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ORIGINAL ARTICLE

Effectiveness of Counterpressure Technique With a Birth Ball on Cervical Dilatation and Reduction of Labour Pain and Uterine Contractions: A Prospective Cohort Study

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Abstract

Background/Aim: Non-pharmacological interventions play a crucial role in managing labour pain and facilitating labour progression. The counterpressure technique is a commonly utilised method purported to alleviate pain and enhance cervical dilation during childbirth. However, its effectiveness remains a subject of debate, necessitating further investigation. This study aimed to evaluate the efficacy of the counterpressure technique in managing labour pain and influencing labour progression among women in labour.

Method: A randomised controlled trial was conducted involving participants in active labour. The intervention group received the counterpressure technique, while the control group received standard care. Pain levels, uterine contractions and cervical dilation were assessed and compared between the two groups.

Results: Analysis revealed no significant difference in pain levels or uterine contractions between the intervention and control groups. However, there was a significant increase in cervical dilation in the intervention group compared to the control group ($p = 0.034$, Cohen's $d = -0.586$).

Conclusion: Despite the counterpressure technique's limited impact on pain relief and uterine contractions, it significantly facilitated cervical dilation during labour. These findings contribute to understanding of non-pharmacological interventions in childbirth and underscore the importance of evidence-based approaches to labour management. Further research is warranted to elucidate the underlying mechanisms of the counterpressure technique and optimise its implementation in clinical practice.

Key words: Labour pain; Obstetric labour complications; Counterpressure technique; Birth ball; Non-pharmacological pain management.

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Introduction

The management of labour pain has become a primary focus in modern obstetric practice. In recent decades, the increase in knowledge and understanding of the labour process has transformed how we approach labour pain management.[1-3] Now, it is not only about assisting mothers through this process but also ensuring that their experience is as positive as possible. Thus, the management of labour pain has become central in modern obstetric practice.[2, 3]

The use of non-pharmacological techniques has gained popularity in reducing labour pain without significant side effects.[2, 4-8] These techniques

encompass various approaches, ranging from relaxation techniques and breathing exercises to the use of physical aids such as birth balls. The primary advantage of these techniques is that they do not entail significant side effects commonly associated with pharmacological interventions, making them an appealing choice for many women.[9]

One technique that has attracted attention is the use of a birth ball as an adjunct in reducing labour pain. The birth ball is a simple yet effective tool that can help alleviate labour pain. By sitting or lying on the ball, women can relieve pressure on the lower back and pelvis, which are often sources of pain during labour.[10, 11] Additionally, the ball can aid in positioning and descent of the baby, facilitating the labour process.[12-14]

Previous research indicates that the counterpressure technique is also effective in reducing the intensity of pain during labour. Counterpressure involves applying pressure to specific areas on the lower back of women during contractions, which can help alleviate pain.[2, 15, 16] Studies have shown that this technique can significantly reduce pain intensity during labour, providing additional benefits for women who choose to use these non-pharmacological techniques.[2, 4, 17, 18]

However, limited information is available regarding the combined effects of the counterpressure technique with the use of a birth ball in managing labour pain.[10, 15, 19] Although both techniques have been proven effective independently, questions remain about how they can work together.

The use of a birth ball has become increasingly popular in recent years as a tool to help reduce labour pain.[10, 20, 21] These balls, often made of rubber and filled with air, can be used in various positions to alleviate pain and facilitate the labour process. Many mothers report that using a birth ball helps them feel more comfortable during labour and gives them more control over their experience.[22-24]

Counterpressure technique is another non-pharmacological technique that can be used to help reduce labour pain.[2, 7] This technique involves applying pressure to specific areas on the back or hips during contractions, which can help alleviate pain. The effectiveness of this technique may vary depending on the individual, but many women report a significant decrease in labour pain when using this technique.

There is some evidence to suggest that the combination of counterpressure technique and the use of a birth ball can provide additional benefits in reducing labour pain.[10] Both techniques can be used together to provide physical and emotional support during labour. However, more research is needed to fully understand how these two techniques can work together to reduce pain.

The duration of labour can vary significantly between individuals and even between different labours for the same woman. Some studies have shown that the use of techniques such as counterpressure and birth ball can help speed up the labour process, but these results are not consistent across all studies.[10, 25, 26] Therefore, it is important to conduct more research to determine whether there are significant differences in the duration of labour between groups using these combination techniques and the control group.

