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The Effectiveness of Pregnancy Exercise and Birthing Ball Use on Labor Progress among Pregnant Women

Gita Rahmadani[1*], Tutik Rahayu[2], Hernandia Distinarista[3]
[1,2,3]Faculty of Nursing Science, Sultan Agung Islamic University Semarang, Indonesia.
Coresponding author : gitarahmadani02@gmail.com

ABSTRACT

Physical unpreparedness, manifestations of anxiety, and pain intensity often hinder labor progress, which in turn escalates the risk of invasive medical interventions. Non-pharmacological approaches, particularly through prenatal exercise activities and the use of birthing balls, are considered to have a positive contribution in optimizing labor mechanisms. This study aims to investigate the efficacy of prenatal exercise and birthing ball education on parameters of smooth labor processes in mothers. The methodology applied was a quasi-experimental design with a pretest-posttest control group design approach. A total of 62 respondents were involved as samples distributed into the experimental group and the control group. The intervention group received treatment in the form of prenatal exercise and education on the use of birthing balls, while the control group only received standard midwifery care. Data were collected through observations using standardized instruments, which were then analyzed using the Mann-Whitney U statistical test. The analysis results showed a significant difference in the level of smooth labor between the intervention and control groups. Pregnant women who received prenatal exercise and birthing ball education tended to have smoother labors compared to those who did not receive these interventions. It can be concluded that the integration of prenatal exercise and birthing ball education has been proven effective in improving the smoothness of labor. This intervention can be implemented as a safe and beneficial non-pharmacological alternative within maternity nursing care. It is hoped that healthcare practitioners can integrate this program into antenatal care to optimize maternal preparedness for labor.

Keywords: Pregnancy exercise, birthing ball, labor progress, pregnant women

Background

Childbirth is a physiological process that is a crucial phase for every pregnant woman, although in practice it is often accompanied by various clinical challenges. Psychological conditions such as anxiety, high pain intensity, and physical exhaustion can hinder the progress of labor, thereby increasing the risk of medical interventions such as induction or cesarean section. Conceptually, labor is defined as a series of mechanisms for the expulsion of a fetus that has reached term gestation, followed by the expulsion of the placenta and fetal membranes through the birth canal (1). This phenomenon begins with uterine contractions that trigger progressive cervical dilation until the birth of the baby and placenta is complete (2). Under normal conditions, labor generally occurs at 37–42 weeks of gestation with a cephalic presentation, where the duration of the process can reach 18 hours as the intensity of contractions increases regularly (1).

According to the World Health Organization, approximately 10–15% of childbirth processes worldwide do not progress normally and require medical intervention. In 2020, an estimated 295,000 maternal deaths were recorded globally, primarily caused by hypertensive disorders of pregnancy, postpartum hemorrhage, infections, and other preventable complications (3). In Indonesia, data from the Ministry of Health showed that in 2022 the leading causes of maternal mortality were eclampsia (23%) and hemorrhage (20%), which increased in 2023 to 24% and 23%, respectively (4). Although maternal mortality rates in Banten Province and Tangerang City have shown a declining trend, the risk of childbirth complications remains a significant maternal health concern (Banten Provincial Health Office Profile, 2024; Tangerang City Health Office Report, 2024).

The smooth progress of labor is influenced not only by physiological factors but also by the psychological condition of the mother. Insufficient physical preparedness, inability to perform relaxation techniques, and inappropriate body positioning may hinder fetal head descent and prolong the first stage of labor. Emotional instability, such as excessive anxiety and stress, can increase adrenaline levels, which negatively affect uterine contractions and intensify labor pain (5). The sensation of pain during labor is a subjective manifestation correlated with myometrial contractions, progressive cervical dilation, and the mechanism of fetal descent through the birth canal. If pain management is not implemented adequately, this condition risks triggering significant recurrence of maternal fatigue and can lead to prolonged labor (6).

