a reduction in pain intensity by 1.71. In the acupressure group, the mean pretest value was 5.75 ± 0.944, whereas the posttest mean was 4.67 ± 0.868 , showing a smaller reduction in pain intensity of 1.08.



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**Table 1. Mean Pain Intensity among Mothers in Labor in the Birth Ball and Acupressure Groups**

| Variable | n | Mean | min | max | *SD* |
|---|---|---|---|---|---|
| Pretest Pain (Birth Ball) | *24* | 5.50 | 4 | 7 | 0.780 |
| Posttest Pain (Birth Ball) | 24 | 3.79 | 3 | 5 | 0.658 |
| Pretest Pain (Acupressure) | *24* | 5.75 | 4 | 7 | 0.944 |
| Posttest Pain (Acupressure) | 24 | 4.67 | 3 | 6 | 0.868 |

Based on table 2, the mean duration of the first stage of active labor in the birth ball group was 3 ± 0.955 hours, while in the acupressure group, it was 4.10 ± 1.280 hours. Thus, the mean duration of the active phase in the birth ball group was shorter by 1.10 hours compared to the acupressure group.

**Table 2. Mean Duration of the First Stage of Active Labor among Mothers in the Birth Ball and Acupressure Groups.**

| **Variable** | **n** | **Mean** | **min** | **max** | ***SD*** |
|---|---|---|---|---|---|
| Duration of Active Phase I (Birth Ball) | *24* | 3 | 1.75 | 5 | 0.955 |
| Duration of Active Phase I (Acupressure) | 24 | 4.10 | 2 | 7 | 1.280 |

Based on table 3, the pretest pain intensity for both the birth ball and acupressure groups showed a p-value of 0.336 > 0.05, indicating no significant difference in baseline pain intensity between the control and intervention groups. The posttest mean rank of pain in the birth ball group was 17.96, while in the acupressure group it was 31.04. There was a statistically significant difference in pain intensity after the intervention between the two groups, with a p-value of 0.001 ($p < 0.05$).

**Table 3. Analysis of Differences in Pain Intensity among Mothers in Labor between the Birth Ball and Acupressure Groups.**

| **Variable** | **n** | **Mean Rank** | **Sum of Rank** | **Mann Whitney U** | ***P Value*** |
|---|---|---|---|---|---|
| Pretest Pain (Birth Ball) | *24* | 22.67 | 544 | 244 | |
| Posttest Pain (Birth Ball) | 24 | 26.33 | 643 | | 0.336* |
| Pretest Pain (Acupressure) | *24* | 17.96 | 431 | 131 | 0.001* |
| Posttest Pain (Acupressure) | 24 | 31.04 | 745 | | |

Based on table 4, the mean rank for the duration of the first stage of active labor in the birth ball group was 18.50, while in the acupressure group it was 30.50. The p-value of 0.003 ($p < 0.05$) indicates a significant difference in the duration of the active phase of the first stage of labor between the birth ball and acupressure groups.

**Table 4. Analysis of Differences in the Duration of the First Stage of Active Labor among Mothers in Labor between the Birth Ball and Acupressure Groups at TPMB Iin Sepnita, 2025**

| **Variable** | **n** | **Mean Rank** | **Sum of Rank** | **Mann Whitney U** | ***P Value*** |
|---|---|---|---|---|---|
| Duration of Active Phase I (Birth Ball) | *24* | 18.50 | 444 | 144 | 0.003* |
| Duration of Active Phase I (Acupressure) | 24 | 30.50 | 732 | | |

## DISCUSSION

According to the results, birth ball therapy exerted a stronger impact on reducing pain intensity compared to acupressure. The birth ball demonstrated a 1.71 point reduction in pain scores, while the acupressure improved by only 1.08. This efficacy is largely driven by integrated distraction, pelvic postural adjustments, and mechanoreceptor activation. From a neurological perspective, the rhythmic motions and deep contact pressure of the ball engage the gate control theory of pain; by activating low-threshold A-beta fibers, they inhibit the transmission of noxious stimuli at the spinal dorsal horn level(18).