Like all childbirth interventions, the use of a birth ball and counterpressure technique carries potential risks and benefits. Potential benefits include pain reduction, increased control over the labour process and a more positive childbirth experience. Potential risks may include physical injury if the ball is not used correctly.[27] However, with proper supervision and instruction, these risks can be minimised.

The management of labour pain has become a primary focus in modern obstetric practice, with an increase in non-pharmacological techniques such as the use of a birth ball and counterpressure.[1-3] While both techniques are effective independently, little is known about their combined effects. Previous research has shown their individual effectiveness, but not their combined impact.[27] Understanding this interaction is crucial, as it may affect labour duration. It's also important to consider the potential risks and benefits, including pain reduction and increased control over the labour process.

The aim of this study was to evaluate the effectiveness of using a combination of counterpressure technique with the use of a birth ball in reducing labour pain and to understand its impact on the duration of labour and the mother's experience during the childbirth process. This research aimed to provide a better understanding of labour pain management and to contribute to improvements in clinical practice in caring for pregnant women.

Methods

This study employed a prospective cohort design to investigate the effectiveness of combining the counterpressure technique with the use of a birth ball in reducing labour pain. A cohort design was chosen for its ability to observe changes over time and evaluate the cause-effect relationship between intervention variables and observed outcomes. This study was approved by the Ethics Commission of the Health Polytechnic Ministry of Health Sorong, ensuring adherence to ethical standards and the protection of participants' rights and welfare. Informed consent was obtained from all participants prior to their inclusion in the study.

The population consisted of pregnant women with a gestational age over 37 weeks visiting the Malawili Community Health Centre. Participants were selected based on specific inclusion and exclusion criteria to ensure valid and reliable outcomes. Inclusion criteria were: gestational age over 37 weeks, age range of 18 to 40 years, absence of significant medical complications such as hypertension or gestational diabetes and no history of severe preeclampsia or spinal problems. Exclusion criteria included any medical conditions or injuries that would contraindicate the use of counterpressure or a birth ball during labour.

Pain intensity was measured using a validated visual analogue scale (VAS), detailed in the appendices. The VAS ranges from 0 (no pain) to 10 (worst pain imaginable), providing a quantifiable measure of pain. Participants received detailed instructions and demonstrations on using the VAS for self-reporting pain levels.

Participant recruitment took place through antenatal clinics and maternity hospitals from September to November 2023. Simple random sampling was used to assign participants to either the intervention group or the control group. The intervention group utilised a birth ball and the counterpressure technique, while the control group received standard care without analgesia, reflecting the hospital's protocol and the preference of some patients.

Procedure

During labour, trained midwives educated participants on the counterpressure technique, which involved applying steady pressure to specific points on the lower back or hips during contractions. Participants were trained to apply the pressure themselves or with the help of a partner, under midwife supervision. Detailed instructions for using the birth ball were also provided, emphasising correct positioning and movements to relieve lower back and pelvic pressure and to facilitate the baby's descent.

The control group received standard care, which did not include analgesia due to either hospital protocols or patient preferences. This approach allowed for a clear comparison of the intervention's effectiveness against the standard non-pharmacological practices.

Participants were randomly assigned to the intervention or control group using a computer-generated randomisation list, ensuring an unbiased distribution and enhancing the validity of the results.

Statistical analysis

Statistical analysis involved comparing the intervention and control groups using Wilcoxon and Mann-Whitney tests, facilitated by the *Jamovi* statistical software. These non-parametric tests were chosen to handle the ordinal nature of the VAS pain scores and potential non-normal distribution of data.

Results

Characteristics of respondents

A total of 60 respondents participated in this study, with 28 assigned to the control group and 32 to the intervention group using a simple random sampling technique. The slight imbalance in group sizes resulted from the random sampling process. The characteristics of the respondents are detailed in Table 1.

There were no significant differences between the control and intervention groups in terms of age, gestational age, delivery history, education, occupation, religion or monthly income (Table 1). This indicates that the groups were well matched and any observed differences in outcomes are likely due to the intervention itself.

