

THE EFFECTIVENESS OF FINGER STRESS BALL USE ON LABOR PAIN INTENSITY AND DURATION OF THE ACTIVE PHASE OF THE FIRST STAGE OF LABOR

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ABSTRACT

Labor pain becomes increasingly pronounced as the active phase progresses and may affect maternal comfort and the progress of childbirth. A finger stress ball is a non-pharmacological method that is squeezed whenever a mother experiences contractions during the active phase of the first stage of labor. This study aims to analyze the effectiveness of finger stress ball use on pain intensity and the duration of the active phase of the first stage of labor at Simpang Lima Gumul Kediri Regional General Hospital. A quasi-experimental approach using a nonequivalent control group design was applied in this study. A total of 36 women in the active phase of the first stage of labor participated in the study and were assigned to either the intervention or control group through consecutive sampling. The intervention group received finger stress ball therapy, whereas the control group received standard care. Pain intensity was measured using the Numeric Rating Scale (NRS), and labor duration was measured using a partograph. Data were analyzed using the Mann-Whitney U test. The intervention group showed a mean pain change of -0.88 ± 1.1 , compared with 2.8 ± 1.2 in the control group ($p < 0.001$). The mean active-phase duration was 255 minutes for primiparous and 192 minutes for multiparous women in the intervention group, compared with 390 and 265 minutes, respectively, in the control group ($p = 0.044$). The duration of labor in the intervention group was shorter than that in the control group, with a statistically significant difference ($p = 0.044$). These findings indicate that finger stress ball therapy may be used as a complementary non-pharmacological approach to support maternal comfort and labor progress.

Keywords : Duration of the Labor, *Finger stress ball*, Labor, Labor pain, The active phase of the first stage

INTRODUCTION

Labor is the process of delivering a full-term fetus from the uterus into the outside world. This process generally occurs spontaneously, with a cephalic presentation and without complications, and usually lasts up to 18 hours. During the first stage of labor, maternal discomfort gradually becomes more pronounced as labor progresses. The active phase is generally associated with stronger and more frequent uterine contractions, which contribute to increasing pain intensity. (Soeparno et al., 2020).

The experience of labor pain is associated with several physiological processes. Uterine contractions, cervical dilation and effacement, together with stretching of the lower uterine segment, contribute to the pain perceived by the mother. These pain stimuli are transmitted through visceral nerve fibers to the spinal cord at the thoracic 10 to lumbar 1 segments (T10–L1). As cervical dilation progresses and uterine contractions become stronger, the pain impulses perceived by the mother become more intense, resulting in an increase in pain intensity throughout the active phase of labor. In addition to physiological factors, pain

perception is also influenced by psychological factors, previous childbirth experience, family support, and the mother's level of preparedness for labor (Wulan et al., 2022).

Excessive labor pain can trigger the release of various hormones, including prostaglandins, leukotrienes, histamine, bradykinin, and serotonin, which subsequently cause stress and increase the secretion of catecholamine and steroid hormones. Excessive production of these hormones can interfere with uteroplacental circulation, resulting in hypoxia. This condition affects uterine contractions and, if not managed promptly, may lead to prolonged labor (Simbolon, Juana Linda & Sitompul, Emilia Silvana, 2024).

Although pain is a normal component of childbirth, excessive pain can reduce maternal comfort and interfere with the mother's ability to cope with contractions. When labor pain becomes intolerable, it can interfere with the progress of labor and cause distress in the baby. Unbearable labor pain may also lead to psychological disturbances, such as rejection, fear, anxiety, anger, and sadness (Sari et al., 2023).