Non-pharmacological interventions such as the use of a birth ball and acupressure are widely recommended to reduce pain and shorten labor duration. Birth ball exercises help mothers cope with pain through various positions that utilize gravity and promote endorphin release. The elasticity and curvature



https://doi.org/10.56303/jhnresearch.v5i2.1009

of the ball stimulate hip receptors responsible for endorphin secretion. The pain reduction mechanism of birth ball use involves pelvic bouncing and rotation movements that enhance relaxation, blood flow, and fetal descent, indirectly decreasing pain. Increased uterine blood flow resulting from active movements alleviates ischemia-related pain. Psychologically, the mother feels more in control and less anxious, further reducing pain perception Jha et al (2023) reported that birth ball use significantly decreased VAS pain scores compared to the control group, as it stimulated endorphin release and optimized fetal positioning. The active movements during birth ball use (bouncing, pelvic rocking, pelvic tilt) stimulate non-nociceptive Aβ nerve fibers, inhibiting pain signal transmission (Aδ dan C fibers) in the dorsal horn of the spinal cord according to the gate control theory. Based on the endorphin theory, light physical activity increases β-endorphin secretion, which binds to opioid receptors in the central nervous system, reducing pain perception. From a biomechanical perspective, sitting or semi-squatting positions on a birth ball widen the pelvic diameter and utilize gravity to facilitate fetal descent and accelerate cervical dilation(18).

Although acupressure yielded a smaller reduction in pain scores, it remains a proven and effective option for relieving uterine contraction pain during the first stage of labor. According to Traditional Chinese Medicine (TCM), Qi is an essential energy that circulates through invisible channels called meridians. Health disturbances occur when the flow of Qi becomes too fast, too slow, turbulent, or stagnant (19). Most studies focus on SP6 and LI4 points, which have proven effective in reducing labor pain. Stimulation at these points promotes endorphin production, the body's natural analgesic, thereby decreasing pain perception (20). Based on the gate control theory, pain impulses transmitted through small-diameter nerve fibers are inhibited when large-diameter cutaneous nerve fibers are activated by acupressure (21). This activation "closes the gate" to pain transmission in the spinal cord, blocking pain signals from reaching the brain (22). The SP6 and LI4 points are particularly effective due to their abundance of large sensory nerve fibers, dense vascularization, and regulatory roles in vital energy (Qi) in TCM(23).

The mechanism of acupressure at LI4 and SP6 involves stimulating endorphin release and inhibiting pain transmission. The neuromodulation theory suggests that pressure on acupressure points activates Aβ fibers that inhibit nociceptive transmission in the substantia gelatinosa via descending inhibitory pathways(24). According to the hormonal theory, acupressure at SP6 increases endogenous oxytocin secretion and reduces cortisol, thereby strengthening uterine contractions. Pressure on LI4 stimulates the anterior pituitary to release β-endorphins (natural analgesics) and inhibits prostaglandin production by lowering PGE2 levels, a key inflammatory pain mediator. In conclusion, both birth ball and acupressure interventions effectively and significantly reduce pain intensity through distinct mechanisms biomechanical effects in birth ball use, and neuromodulation, nerve blockade, endorphin release, and the balancing of Qi and blood flow in acupressure.

Similar results were reported by Siregar et al (2020) who found that mothers in the birth ball group experienced an average labor progress of 9.1 ± 54.2 minutes, while those who did not use the birth ball had an average labor progress of 21.8 ± 101.6 minutes. The independent sample test yielded a p-value of 0.000, indicating a significant effect of the birth ball on labor progress(25). The mechanism of the birth ball in enhancing maternal mobility helps improve uterine contractions and cervical dilation, thereby facilitating labor progress. Pelvic rocking movements are particularly effective in shortening the duration of the active phase of the first stage of labor. These movements accelerate cervical dilation by promoting fetal descent, while pelvic rotation optimizes fetal positioning and engagement. The pressure exerted by the fetal head on the cervix stimulates prostaglandin release, which further facilitates cervical dilation. Upright maternal positions and free pelvic movement utilizing gravity also enhance cervical dilation by increasing fetal pressure on the cervix, thereby improving contraction efficiency. Karningsih et al (2022) found differences in the duration of the first and second stages of labor between the birth ball and SP6 acupressure groups, where pelvic rocking with the birth ball (active phase mean rank = 19.83; second stage = 24.56) was more effective in shortening labor duration than SP6 acupressure (active phase mean rank = 45.17; second stage = 40.44)(26).