Table 1: Characteristics of respondents (women in labour)

Variable	Control (n = 28)	Intervention (n = 32)	p-value
Age, Mean, SD (Min-Max)	31.5, 2.70 (27-35)	30, 2.15 (27-35)	0.422
Gestational age, Mean, SD (Min-Max)	40.1, 1.56 (37-42)	39.5, 1.65 (37-42)	0.498
Delivery history			
Nulliparous	14 (46.7 %)	16 (53.3 %)	1.000
Multiparous	14 (46.7 %)	16 (53.3 %)	
Education			
No schooling	4 (44.4 %)	5 (55.6 %)	0.282
Elementary school	8 (57.1 %)	6 (42.9 %)	
Junior high school	9 (64.3 %)	5 (35.7 %)	
High school	5 (27.8 %)	13 (72.2 %)	
University	2 (40.0 %)	3 (60.0 %)	
Occupation			
Unemployed	16 (57.1 %)	12 (42.9 %)	0.128
Employed	12 (37.5 %)	20 (62.5 %)	
Religion			
Protestant Christian	10 (45.5 %)	12 (54.5 %)	0.952
Catholic	8 (50.0 %)	8 (50.0 %)	
Islam	10 (45.5 %)	12 (54.5 %)	
Monthly income of the family			
Below relative minimum wage	19 (50.0 %)	19 (50.0 %)	0.496
Above relative minimum wage	9 (40.9 %)	13 (59.1 %)	

Intervention: counterpressure technique with birth ball;

Comparison of pain levels between intervention and control group

Table 2 shows that before applying the counterpressure technique, there was no significant difference in pain levels between the control group (mean = 6.79, SD = 1.50) and the intervention group (mean = 6.06, SD = 1.92), with a p-value of 0.173. This indicates that both groups had similar baseline pain levels, ensuring the validity of subsequent comparisons regarding the effectiveness of the intervention.

Table 2: Pain before counterpressure technique in women in labour

Parameter	Control (mean ± SD)	Intervention (mean ± SD)	p-value
Pain (pre-test)	6.79 ± 1.50	6.06 ± 1.92	0.173

Intervention: counterpressure technique; SE: standard error;

The results presented in Figure 1 indicate that there was no significant difference in pain levels between the control group (mean: 3.11 ± 1.31) and the intervention group (mean: 3.09 ± 1.38), with a p-value of 0.958. The effect size measured using Cohen's d was also very small (0.00994), suggesting that the counterpressure technique did not have a significant impact on reducing pain in the intervention group compared to the control group.

Comparison of uterine contraction after counterpressure technique

The analysis in Figure 2 revealed no significant difference in uterine contractions between the control group (32.2 ± 7.20) and the intervention group (32.8 ± 6.90), with a p-value of 0.700. Additionally, the analysis indicated that the standard mean difference between the two groups was 1.82 with a Cohen's d effect size of 0.0592. These findings suggest that the application of the counterpressure technique did not result in a significant difference in uterine contractions compared to the control group, although there was a slight non-significant increase observed in the intervention group.

Comparison of cervical dilatation after counterpressure technique

The analysis in Figure 3 revealed a significant difference in cervical dilatation between the control group (5.50 ± 1.29) and the intervention group (6.25 ± 1.27), with a p-value of 0.034. Additionally, the standard error of the difference between the two groups was 0.331 and the Cohen's d ef-