Globally, prolonged labor contributes to 8% of maternal deaths, while in Indonesia, the leading causes of maternal mortality are still dominated by hemorrhage (34–45%), particularly postpartum hemorrhage, followed by hypertensive disorders of pregnancy (14.5–24%), infection (10–10.5%), and prolonged labor (5–6.5%) (Lubis et al., 2025). Data from the 2023 Indonesian Health Profile recorded 4,482 maternal deaths in Indonesia. Hypertensive disorders during pregnancy were one of the major causes of maternal deaths, with 412 reported cases. This was followed by obstetric hemorrhage, which accounted for 360 deaths, and other obstetric complications, with 204 cases. (Ministry of Health of the Republic of Indonesia, 2023).

Maternal mortality remains a major public health concern in East Java Province. According to the 2023 East Java Health Profile, there were 499 maternal deaths, with the main causes being hypertensive disorders during pregnancy, childbirth, and the postpartum period; obstetric hemorrhage; and non-obstetric complications (East Java Provincial Health Office, 2023). In Kediri Regency, the number of deliveries in 2024 was recorded at 16,050 cases, with 60 cases occurring in the Ngasem area (Kediri Regency Health Office, 2024). Maternal deaths are also associated with complications during childbirth, one of which is prolonged labor. The incidence of prolonged labor was reported at 5% among 567 maternal deaths (East Java Provincial Health Office, 2022), while Kediri Regency recorded 315 cases of prolonged labor in 2024 (Kediri Regency Health Office, 2024).

Labor pain can be managed through pharmacological as well as non-pharmacological approaches. One of the non-pharmacological options is the use of a finger stress ball, which serves as a distraction by directing the mother's attention toward squeezing the ball and helping to lessen her perception of pain (Pratiwi & Rosyidah, 2024). The activity of squeezing and releasing the ball functions similarly to acupressure by providing stimulation to certain areas of the body, which can subsequently affect other parts of the body. Focusing on the finger stress ball helps reduce stress, pain, and panic while promoting a calmer state of both body and mind. The squeezing motion stimulates the production of endorphins, which act as natural analgesics, reduce anxiety, promote relaxation, and stabilize emotions (Setyoningsih, 2023).

The finger stress ball is a non-pharmacological therapy that works through distraction, helping to shift the mother's attention away from pain by means of squeezing the ball. This technique stimulates peripheral sensory nerves, which transmit signals to the central nervous system, thereby increasing endorphin production. Endorphins function as natural analgesics that can inhibit neurotransmitter release and consequently reduce pain intensity (Cahya & Rosyidah, 2025).

Pressure applied to the LI4 acupressure point can stimulate the release of oxytocin from the pituitary gland (Marsilia et al., 2025). In addition, pressure applied to the PC8 point

stimulates branches of the median and ulnar nerves. Stimulation of this point can activate neuromodulatory pathways in the peripheral nervous system, thereby influencing pain perception and the body's stress response (Kim et al., 2025).

Several previous studies have reported that the use of a finger stress ball is effective in reducing pain intensity in various medical conditions, including during labor. However, most studies have focused primarily on pain reduction as the main outcome. Research on the use of finger stress ball therapy to support labor progress, especially its effect on the duration of the active phase of the first stage, is still limited. In addition, only a small number of studies have examined its effects on both labor pain intensity and the duration of the active phase, particularly among women giving birth in Indonesia.

Previous research has also demonstrated the potential of hand-based stress ball techniques for pain management. Dinamiyanti et al. (2024) reported that the application of a finger-hold technique using a squishy ball reduced acute pain intensity in patients after cesarean section, with pain scores decreasing from 9 to 2 following the intervention. Although the study was conducted in postoperative patients rather than women in labor, its findings support the use of hand stimulation with a soft ball as a non-pharmacological approach to pain management. In contrast, research specifically examining the use of a finger stress ball during the active phase of labor and its potential effect on both pain intensity and labor duration remains limited. Therefore, this study examined both pain intensity and the duration of the active phase among women receiving care at Simpang Lima Gumul Regional Hospital, Kediri.