https://doi.org/10.56303/jhnresearch.v5i2.1009

Consistent with these results, Salama (2025) reported that, in addition to reducing labor pain, acupressure also significantly shortened labor duration. A statistically significant reduction in oxytocin administration was observed after the intervention (from 53.1% to 38.5%; p = 0.014), as revealed by the McNemar test. These findings support the potential of SP6 acupressure to reduce the pharmacological need for labor augmentation. Most participants (87.5%) experienced an active phase lasting between 180–300 minutes, with a mean duration of approximately 258 minutes. Furthermore, 90.6% of participants experienced a second stage lasting less than 60 minutes, with an average duration of 44.02 ± 16.76 minutes, which is considered optimal and within normal limits(27).

The research assumption birth ball use has a greater impact on the active phase of labor, while acupressure accelerates the entire first stage through hormonal mechanisms. The researchers concluded that the use of a birth ball optimizes fetal positioning and cervical dilation, while acupressure at the LI4 and SP6 points stimulates natural oxytocin release and enhances uterine contractions in laboring mothers, thereby promoting labor progress as evidenced by a significantly shorter duration of labor.

Several limitations of this study warrant acknowledgment. First, due to the physical nature of both interventions, blinding the participants and data collectors was impossible, which may introduce performance bias. Second, labor pain is highly subjective and heavily influenced by confounding variables such as individual pain tolerance, fatigue, and baseline emotional support that could not be fully controlled. Finally, because this study was conducted within a single clinical facility, the generalizability of the findings to wider or more diverse demographic populations remains limited. Combining acupressure with birth ball exercises is more effective than either intervention alone.

These findings suggest that integrating birth ball protocols into standard intrapartum midwifery care can serve as a highly effective, low-risk strategy to manage pain and optimize labor progression. Labor wards should be adequately equipped with standardized birth balls, and midwife should be trained to guide laboring women through pelvic rocking and rotation movements. Future studies should employ larger, multi-center sample sizes to enhance generalizability. Additionally, combining both modalities (e.g., applying acupressure while the patient is positioned on a birth ball) should be investigated to determine potential synergistic effects on labor outcomes

## CONCLUSION

It can be concluded that there was a decrease in pain intensity during the active phase of the first stage of labor in both groups, with a greater reduction observed in the birth ball group The duration of the active phase of the first stage of labor was shorter in the birth ball than in the acupressure group. The findings of this study recommend the use of birth ball exercises and acupressure during the active phase of the first stage of labor as non-pharmacological pain management options that have been proven to significantly reduce pain intensity and labor duration at the Independent Midwifery Practice Iin Sepnita.

## DECLARATION OF THE USE OF AI

The authors declare that no artificial intelligence (AI), AI-assisted technologies, or large language models (LLMs) were used in the conception of the study, data analysis, or the drafting, writing, and editing of this manuscript. The only exception is the graphical abstract, which was created using the design platform Illustrae (https://illustrae.co/). The authors take full responsibility for the content and accuracy of the graphical abstract and the entire manuscript

## FUNDING

This study was funded by the Medika Bahagia Foundation, the governing of Universitas Medika Suherman, Bekasi.

## ACKNOWLEDGMENTS

The authors would like to express their gratitude to the Indonesian Directorate General of Research and Development, Ministry of Higher Education, Science, and Technology, for the financial



https://doi.org/10.56303/jhnresearch.v5i2.1009

support provided through the 2025 reputable journal publication grant program.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest

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