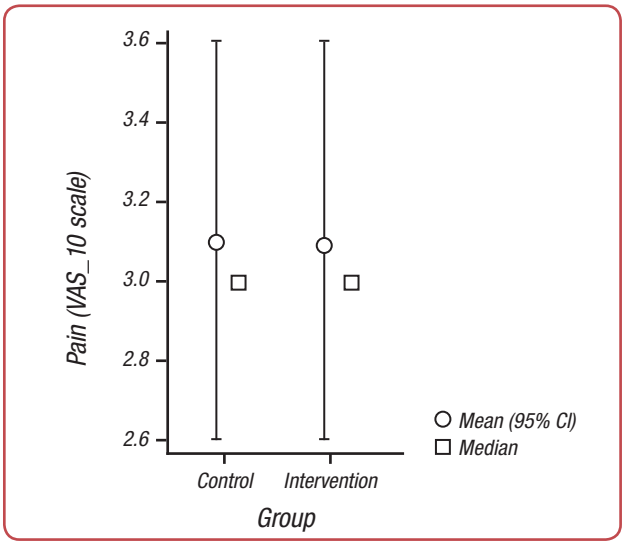

Figure 1: Pain after counterpressure technique in women in labour

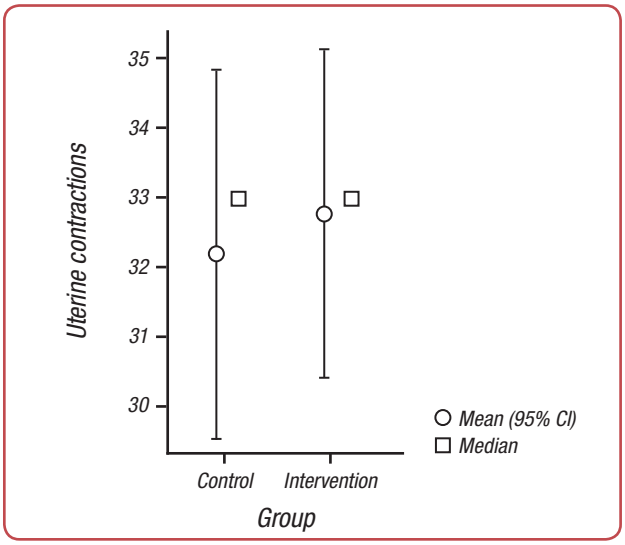

Figure 2: Uterine contraction after counterpressure technique in women in labour

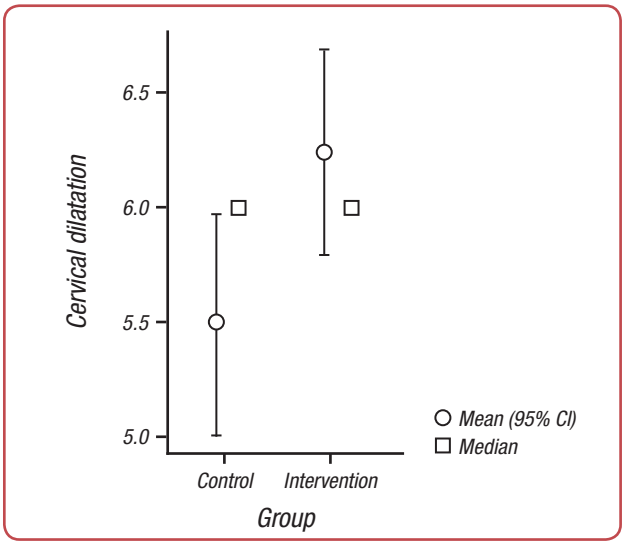

Figure 3: Cervical dilatation after counterpressure technique in women in labour

fect size was -0.586. These findings suggest that the application of the counterpressure technique resulted in a significant difference in cervical dilatation compared to the control group, with the intervention group exhibiting a higher mean cervical dilatation.

Discussion

The findings of this study offer valuable insights into the efficacy of the counterpressure technique in managing labour pain and influencing labour progression. This result suggests that while the counterpressure technique may not directly impact pain or uterine contractions, it may have a notable effect on cervical dilatation, potentially facilitating labour progression.

The examination of pain levels between the intervention and control groups in this study contributes to the ongoing discourse regarding the efficacy of the counterpressure technique in managing labour pain. Presented findings, which revealed no significant difference in pain levels ($p = 0.958$) and a minimal effect size (Cohen's $d = 0.00994$), align with prior research conducted by Ahmed et al, who similarly reported comparable pain scores between groups utilising the counterpressure technique and those who did not. This consistency in findings suggests that while the counterpressure technique is widely used as a non-pharmacological approach to pain management during labour, its effectiveness in significantly reducing pain remains uncertain.[28]

However, it is essential to interpret these results within the context of existing literature, acknowledging variations in study methodologies and participant demographics that may influence outcomes. Despite the non-significant findings, the counterpressure technique may still hold value as part of a comprehensive pain management strategy during childbirth, particularly in combination with other evidence-based interventions.

The examination of uterine contractions in this study provides valuable insights into the potential effects of the counterpressure technique on labour dynamics. Presented findings, which indicated no significant difference in uterine contractions between the intervention and control groups ($p = 0.700$, Cohen's $d = 0.0592$) are consistent with prior research in this domain. For in-

stance, Sriayuningtyas et al conducted a similar investigation and also reported comparable uterine contraction patterns between groups utilising the counterpressure technique and those who did not.[29] Moreover, this study builds upon existing literature by offering a nuanced analysis of the effect size, which, while small, underscores the subtle influence of the counterpressure technique on uterine activity during labour. Although the observed increase in uterine contractions in the intervention group was not statistically significant, it is noteworthy within the context of non-pharmacological interventions for labour pain management.

