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## The effectiveness of birthing ball exercise on reducing pain during the active phase of first stage labor

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### Abstract

Pain is an unpleasant sensory and emotional experience commonly experienced during childbirth and is physiologically caused by distension of the lower uterine segment, cervical dilation, stretching of cervical tissues, and pressure on surrounding structures and nerves, which may lead to fear and anxiety and affect both the mother and the fetus. A preliminary survey conducted at BPM Utin Mulya, Pontianak City, reported approximately 300 deliveries in 2018, with most mothers experiencing severe pain in the abdomen, waist, back, and radiating to the spine. The birthing ball is a non-pharmacological pain management method that involves sitting on the ball and gently rocking back and forth to promote comfort and facilitate labor progression. This study aimed to analyze the effectiveness of birthing ball exercises in reducing pain during the active phase of the first stage of labor. A quasi-experimental design with a pretest–posttest non-equivalent control group was applied, involving 30 women in the active phase of the first stage of labor. The intervention group received birthing ball exercises, while the control group was given deep breathing relaxation. Data were analyzed using Wilcoxon and Mann–Whitney non-parametric tests. The results showed a significant reduction in pain scale in the birthing ball group after the intervention ( $p = 0.001$ ), while the control group also showed a reduction after deep breathing relaxation ( $p = 0.046$ ); however, the decrease in pain was greater in the birthing ball group. In conclusion, birthing ball exercises are more effective than deep breathing relaxation in reducing pain during the active phase of the first stage of labor.

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## INTRODUCTION

Childbirth, or labor and delivery, is a physiological process in which the products of conception, including the fetus, placenta, and membranes, are expelled from the uterus through the birth canal after a pregnancy reaches term, generally between 37 and 42 weeks of gestation, with spontaneous onset of labor and minimal risk to the mother and fetus when no complications occur (Spong, 2013). Normal labor is characterized by regular uterine contractions that lead to progressive cervical effacement and dilation, followed by fetal descent and delivery, most commonly in a cephalic presentation (He et al., 2023). Although the occiput anterior position is the most favorable for labor progression, variations in fetal position may affect the duration and course of labor, particularly during the second stage. When labor proceeds without significant maternal or fetal complications and results in a healthy mother and newborn, it is classified as normal childbirth (Indrayani & Djami, 2016).

Despite being a normal physiological event, childbirth is commonly associated with pain, which remains a major concern for pregnant women. Labor pain is a complex and subjective experience influenced by both sensory and emotional components, leading to wide individual variations in pain perception and coping mechanisms (Makino, 2023). The anticipation of pain during labor often causes anxiety and fear, which can negatively influence a woman's psychological readiness for childbirth and her overall labor experience.

Pain during labor arises from both physical reflexes and psychological responses. Emotional tension due to anxiety and fear may intensify pain perception and trigger physiological reactions such as increased blood pressure, heart rate, altered breathing patterns, pallor, diaphoresis, nausea, and vomiting. These responses can interfere with uterine contractility, reduce the effectiveness of contractions, and potentially prolong the duration of labor (Kurniawati, 2017; Lowdermilk, 2013). Consequently, unmanaged labor pain may adversely affect maternal comfort, labor progress, and clinical outcomes.

During the first stage of labor, pain is primarily visceral in nature, resulting from distension of the lower uterine segment, cervical dilation, stretching of cervical tissues, and pressure on surrounding structures and nerves. In contrast, pain in the second stage of labor is predominantly somatic and is often described as sharp, intense, burning, and well localized. Labor pain is frequently accompanied by emotional expressions such as anxiety, crying, moaning, restlessness, and excessive muscle tension, reflecting the close interaction between physiological and psychological factors (Lowdermilk, 2013). Therefore, effective pain management is essential, not necessarily to eliminate pain completely but to ensure that it is manageable, in line with the maternal care aspect of childbirth management promoted by the Indonesian Ministry of Health (Aryani et al., 2015).

Various pharmacological and non-pharmacological methods have been developed to manage labor pain; however, pharmacological approaches may cause side effects and are not always feasible in primary healthcare settings. Non-pharmacological interventions, such as relaxation techniques and physical exercises, are increasingly recommended due to their safety and simplicity. One such method is the use of birthing ball exercises, which allow mothers to sit, sway, and perform gentle movements to enhance comfort and facilitate labor progress. Although previous studies have shown the benefits of birthing ball exercises, evidence comparing their effectiveness with deep breathing relaxation during the active phase of the first stage of labor, particularly in independent midwife practice settings in Pontianak City, remains limited. This gap forms the basis of the present study, which aims to analyze the effectiveness of birthing ball exercises in reducing labor pain during the active phase of the first stage of labor at the Utin Mulya Independent Midwife Practice in Pontianak City.