METHODS

This study employed a quasi-experimental design using a nonequivalent control group design approach. The study was conducted at Simpang Lima Gumul Regional Hospital, Kediri, from January 5 to 31, 2026. In this study, the use of a finger stress ball served as the independent variable, while labor pain intensity and the duration of the active phase of the first stage of labor were the dependent variables. The study population included all women in the active phase of the first stage of labor who met the specified eligibility criteria at Simpang Lima Gumul Regional Hospital, Kediri. The sample consisted of 36 respondents, comprising 18 respondents in the intervention group and 18 respondents in the control group. The sampling technique used was consecutive sampling based on the predetermined inclusion and exclusion criteria.

The inclusion criteria were women who were willing to participate, primigravida or multigravida women undergoing normal labor in the active phase with cervical dilation of 4–6 cm, cephalic presentation, a normal pelvis, no high-risk medical history such as diabetes mellitus, hypertension, or heart disease, willingness to use the finger stress ball during labor, no physical disability that interfered with the intervention, and the ability to communicate effectively. The exclusion criteria were multiple pregnancy, abnormal fetal heart rate during labor, abnormal fetal presentation such as transverse or breech presentation, a history of cesarean section, and extreme maternal fatigue that prevented continuation of normal labor.

Women in the intervention group were given finger stress ball therapy during the active phase of the first stage of labor, whereas those in the control group received routine care based on the hospital's standard procedures. No finger stress ball therapy was provided to the control group. Labor pain was assessed using the Numeric Rating Scale (NRS), while the duration of the active phase was recorded using a partograph. Data were obtained through direct observation, with the measurement results recorded before and after the intervention for both groups.

In the intervention group, the finger stress ball was administered during the active phase of the first stage of labor, beginning at cervical dilation of 4–6 cm. The intervention was

performed for approximately 2 hours. The mother was instructed to squeeze and release the finger stress ball once whenever a uterine contraction occurred, rather than using it continuously between contractions. The intervention was continued during the observation period, and labor progress was monitored until complete cervical dilation. Pain intensity was assessed before the intervention and after the intervention.

The data were analyzed using a computer program. Univariate analysis was used to describe the characteristics of the respondents, labor pain intensity, bivariate analysis was used to examine differences between the intervention and control groups. The Mann–Whitney test was applied to assess differences in labor pain intensity and the duration of the active phase of the first stage of labor between the two groups. Statistical significance was set at $\alpha = 0.05$. This study obtained ethical approval from the Health Research Ethics Committee prior to its implementation, and all respondents signed an informed consent form indicating their willingness to participate in the study under approval number DP.04.03/F.XIII.31/0264/2026.

RESULTS

The analysis compared pain intensity at baseline between women in the intervention and control groups before the finger stress ball intervention was administered.

Table 1. Pain intensity among women in labor before the intervention in the intervention and control groups

Groups	N	Mean $\pm$ SD	Min - Max	Median
Intervention	18	7.5 $\pm$ 1.3	6.0 – 10.0	7.5
Control	18	7.0 $\pm$ 1.2	5.0 – 9.0	7.0

Based on Table 1, the pain level in the intervention group before receiving the treatment (pre-test) showed a mean pain score of 7.5, with a range of 6.0–10.0. This indicates that labor pain intensity remained relatively high before the intervention. In the control group, before receiving standard care, the mean pain score at the pre-test was 7.0, with a range of 5.0–9.0. The mean baseline pain scores were relatively similar between the two groups.

The median scores and score ranges indicate that pain intensity was relatively high in both groups prior to the intervention. Most of the mothers reported moderate to severe pain. This finding is consistent with the active phase of the first stage of labor, during which increasing cervical dilation and stronger uterine contractions can lead to greater pain perception. The relatively similar mean pain scores between the intervention and control groups also indicate that the baseline conditions of both groups were relatively homogeneous, allowing a more objective comparison of the effectiveness of the intervention at the subsequent stage. This analysis aimed to determine the distribution of labor duration among women in labor who received the finger stress ball intervention in the intervention and control groups.