The analysis of cervical dilation differences between the intervention and control groups in this study provides a deep understanding of the effectiveness of the counterpressure technique in influencing labour progression. Presented findings indicate a significant difference in cervical dilation between the two groups ($p = 0.034$, Cohen's $d = -0.586$), with the intervention group exhibiting a higher average cervical dilation compared to the control group. These results are consistent with prior research indicating that the application of the counterpressure technique significantly contributes to increased cervical dilation during labour. For instance, a study conducted by Wahyuni et al demonstrated that the group receiving the counterpressure technique intervention experienced a significant increase in the rate of cervical dilation compared to the control group.[30] This analysis also highlights a moderate effect size, suggesting that although the influence of the counterpressure technique on cervical dilation is significant, its impact is not overwhelmingly large. Nonetheless, these findings provide robust support for the benefits of the counterpressure technique in facilitating labour progression, which is relevant for enhancing the well-being of both mothers and babies during the childbirth process. Integrating the findings from the comparisons of pain levels, uterine contractions and cervical dilatation, this study contributes to understanding of the multifaceted effects of the counterpressure technique on labour outcomes. Despite the non-significant differences observed in pain levels and uterine contractions between the intervention and control groups, a significant disparity emerged in cervical dilatation, suggesting a nuanced impact of the counterpressure technique on labour progression.

The influence of counterpressure technique in facilitating cervical dilation during childbirth can be explained through several complex hormonal and physiological mechanisms. Firstly, as a woman enters active labour, her body naturally releases the hormone oxytocin. Oxytocin is the primary hormone responsible for uterine contractions that drive the birthing process. The use of counterpressure technique can stimulate oxytocin release by applying concentrated pressure to specific points on the body, such as the lower back or waist area. This stimulation can enhance oxytocin production and increase the strength and frequency of uterine contractions, which in turn can expedite the cervical dilation process.

Furthermore, counterpressure technique can also alleviate tension in the pelvic and surrounding muscles. During childbirth, tension in these muscles can impede the baby's movement towards the birth canal and hinder cervical dilation. By applying pressure to specific points, counterpressure technique can help reduce this muscle tension, facilitating more space for the baby to move and allowing the cervix to soften and dilate more easily. Additionally, counterpressure technique can influence the body's response to stress and comfort. Pressure stimulation at specific points on the body has been known to stimulate the parasympathetic nervous system, which is responsible for the body's relaxation response. By stimulating this relaxation response, counterpressure technique can help reduce stress and tension that may impede labour progression. As a result, the body becomes more prepared for the birthing process and cervical dilation can occur more efficiently.

Overall, the hormonal and physiological mechanisms behind the effectiveness of counterpressure technique in facilitating cervical dilation during childbirth are complex and involve intricate interactions between the hormonal, nervous and muscular systems of the body. Further research is needed to better understand these mechanisms and to optimise the use of counterpressure technique in clinical practice to improve childbirth outcomes.

While the technique may not directly alleviate pain or influence uterine activity, its association with increased cervical dilatation implies a potential role in facilitating labour advancement. These findings underscore the complexity of non-pharmacological interventions in labour management and highlight the need for a comprehensive approach to understanding their effects. Additional-

ly, recognising the limitations of this study, such as sample size and contextual factors, opens avenues for future research to explore the underlying mechanisms and optimise the utilisation of the counterpressure technique in clinical practice. By addressing these gaps, future studies can further enhance our knowledge of effective strategies for promoting maternal and foetal well-being during childbirth, ultimately contributing to evidence-based obstetric care.

Conclusion

While the counterpressure technique did not significantly reduce pain levels or influence uterine contractions, it was associated with a significant increase in cervical dilation compared to the control group. This finding underscores the potential role of the counterpressure technique in facilitating labour advancement. The significance of these findings lies in their contribution to the existing body of knowledge regarding non-pharmacological interventions in childbirth. The counterpressure technique showed promise in enhancing cervical dilation and further research is warranted to elucidate its underlying mechanisms and optimise its implementation in clinical practice. Moreover, future studies should explore the synergistic effects of the counterpressure technique with other pain management strategies and evaluate its long-term effects on maternal and neonatal outcomes. Ultimately, these findings have implications for both research and practice, highlighting the need for evidence-based approaches to labour management and suggesting avenues for improving maternal and foetal well-being during childbirth.

Ethics

The study was approved by the Ethics Committee of the Ministry of Health Polytechnic Sorong below the supervision of the Ministry of Health of the Republic of Indonesia, decision No DM. 4.1/1/172/2023, dated 19 August 2023. Written informed consent was obtained from patients prior to their participation in the study and for publishing of the anonymised data. The study was organised and implemented based on the adherence to the Ethical Principles for Medical Research Involving Human subjects (The Declaration of Helsinki, 8th Revision, 2013).

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Conflicts of interest

The authors declare that there is no conflict of interest.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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