## METHOD

This study applied a quasi-experimental research design using a pre-test and post-test control group approach. This design was chosen because the researchers did not perform randomization in assigning participants to the intervention and control groups. In the intervention group, birthing ball therapy was provided, while the control group received only standard care for mothers in labor (Dharma, 2011). The use of this design allowed the researchers to evaluate the effectiveness of birthing ball therapy in reducing pain during the active phase of the first stage of labor.

The determination of the sample size in this study was conducted using a hypothesis testing formula for the difference between two independent group means. Several parameters were included in the calculation, such as the standard normal deviations for  $\alpha$  (1.96) and  $\beta$  (0.842), along with mean values obtained from previous research, namely  $\mu_1 = 2.398$  for the intervention group and  $\mu_2 = 5$  for the control group. The difference between these two means represented the expected clinically significant effect. Variance estimation was calculated using the formula  $\frac{1}{2}(SD_1^2 + SD_2^2)$ , which reflected the combined variability of both groups.

The population in this study consisted of mothers experiencing the active phase of the first stage of labor. From this population, a sample was selected using an appropriate sampling technique to ensure that the participants represented the broader population. The calculated sample size ensured that the study had adequate statistical power to detect meaningful differences between the intervention and control groups. Overall, this methodological approach beginning with the research design, sample size calculation, and population selection provided a systematic framework for assessing the impact of birthing ball therapy, thereby yielding valid and reliable findings regarding labor pain reduction (Judha, 2012).

This chapter also presents the results of the study on the effectiveness of birthing ball exercises in reducing labor pain during the active phase of stage 1 at the Utin Mulya independent midwifery practice in Pontianak. The research was conducted on May 16, 2019, involving 30 participants who were divided equally into two groups. Fifteen participants received birthing ball exercises, while the remaining fifteen were given deep breathing exercises. The study results are presented in tabular form accompanied by descriptive explanations, while the discussion is delivered in narrative form to provide a comprehensive understanding of the findings.

## RESULTS AND DISCUSSION

**Table 1.** Differences in Labor Pain Scores Before and After Birthing Ball Exercises.

<b>Variable</b>	<b>Median Before</b>	<b>Median After</b>	<b>p-value</b>
Labor pain score	6.00	4.00	0.001

Table 1 shows that the results indicate a statistically significant difference in labor pain scores before and after the implementation of birthing ball exercises. The median pain score decreased after the intervention, demonstrating that birthing ball exercises effectively reduced labor pain during the active phase of the first stage of labor. The significant p-value suggests that the observed reduction in pain was not due to chance, highlighting the effectiveness of birthing ball exercises as a non-pharmacological method for managing labor pain.

**Table 2.** Comparison of Labor Pain Scores Before and After Interventions During the Active Phase of the First Stage of Labor.

<b>Intervention Type</b>	<b>Pain Score Before (Median)</b>	<b>Pain Score After (Median)</b>	<b>Pain Reduction</b>	<b>p-value</b>
Birthing ball exercises	Higher pain score	Lower pain score	Decreased	0.001
Deep breathing exercises	Pain score unchanged	Pain score unchanged	No reduction	<0.046
Comparison between interventions	—	—	Greater reduction in birthing ball group	0.001

Table 2 shows that the findings of this study indicate that birthing ball exercises significantly reduced labor pain during the active phase of the first stage of labor. A clear decrease in pain intensity was observed after the intervention, demonstrating that birthing ball exercises are effective as a non-pharmacological method for labor pain management. This reduction suggests that the use of birthing ball exercises helps mothers cope better with labor pain by promoting comfort, relaxation, and optimal pelvic positioning during labor.

Deep breathing exercises also showed a statistically significant difference in pain scores before and after the intervention. However, the absence of a meaningful reduction in pain intensity indicates that, although deep breathing may assist mothers in managing anxiety and maintaining controlled breathing during labor, it is less effective in directly reducing perceived labor pain compared to birthing ball exercises.

Furthermore, the comparison between the two interventions revealed a significant difference in effectiveness, with birthing ball exercises demonstrating superior outcomes in reducing labor pain during the active phase of the first stage of labor. These results suggest that birthing ball exercises provide greater physiological and psychological benefits than deep breathing exercises alone. Therefore, birthing ball exercises can be recommended as a more effective non-pharmacological intervention for pain management during labor, particularly in the active phase of the first stage of labor.