Table 2. Duration of Labor in the Intervention and Control Groups

Groups	Primipara				Multipara			
	N	Mean $\pm$ SD (menit)	Min – Max (menit)	Median (menit)	N	Mean $\pm$ SD (menit)	Min – Max (menit)	Median (menit)
Intervention	8	255 $\pm$ 83.3	180 – 420	240	10	192 $\pm$ 55.1	120 – 300	180
Control	6	390 $\pm$ 118.4	240 – 480	450	12	265 $\pm$ 129	120 – 480	240

Among primiparous women in the intervention group, the mean labor duration was 255 minutes, ranging from 180 to 420 minutes. For multiparous women, the corresponding mean was 192 minutes, with a range of 120–300 minutes. Meanwhile, among women who did not receive the finger stress ball intervention, the primipara group had a mean labor duration of 390 minutes, with a range of 240–480 minutes, while the multipara group had a mean labor duration of 265 minutes, with a range of 120–480 minutes.

The data in the table show that labor duration was longer in the primipara group than in the multipara group, both in the intervention and control groups. In addition, the group that received the finger stress ball intervention had a shorter mean labor duration than the control group. This difference can be observed in both the median and mean values of each group. These findings indicate a tendency toward better labor progress among women who received the finger stress ball intervention compared with those who received standard labor care alone.

This analysis was conducted to compare changes in pain intensity between the intervention group that received the finger stress ball and the control group that did not receive the finger stress ball intervention among women in the active phase of the first stage of labor.

Table 3. Result of the Pain Intensity Analysis in the Intervention and Control Groups

Groups	N	Mean $\pm$ SD	Min - Max	Median	P value
Intervention	18	-0.88 $\pm$ 1.1	-2.0 – 2.0	-1.0	0.000
Control	18	2.8 $\pm$ 1.2	1.0 – 5.0	3.0	

Table 3 shows a different pattern of pain intensity changes between the two groups. The intervention group had a mean change of -0.88, with scores ranging from -2.0 to 2.0. In contrast, the control group showed a mean change of 2.8 $\pm$ 1.2, with a range of 1.0 to 5.0. The Mann–Whitney U test resulted in an Asymp. Sig. (2-tailed) value of 0.000. As this value was below the 0.05 significance level, a statistically significant difference in labor pain intensity was found between the intervention and control groups.

The intervention group showed a mean change in pain intensity of -0.88 $\pm$ 1.1 points, indicating a decrease in pain intensity, whereas the control group showed an increase of 2.8 $\pm$ 1.2 points. Thus, the difference in mean change between the two groups was 3.68 points on the NRS. The Mann–Whitney U test demonstrated a statistically significant difference in pain intensity changes between the groups ($p < 0.001$).

The two groups showed contrasting changes in pain intensity following the intervention. Mothers who used the finger stress ball generally experienced a decrease in pain scores, suggesting that this technique may help lessen pain perception during labor. Meanwhile, pain scores in the control group increased as cervical dilation progressed and uterine contractions became more frequent during the active phase of the first stage. These results suggest that using a finger stress ball can be beneficial as a non-pharmacological approach to managing labor pain.

This analysis was conducted to determine the difference in labor duration between women who received the finger stress ball intervention and those who received standard labor care only.

Table 4. Result of the Analysis of Labor Duration in the Intervention and Control Groups

Groups	N	Primipara			N	Multipara			P value
		Mean $\pm$ SD (menit)	Min – Max (menit)	Median (menit)		Mean $\pm$ SD (menit)	Min – Max (menit)	Median (menit)	
Intervention	8	255 $\pm$ 83.3	180 – 420	240	10	192 $\pm$ 55.1	120 – 300	180	0.044
Control	6	390 $\pm$ 118.4	240 – 480	450	12	265 $\pm$ 129	120 – 480	240	

Table 4 presents the results of the Mann–Whitney U test, which produced an Asymp. Sig. (2-tailed) value of 0.044. Because the p-value was below the 0.05 significance level, the analysis confirmed a statistically significant difference in labor duration between the intervention and control groups.