Various physiological approaches can be applied to support a smoother labor process, including pregnancy exercise, breathing techniques, and the use of a birthing ball. Pregnancy exercise has been shown to improve pelvic muscle flexibility, enhance blood circulation, train breathing techniques, and maintain maternal stamina before delivery (7). Regular physical activity initiated from 24 weeks of gestation is associated with smoother labor and reduced levels of maternal anxiety (8)(9). In addition, the use of a birthing ball as a non-pharmacological method has proven effective in increasing pelvic flexibility, facilitating fetal descent, and reducing the intensity of labor pain (10).

Midwives play a crucial role in preparing pregnant women for childbirth through education, counseling, and the implementation of antenatal classes. Proper birth planning and education can reduce maternal stress and anxiety, thereby supporting the occurrence of physiological childbirth (11). Based on this background, the researcher is interested in conducting a study entitled “The Effectiveness of Pregnancy Exercise and Birthing Ball Education on the Smoothness of the Childbirth Process among Pregnant Women in the Maternity Ward of “Sari Asih” Karawaci Hospital in 2025”.

Methods

This study implemented a quantitative methodology with a quasi-experimental design involving a control group as a comparison. The study location was set at the Delivery Unit of Sari Asih Hospital, Karawaci, Tangerang City, with a data collection period between September and December 2025. The study subjects included all mothers in their third trimester who met the inclusion criteria and were registered to undergo labor at the health facility. A total of 62 participants were selected through a non-probability sampling technique, which were then evenly distributed into the experimental group (n=31) and the control group (n=31). In the intervention group, respondents were given a prenatal exercise program and education on the use of a birth ball with a frequency of twice a week for a duration of four weeks, while the control group only received standard care without additional treatment. Within this conceptual framework, prenatal exercise and birth ball education were positioned as independent variables, while the smoothness of the labor mechanism acted as the dependent variable.

Data were collected using demographic questionnaires, observation sheets, partographs, the Visual Analog Scale (VAS) for labor pain, and medical records. Data processing included editing, coding, tabulating, and cleaning. Univariate analysis was applied to map the distribution of respondent characteristics and research variables in depth. Meanwhile, to test the significance of the influence of prenatal exercise and birth ball education on parameters of smooth delivery, bivariate analysis was used using the non-parametric Mann-Whitney test. This test was selected based on the results of the assumption test, which indicated that the research data were not normally distributed. The legal and ethical aspects of the research were met through obtaining ethical clearance from the ethics committee of Sultan Agung Islamic University (UNISSULA) Semarang. Furthermore, the official authorities of Sari Asih Hospital Karawaci have also granted formal permission as the location for the research. Research ethics, including self-determination, privacy, anonymity, informed consent, and protection from discomfort, were strictly applied throughout the study. The results of this study have undergone ethical testing at the Faculty of Nursing, Sultan Agung Islamic University, Semarang and have obtained ethical eligibility with the ethical testing number 1768/A.1-KEPK/FIK-SA/X/2025.

Results

The results of a study on the effects of prenatal exercise and birth ball use on smooth deliveries at

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Sari Asih Hospital, Karawaci, in 2025 have now been completed. Before the study began, researchers conducted a validity test to ensure that the questionnaire accurately measured the intended results. Data collection was conducted over four months, from September to December 2025. The study involved 62 pregnant women, divided equally into 31 in the intervention group (given the exercises) and 31 in the control group (as a comparison). All participants were selected because they met the established research criteria.

General Data

Based on the research that has been conducted, general data are presented in the form of respondent characteristics, which include age, education, occupation, and gestational age.

Table 1. Frequency Distribution Analysis and Percentage of Respondents

Variable		Frequency (f)	Percentage (%)
Age	25-27	34	54,8
	28-33	28	45,2
Education	Elementary School	4	6,5
	Junior High School	14	22,6
	Senior High School	34	54,8
	University	10	16,1
Occupation	Not working	20	32,3
	Entrepreneur	8	12,9
	Private Sector Employee	24	38,7
	Government Employee	10	16,1
Gestational Age	37 weeks	4	6,5
	38 weeks	28	45,2
	39 weeks	30	48,4
Total		**62**	**100**