## **DISCUSSION**

The results of this study showed a significant reduction in labor pain during the active phase of the first stage after the application of birthing ball exercises, with a p-value of 0.001. The median pain score decreased from 6.00 before the intervention to 4.00 after the intervention, indicating that birthing ball exercises were effective in alleviating labor pain. These findings are consistent with the study conducted by Kurniawati (2017), which reported that the average pain score in mothers who received birthing ball exercises was lower than that in the control group (4.5 vs. 5.4), with a p-value of 0.01. Furthermore, Kurniawati (2017) found that anxiety and husband or family support significantly influenced labor pain ( $p < 0.05$ ), and multivariate analysis revealed that birthing ball exercises combined with social support contributed 49% to the reduction in labor pain ( $R^2 = 0.49$ ). This highlights that labor pain is not solely a physiological phenomenon but is also influenced by psychological and social factors.

Normal childbirth is defined by the World Health Organization as labor with a vertex presentation that occurs spontaneously, within a normal duration, and with minimal risk to both mother and fetus, typically between 37 and 42 weeks of gestation (Andarmoyo, 2013; Indrayani & Djami, 2016). Pain experienced during labor is highly subjective and can only be accurately described by the individual experiencing it (Indrayani & Djami, 2016). Labor pain consists of two distinct types: visceral pain during the first stage of labor, originating from uterine contractions and cervical dilation, and somatic pain during the second stage, which

is localized and results from stretching of the pelvic floor, vagina, and perineum. The effectiveness of birthing ball exercises in reducing pain may be attributed to their ability to facilitate pelvic movement, promote fetal descent, and enhance maternal comfort, thereby reducing the intensity of visceral pain experienced during the active phase of labor.

The birthing ball, also known as a birth ball or exercise ball, is a physical therapy tool that has been increasingly utilized in maternal care as a non-pharmacological method for pain management. Originally developed for physiotherapy and rehabilitation, its use during pregnancy helps improve posture, increase pelvic flexibility, strengthen core muscles, and reduce discomfort in the lower back and pelvic region (Kusfari et al., 2012). During labor, particularly in the active phase of the first stage, sitting or performing gentle movements such as rocking and circular motions on the birthing ball can widen the pelvic outlet, stimulate mechanoreceptors, enhance uterine contraction efficiency, and encourage relaxation. These mechanisms contribute to reduced muscle tension and anxiety, leading to a lower perception of pain. Previous studies have demonstrated that birthing ball exercises significantly reduce labor pain intensity, shorten the duration of the first stage of labor, and improve maternal comfort without increasing maternal or neonatal complications, making this intervention a safe and effective option for supporting normal childbirth (Taavoni et al., 2016; Makvandi et al., 2022).

In addition to birthing ball exercises, deep breathing relaxation was also found to significantly reduce labor pain during the active phase of the first stage, as indicated by a p-value of 0.046. Labor pain begins with the onset of contractions and continues through cervical dilation, typically lasting 12–18 hours, particularly in primiparous women. Physiologically, pain results from uterine contractions, cervical effacement and dilation, and pressure on surrounding structures, while psychologically, factors such as anxiety, fear, fatigue, and emotional stress play a significant role in amplifying pain perception (Landmark, 2024). Anxiety activates the sympathetic nervous system, leading to increased muscle tension and reduced pain tolerance, which may prolong labor and exacerbate discomfort (Lowdermilk et al., 2013; WHO, 2020; Melzack & Wall, 2014).

Deep breathing relaxation works by reducing mental, physical, and emotional tension through controlled breathing patterns that enhance oxygen delivery and stimulate the release of endorphins, the body's natural pain-relieving hormones (Firtiani, 2014; Faujiah et al., 2018). By promoting relaxation and reducing anxiety, this technique helps mothers cope better with labor pain. However, when comparing the effectiveness of both interventions, the results of this study indicated a significant difference between birthing ball exercises and deep breathing relaxation, with a p-value of 0.001. Although both interventions reduced pain, the median reduction in pain was greater in the birthing ball group (1.00) compared to the deep breathing group (0.00). This suggests that birthing ball exercises provide a more substantial reduction in labor pain during the active phase of the first stage of labor. Therefore, birthing ball exercises can be considered a more effective non-pharmacological intervention for labor pain management than deep breathing relaxation in this context.

## **CONCLUSION**

This study concludes that birthing ball exercises are effective in reducing labor pain during the active phase of the first stage of labor at the Utin Mulya Independent Midwife Practice in Pontianak City. A significant reduction in pain intensity was observed after the application of birthing ball exercises. Deep breathing exercises also demonstrated an effect on reducing labor pain during the active phase of the first stage; however, the reduction was less pronounced compared to birthing ball exercises. Furthermore, a difference in effectiveness was identified between the two non-pharmacological interventions, indicating that birthing ball exercises are more effective than deep breathing exercises in managing

labor pain during the active phase of the first stage of labor. The findings of this study may serve as a reference for future researchers and are expected to contribute to further investigations exploring additional factors that influence labor pain management during the active phase of the first stage of labor.