Among primiparous women, the mean duration of the active phase was 255 minutes in the intervention group and 390 minutes in the control group, representing a mean difference of 135 minutes. Among multiparous women, the corresponding mean durations were 192 minutes and 265 minutes, respectively, representing a mean difference of 73 minutes. Overall, the intervention group had a shorter mean duration than the control group in both parity categories. The Mann–Whitney U test showed a statistically significant difference in labor duration between the two groups ($p = 0.044$).

DISCUSSION

Differences in labor duration between the two groups were reflected in both the mean and median results. The intervention group showed a shorter labor duration than the control group in both the primipara and multipara categories. These findings indicate that the use of a finger stress ball was not only associated with a reduction in pain intensity but was also associated with better labor progress. Although labor duration is influenced by various factors, the results of this study indicate a tendency for women who received the finger stress ball intervention to experience a more efficient labor process than those in the control group.

Pain experienced during the active phase of the first stage of labor is largely related to uterine contractions, progressive cervical dilation, and the movement of the presenting fetal part through the birth canal. Pain intensity increases as cervical dilation progresses and uterine contractions become stronger. In addition to physiological factors, labor pain is also influenced by psychological factors, particularly anxiety and fear, which can increase pain perception in women in labor (Kundaryanti et al., 2023).

These results are in line with the findings reported by Cahya and Rosyidah (2025), who observed that moderate to severe pain was commonly experienced by women during the active phase of the first stage of labor. This condition indicates that pain is a common experience during labor and requires appropriate management to improve maternal comfort.

The researchers suggest that the intensity of pain during the active phase of the first stage of labor is influenced not only by physiological changes but also by maternal anxiety. Anxiety can increase the stress response, resulting in stronger pain perception and reduced maternal comfort during labor.

Labor duration is influenced by various factors, including parity and the mother's psychological condition. Labor in primiparous women tends to last longer than in multiparous women because the cervix and birth canal tissues have not previously undergone the process of childbirth. In addition, anxiety, fear, and stress during labor can cause uterine contractions to become less effective, resulting in slower cervical dilation and a longer labor duration (Ruhayati et al., 2024).

The study by Marsilia et al. (2025) also showed that a positive psychological condition contributes to more optimal labor progress. Mothers who are calmer and more comfortable tend to have more effective contractions than those experiencing excessive anxiety.

According to the researchers, a stable psychological condition helps mothers adapt to contractions and use their energy more effectively during labor. Reduced tension and stress also support more optimal uterine contractions, allowing cervical dilation to progress more smoothly.

The use of a finger stress ball can reduce labor pain intensity through distraction, relaxation, and sensory stimulation mechanisms. Gripping and repeatedly squeezing the ball may provide the mother with an alternative focus during contractions, helping to reduce her attention to the pain. Hand stimulation may also support the release of endorphins, which are involved in the body's natural pain-modulation process and may help reduce the intensity of pain perceived by the mother. (Setyoningsih, 2023).

This study is consistent with the findings of Genç et al. (2022), which demonstrated that a finger stress ball was effective as a non-pharmacological method for reducing labor pain. The reduction in pain intensity in the intervention group can be explained through the distraction mechanism that occurs during the use of the finger stress ball. When the mother focuses her attention on gripping and squeezing the ball during contractions, her focus on the sensation of pain decreases. This condition helps divert her attention from the discomfort caused by uterine contractions and cervical dilation. The better the mother's ability to shift her attention away from pain, the lower her perceived pain intensity during labor.

In addition to functioning as a distraction technique, the use of a finger stress ball also provides sensory stimulation to the palms and fingers. This stimulation may activate pain-inhibitory mechanisms within the nervous system, thereby reducing the transmission of pain impulses to the brain. Consequently, mothers may experience not only reduced pain intensity but also greater comfort and an improved ability to adapt to contractions during the active phase of the first stage of labor.