Based on the table above, the average age of the respondents was 27 years (standard deviation ±1.821), with the most common age being 28 years, representing 25.8% of the respondents. The youngest age was 25 years, and the oldest age was 33 years. Regarding education level, the highest number of respondents had completed Senior High School (SMA), with 34 respondents (54.8%). The number of respondents with Elementary School (SD) education was 4 (6.5%), Junior High School (SMP) was 14 (22.6%), and Higher Education was 10 respondents (16.1%). Based on the table above, the distribution of respondents by occupation was as follows: Not Working, 20 respondents (32.3%); Entrepreneur/Self-employed, 4 respondents (12.9%); Private Sector Employee, 24 respondents (38.7%); and Civil Servant (PNS), 10 respondents (16.1%). Regarding gestational age, 4 respondents (6.5%) were at 37 weeks, 28 respondents (45.2%) were at 38 weeks, and 30 respondents (48.4%) were at 39 weeks.

Special Data

This section will present the results of the research data used to clarify the discussion. This study will analyze the variables related to the Smoothness of the Labor Process descriptively, using calculations based on categories.

Table 2. Smoothness of the Labor Process

Variable	Frequency (f)	Percentage (%)
Smoothness of the Labor Process		
Intervention Group		
Normal Delivery	22	71,0
Cesarean Section	9	29,0
Control Group:		
Normal Delivery	12	38,7
Cesarean Section	19	61,3
Total	**62**	**100**

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Correspondent*

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The table above shows that the highest data in the intervention group was for smoothness of the labor process, with 22 respondents (71.0%) having a normal delivery, while 9 respondents (29.0%) underwent a cesarean section. In the control group, 12 respondents (38.7%) had a normal delivery, whereas 19 respondents (61.3%) underwent a cesarean section.

The Effectiveness of Prenatal Exercise and Birthing Ball on the Smoothness of the Labor Process in Pregnant Women at the Maternity Ward of Sari Asih Hospital, Karawaci

Table 3. This is the Mann-Whitney U Test for the pre-test on the effectiveness of prenatal exercise and birthing ball on the smoothness of the labor process in pregnant women at the maternity ward of Sari Asih Hospital, Karawaci, for the intervention and control groups, conducted from September to December 2025 (n = 62).

		Measurement Results
Smoothness of the Labor Process	Mann-withney U	356.000
	Wilcoxon w	852.500
	Z	-2.740
	Asymp. Sig(2-tailed)	006

Based on the results of the study, a total of 62 respondents were involved, with 31 respondents in the intervention group and 31 respondents in the control group. The p-value obtained was 0.006, which is less than 0.05. Therefore, it can be concluded that there is a significant difference between the intervention and control groups in terms of the smoothness of the labor process.

Discussion

Respondent characteristics based on age, education, occupation, and gestational age

The results of a study at the Obstetrics Unit of "Sari Asih" Hospital, Karawaci, indicated that the average minimum age of respondents was 27 years, a phase clinically classified as healthy reproduction. Based on obstetric literature, the age range between 20 and 35 years is considered the most optimal period for gestation and delivery due to the significantly lower risk of complications compared to extreme age groups (12). Thus, the demographic profile of the subjects in this study represents a physiological condition that strongly supports the success of vaginal delivery. This finding is in line with a study, which reported that the majority of respondents (84%; n=78) were in the productive age cohort (13). These data are consistent with national demographic statistics that determine this period as the main productive phase for women. Biologically, this group has a more favorable obstetric risk profile than women under 20 or over 35 years of age. However, even though you are at the ideal reproductive age, psychological factors such as gestational anxiety remain a determining variable that can influence the effectiveness of the labor mechanism.