## REFERENCE

- Andarmoyo, S. (2013). *Konsep dan proses keperawatan nyeri*. Yogyakarta: Ar-Ruzz Media.
- Aryani, Y., Masrul, M., & Evareny, L. (2015). Pengaruh Masase pada Punggung Terhadap Intensitas Nyeri Kala I Fase Laten Persalinan Normal Melalui Peningkatan Kadar Endorfin. *Jurnal Kesehatan Andalas*, 4(1), 70-77. <https://doi.org/10.25077/jka.v4i1.193>
- Dharma, K. K. (2011). *Metodologi penelitian keperawatan*. Jakarta: CV. Trans Info.
- Faujiah, I. N., Herliani, Y., & Diana, H. (2018). Pengaruh Kombinasi Teknik Kneading dan Relaksasi Nafas dalam terhadap Intensitas Nyeri Kala I Fase Aktif Persalinan Primigravida di Wilayah Kerja Upt Puskesmas Rajapolah Tahun 2018. *Jurnal Bidan "Midwife Journal"*, 4(2), 1-10.
- Fitriani, R. (2014). The effect of deep breathing relaxation techniques on pain adaptation responses in patients during the first stage of labor. Unpublished undergraduate thesis, Faculty of Health Sciences, Alauddin State Islamic University, Makassar. Retrieved from <http://journal.uin-alauddin.ac.id/index.php/kesehatan/article/view/62>
- Fitriani, R. (2014). Pengaruh Teknik Relaksasi Nafas Dalam Terhadap Respon Adaptasi Nyeri Pada Pasien Inpartu Kala I Fase Laten Di Rskdia Siti Fatimah Makassar Tahun 2013. *Jurnal Kesehatan*, 7(2), 443-452. <https://doi.org/10.24252/kesehatan.v7i2.62>
- He, X., Zeng, X., Troendle, J., Ahlberg, M., Tilden, E. L., Souza, J. P., Bernitz, S., Duan, T., Oladapo, O. T., Fraser, W., & Zhang, J. (2023). New insights on labor progression: a systematic review. *American journal of obstetrics and gynecology*, 228(5S), S1063–S1094. <https://doi.org/10.1016/j.ajog.2022.11.1299>
- Indrayani, & Djami, M. E. U. (2016). *Asuhan persalinan dan bayi baru lahir*. Jakarta: Trans Info Media.
- Judha, M. (2012). *Teori pengukuran nyeri dan nyeri persalinan*. Yogyakarta: Nuha Medika.
- Kurniawati, A., Dasuki, D., & Kartini, F. (2017). Efektivitas Latihan Birth Ball terhadap Penurunan Nyeri Persalinan Kala I Fase Aktif pada Primigravida. *Junral Ners dan Kebidanan Indonesia*, 5(1), 1-10.
- Kusfari, O. (2012). *Pengaruh Terapi Birth Ball Terhadap Nyeri Persalinan*. Malang: Fakultas Kedokteran, Universitas Brawjaya.
- Landmark, L., Sunde, H. F., Fors, E. A., Kennair, L. E. O., Sayadian, A., Backelin, C., & Reme, S. E. (2024). Associations between pain intensity, psychosocial factors, and pain-related disability in 4285 patients with chronic pain. *Scientific Reports*, 14(1), 13477. <https://doi.org/10.1038/s41598-024-64059-8>
- Lowdermilk, D. L., Perry, S. E., & Cashion, K. (2013). *Maternity and women's health care* (10th ed.). St. Louis, MO: Elsevier Mosby.
- Makino, S. (2023). Pain management during labor. *Journal of Obstetrics and Gynaecology Research*, 49(Suppl. 1), 174–176. <https://doi.org/10.1111/jog.15601>
- Makvandi, S., Mirzaiinajmabadi, K., Mirteimoori, M., & Esmaily, H. (2022). Effect of birth ball exercises on pain intensity and labor duration during the active phase of labor: A randomized controlled trial. *BMC Pregnancy and Childbirth*, 22, 457. <https://doi.org/10.1186/s12884-022-04738-9>
- Melzack, R., & Wall, P. D. (2014). *The challenge of pain* (2nd ed.). London: Penguin Books.
- Spong, C. Y. (2013). Defining "Term" Pregnancy: Recommendations From the Defining "Term" Pregnancy Workgroup. *JAMA*, 309(23):2445–2446. <https://doi.org/10.1001/jama.2013.6235>

Taavoni, S., Abdollahian, S., Haghani, H., & Neysani, L. (2011). Effect of birth ball usage on pain in the active phase of labor: a randomized controlled trial. *Journal of midwifery & women's health*, 56(2), 137–140. <https://doi.org/10.1111/j.1542-2011.2010.00013.x>

World Health Organization. (2020). *WHO recommendations: Intrapartum care for a positive childbirth experience*. Geneva: World Health Organization.