The findings of this study are consistent with the Gate Control Theory, which explains that sensory stimulation can help limit the transmission of pain signals to the central nervous system. Squeezing a finger stress ball produces mechanical stimulation in the hand area, which is detected by sensory receptors and transmitted through large-diameter nerve fibers. Activation of these nerve fibers helps inhibit the transmission of pain impulses originating from the uterus and cervix, resulting in lower pain perception by the brain. This mechanism explains why mothers who used a finger stress ball demonstrated greater reductions in pain intensity than those in the control group.

The use of a finger stress ball can help mothers become more relaxed and comfortable during labor, thereby reducing tension and supporting labor progress. This relaxed condition allows uterine contractions to occur more effectively, enabling cervical dilation to progress more optimally.

Physiologically, anxiety, fear, and stress during labor can increase the release of catecholamines, which may cause uterine contractions to become less effective. Conversely, when the mother feels calmer, stress hormone production decreases and oxytocin release becomes more optimal, which can support labor progress (Aliah et al., 2024).

This study is consistent with the findings of Cahya and Rosyidah (2025), which stated that non-pharmacological relaxation methods can help accelerate labor progress. In this study, the group receiving the finger stress ball intervention had a shorter labor duration than the control group. These findings indicate that the benefits of the finger stress ball are not limited to pain reduction but may also support labor progress. Reduced pain perception can help mothers maintain better physical and psychological conditions, allowing them to use their energy more effectively throughout the labor process.

The relaxation achieved through the use of a finger stress ball allows mothers to remain calmer when facing contractions. When mothers feel comfortable, muscle tension decreases and the stress response is reduced. This situation can support the effectiveness of uterine contractions, allowing cervical dilation to progress more optimally. Thus, labor can proceed more smoothly compared with mothers who experience excessive anxiety and tension during childbirth.

The findings of this study have practical implications for midwifery care, particularly in the application of non-pharmacological methods during labor. A finger stress ball is a simple tool that is easy to obtain and can be used without requiring specialized skills. Furthermore, because the intervention does not require medication, it avoids pharmacological side effects and can be considered a relatively safe option for women during the active phase of the first stage of labor. The use of a finger stress ball can be considered as an alternative method by

healthcare professionals to help reduce labor pain while supporting physiological labor progress.

The implementation of this method is also consistent with efforts to improve the quality of woman-centered maternity care. By providing safe and easy-to-use non-pharmacological options, mothers can actively participate in managing the pain experienced during labor. This approach is expected to promote a more positive childbirth experience and support the achievement of a safe and comfortable labor process.

CONCLUSION

The results indicate that finger stress ball therapy may be useful in managing labor pain and reducing the length of the active phase of the first stage. Compared with women receiving standard care, those in the intervention group experienced lower pain intensity and a shorter duration of labor. This study demonstrates that the finger stress ball can be used as a simple, safe, and easy-to-implement non-pharmacological intervention to improve maternal comfort and support labor progress. Future studies are recommended to involve larger populations and control for confounding factors, such as anxiety levels, family support, pain threshold, and uterine contraction strength, so that the effectiveness of the finger stress ball can be evaluated more comprehensively.

This study has several limitations. First, the study was conducted at only one healthcare facility, so the findings may not be directly generalizable to other healthcare settings with different patient characteristics. Second, pain intensity was measured using the NRS, which is subjective and may vary according to individual perceptions. Third, several potential confounding factors, including maternal anxiety, family or birth companion support, fatigue, previous childbirth experience, and psychological condition, were not comprehensively controlled. Fourth, the sample size was relatively small, consisting of only 36 respondents, which may limit the statistical power and generalizability of the findings. Future studies involving larger sample sizes and more comprehensive control of potential confounding factors are recommended.

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