The healthy productive age range, considered the best period for reproductive processes, is between 20 and 30 years. During this period, not only are the reproductive organs fully matured and ready to function optimally, but psychologically, the individual is also sufficiently mature to take on the role of a mother. This is reinforced by research showing a significant relationship between maternal age and antenatal care (14). The majority of respondents had completed Senior High School (SMA) education (54.8%). Education plays an important role in a pregnant woman's ability to receive health information and implement recommended health behaviors, including participation in prenatal exercise and the use of a birthing ball . With a secondary education background, respondents tend to be more cooperative in following intervention instructions, such as prenatal exercise and the use of a birthing ball. A study published confirmed a significant correlation between maternal educational background and anxiety manifestations during gestation (13). Based on these data, subjects with secondary education tended to experience more intense psychological distress than those with higher education during the preparation phase for childbirth. This phenomenon is thought to be related to cognitive barriers in low-educated pregnant women in assimilating and processing clinical information about pregnancy, which in

turn escalates negative expectations and systemic uncertainty throughout the antenatal and intranatal periods.

In research results conducted there was a significant relationship between maternal characteristics (age, parity, and education) and participation in prenatal exercise (15). However, this contrasts with other studies in which age was found not to have a significant relationship with prenatal exercise (16)(17). The majority of respondents worked in the private sector or were unemployed. Employment status can influence the level of physical activity and a mother's readiness to participate in prenatal exercise programs and the use of a birthing ball. Pregnant women who are employed generally require additional support from healthcare providers to optimally follow childbirth preparation programs. Regarding the gestational age characteristics of the respondents, the majority were at 38–39 weeks of gestation. Term pregnancy is the ideal time for delivery because both the mother's and the fetus's physical readiness are optimal (18). This supports the relevance of implementing prenatal exercise and the use of a birthing ball for the respondents in this study.

Smoothness of the Labor Process

A birth ball intervention was used to ensure the participants' condition was stable. This health parameter assessment included observation of vital signs, fetal heart rate (FHR) monitoring, and a thorough physical examination as part of the procedure's safety protocol. Empirical data showed a significant disparity in delivery outcomes between the two groups; the majority of subjects in the intervention group successfully achieved vaginal delivery (71%), while the control group predominantly had cesarean sections (61.3%). These findings indicate that the integration of prenatal exercise and the use of a birth ball positively contributes to optimizing labor mechanisms. Physiologically, programmed physical activity during gestation has been clinically proven to play a crucial role in maintaining maternal somatic fitness and psychological stability(19).

Prenatal exercise programs are designed for healthy pregnant women, focusing on strengthening the muscles and joints that are important for the labor process, while also providing mental preparation and boosting self-confidence to better face childbirth (20). In the study results showed that 37 respondents (56.2%) participated in prenatal exercise, while 17 respondents (43.8%) did not. The results of the data evaluation showed that the majority of subjects, namely 74.2%, successfully underwent physiological vaginal delivery, while the remaining 25.8% required certain medical interventions, including cesarean section. Based on the inferential analysis using the chi-square test, a significance value of $p = 0.010$ ($p < 0.05$) was obtained, which confirmed that prenatal exercise activities had a significant influence on the effectiveness of the delivery process at the "Sehat Kasih Bunda" Clinic, Medan (19). These findings validate the urgency of prenatal exercise as a form of systematic physical conditioning to optimize maternal body endurance and muscle strength in facing the mechanism of delivery. According to research conducted resuls, the use of a gym ball can accelerate the labor process, reduce pain intensity, and shorten the duration of the first stage of labor (21). This is supported by research results, whose statistical test showed $p = 0.001$, indicating the effectiveness of the gym ball in accelerating labor progress and reducing pain intensity during the first active phase (22).

The use of a birth ball facilitates an upright maternal posture, optimizes pelvic articulation mobility, and effectively stimulates fetal head descent into the birth canal. This instrument represents a significant alternative modality for mitigating labor pain perception through measurable physical mechanisms. In addition to accelerating labor duration, the use of this device contributes to pelvic floor expansion to provide a more adequate fetal path. In this context, physiological labor is interpreted as a safe vaginal delivery mechanism, in which maternal comfort is maintained and psychological stability remains free from manifestations of anxiety. Therefore, non-pharmacological methods, such as the birthing ball, are increasingly chosen because they function as pain-relief techniques that support a smooth labor process (10). Increased participation of respondents in prenatal exercise and the use of the birthing ball shows that education and interventions provided are effective in raising pregnant women's awareness of the importance of physical preparation for labor. Using a birthing ball helps optimally open the pelvis and utilizes gravity to facilitate fetal descent. In the study conducted, state it was reported that mothers who used a birthing ball had a shorter first stage of labor compared to those who did not use it(23).

The Effectiveness of Prenatal Exercise and Birthing Ball on the Smoothness of the Labor Process in Pregnant Women at the Maternity Ward

The results of the inferential analysis using the Mann-Whitney U test yielded a significance value of $p = 0.006$ ($p < 0.05$), confirming a substantial disparity between the experimental and control groups regarding the parameters of smooth delivery. These findings provide empirical evidence that the integration of prenatal exercises and the use of birth balls effectively increases the probability of a successful physiological vaginal delivery. These data are in line with a study, which stated that structured prenatal physical activity is correlated with a reduction in the risk of obstetric interventions(19). In addition, this study strengthens the proposition that the implementation of birth balls plays a role in minimizing dependence on invasive medical procedures during the labor process.

This study aligns with the research conducted research results, which found that birthing ball intervention and parity influenced the duration of the first stage of labor at the Air Lais Community Health Center, North Bengkulu. Among 30 pregnant women, the majority (24 respondents, 80%) underwent birthing ball therapy, and most (27 respondents, 90%) experienced a smooth labor process(23). Statistical analysis using the chi-square test indicated a significant relationship between birthing ball therapy and the smoothness of the labor process ($p = 0.005 < 0.05$). In the study, state Wilcoxon test showed a significance value of 0.033, statistically demonstrating that birthing ball use had an effect on the smoothness of the labor process and reduced lower back pain during the first stage of labor(23).

These findings are further supported research results, who reported that among 35 respondents who regularly performed prenatal exercise, 32 experienced a normal second stage of labor. In contrast, 2 respondents who did not exercise regularly experienced an abnormal second stage of labor, and 1 respondent who did not exercise regularly still experienced a normal second stage of labor. The chi-square test showed a p-value of 0.005 ($\alpha > 0.005$), indicating a significant relationship between prenatal exercise and the smoothness of labor in women in labor (24). Theoretically, structured physical activity during pregnancy helps improve maternal stamina, enhances muscle coordination, and increases mental readiness for labor. Therefore, this study strengthens both theoretical and empirical evidence that prenatal exercise and the birthing ball are effective, safe, and easily implemented non-pharmacological interventions to improve the smoothness of the labor process.

Conclusions and Recommendations

Based on the results of the study on the effectiveness of prenatal exercise and the birthing ball on the smoothness of labor among pregnant women at the Maternity Ward of “Sari Asih” hospital Karawaci in 2025, several conclusions can be drawn. The respondents had an average age of 27 years, mostly within the safe reproductive age range, with senior high school education, working in the private sector, and at term pregnancy (38–39 weeks). Participation in prenatal exercise and the use of the birthing ball increased significantly from pre-test to post-test, with most respondents actively participating after the intervention. The intervention group demonstrated significantly better birth outcomes, with a higher prevalence of vaginal deliveries compared to the control group, which had a higher tendency toward cesarean sections. Statistically, the Mann-Whitney U test confirmed a fundamentally significant difference between the two groups ($p = 0.0006$). These data support the thesis that the synergy between prenatal exercise and birth ball use is highly efficacious in stimulating a smooth, physiological labor process.

Based on these findings, several recommendations are proposed. Health institutions are encouraged to incorporate prenatal exercise and birthing ball programs into routine antenatal care, especially for third-trimester pregnant women, to promote safe and smooth labor and reduce intervention rates. Healthcare providers should provide intensive education on the benefits of these interventions, encouraging active and regular participation while integrating them into comprehensive maternity care. Pregnant women are encouraged to follow these programs to enhance preparedness for a safe, comfortable, and smooth delivery. Future researchers are advised to expand sample sizes, extend intervention duration, include additional variables such as labor pain, duration of labor stages, or maternal anxiety, and consider using a stronger study design, such as a randomized controlled trial (RCT), to strengthen scientific evidence.

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