

Effect of the combination of oketani massage and the marmet technique on breast milk volume among postpartum mothers

Pengaruh Kombinasi Pijat Oketani Dan Teknik Marmet Terhadap Volume Asi Pada Ibu Pasca Melahirkan

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ABSTRACT

Background: Adequate breast milk production during the early postpartum period is essential for successful exclusive breastfeeding. However, delayed lactation and insufficient milk volume are common. Evidence regarding the effectiveness of combining Oketani massage and the Marmet technique remains limited.

Objective: To analyze the effect of combined Oketani massage and the Marmet technique on breast milk volume among postpartum mothers.

Methods: This quasi-experimental study used a nonequivalent control group design. Thirty postpartum mothers were recruited through consecutive sampling and assigned to an intervention group (n=15) and a control group (n=15). The intervention group received Oketani massage and the Marmet technique twice daily for three days, while the control group received standard breastfeeding care. Breast milk production was measured as the volume of milk expressed using a breast pump or manual expression before and after the intervention. Data were analyzed using paired and independent t-tests.

Results: Mean milk volume increased from 42.6 mL to 78.3 mL in the intervention group and from 44.1 mL to 52.7 mL in the control group. The mean difference between groups after the intervention was 25.6 mL (95% CI: 16.01–35.19). Significant increases were observed in the intervention group ($p < 0.001$), and significant differences were found between groups after the intervention ($p < 0.001$).

Conclusion: The combination of Oketani massage and the Marmet technique significantly increased breast milk volume among postpartum mothers compared with standard breastfeeding care.

Keywords: breast milk volume, exclusive breastfeeding, marmet technique, oketani massage, postpartum mothers

ABSTRAK

Latar Belakang: Keberhasilan ASI eksklusif bergantung pada kecukupan produksi ASI pada masa awal pascapersalinan. Namun, keterlambatan laktasi dan rendahnya volume ASI masih sering terjadi. Bukti mengenai efektivitas kombinasi pijat Oketani dan teknik Marmet masih terbatas.

Tujuan: Menganalisis pengaruh kombinasi pijat Oketani dan teknik Marmet terhadap volume ASI pada ibu pascamelahirkan.

Metode: Penelitian quasi-experimental dengan desain nonequivalent control group. Sebanyak 30 ibu pascapersalinan dipilih menggunakan consecutive sampling dan dibagi menjadi kelompok intervensi (n=15) dan kelompok kontrol (n=15). Kelompok intervensi menerima kombinasi pijat Oketani dan teknik Marmet dua kali sehari selama tiga hari, sedangkan kelompok kontrol menerima perawatan standar menyusui. Produksi ASI diukur sebagai volume ASI yang dikeluarkan menggunakan pompa ASI atau pemerahan manual sebelum dan sesudah intervensi. Analisis data menggunakan

uji t berpasangan dan uji t independen.

Hasil: Rata-rata volume ASI meningkat dari 42,6 mL menjadi 78,3 mL pada kelompok intervensi dan dari 44,1 mL menjadi 52,7 mL pada kelompok kontrol. Perbedaan rata-rata antar kelompok setelah intervensi sebesar 25,6 mL (95% CI: 16,01–35,19). Peningkatan yang signifikan ditemukan pada kelompok intervensi ($p < 0,001$), dan terdapat perbedaan yang signifikan antar kelompok setelah intervensi ($p < 0,001$).

Kesimpulan: Kombinasi pijat Oketani dan teknik Marmet secara signifikan meningkatkan volume ASI pada ibu pascapersalinan dibandingkan dengan perawatan standar menyusui.

Kata kunci: ASI eksklusif, ibu postpartum, pijat oketani, produksi asi, teknik marmet

INTRODUCTION

Exclusive breastfeeding during the first six months of life is one of the most effective public health interventions for improving child survival, growth, and development.¹ Exclusive breastfeeding has been proven to reduce the risk of various infectious diseases in infants and to improve children's long-term health outcomes.² Breastfeeding also provides benefits for mothers by reducing the risk of breast cancer and ovarian cancer.³ The success of exclusive breastfeeding programs is considered an important indicator in efforts to improve maternal and child health globally.⁴ The World Health Organization has set a target of increasing the global exclusive breastfeeding rate to at least 60% by 2030.¹ The Indonesian government has established a target of 80% exclusive breastfeeding coverage as part of its national health development agenda.⁴

Despite the scientifically proven benefits of exclusive breastfeeding, its coverage in Indonesia has not yet reached the target established by the government.⁴ The 2023 Indonesian Nutrition Status Survey revealed a gap between the current achievement and the national target for exclusive breastfeeding.⁴ The 2024 Health Profile of Lampung Province indicated that improving maternal and child health remains a priority in regional health development.⁵ Research conducted in Bandar Lampung City showed that the success rate of exclusive breastfeeding among some breastfeeding mothers remains suboptimal.⁶ These findings suggest that efforts to improve breastfeeding success still require effective and evidence-based interventions during the early postpartum period.

Insufficient breast milk production during the first days after childbirth is one of the primary causes of failure to achieve exclusive breastfeeding.⁷ Breast milk production is influenced by various factors, including hormonal conditions, frequency of breast emptying, maternal nutritional status, stress levels, fatigue, and support from family members and healthcare professionals.⁸ The hormone prolactin plays a crucial role in breast milk synthesis within the mammary alveolar cells.⁷ Oxytocin functions in breast milk ejection through the contraction of myoepithelial cells surrounding the alveoli (*milk ejection reflex*).⁹ Inadequate breast emptying may lead to the accumulation of the *feedback inhibitor of lactation*, which suppresses subsequent milk production.¹⁰ The perception that breast milk has not yet been produced or is insufficient often encourages mothers to introduce infant formula prematurely.² Therefore, interventions capable of enhancing hormonal stimulation while simultaneously improving breast emptying are essential for supporting successful lactation during the postpartum period.

Various non-pharmacological interventions have been used to increase breast milk production, including oxytocin massage, *breast care*, acupressure, the *Marmet technique*, and *Oketani massage*.¹¹ Oxytocin massage primarily works by stimulating the release of oxytocin, thereby facilitating the *let-down reflex*.¹² Acupressure and other

stimulation-based interventions focus on activating neuroendocrine responses that support lactation.¹¹ Meanwhile, *breast care* is primarily intended to maintain breast health and prevent breast engorgement.¹³ However, barriers to breast milk production among postpartum mothers are not solely related to the milk ejection reflex but also to suboptimal breast emptying during the early stage of lactation.¹⁰ Therefore, the combination of *Oketani massage* and the *Marmet technique* is considered more relevant because it simultaneously targets both mechanisms.

Oketani massage is a breast tissue manipulation technique designed to improve tissue elasticity and enhance local blood circulation within the breast.¹⁴ Improved blood circulation contributes to the increased distribution of hormones involved in the lactation process.¹⁵ Previous studies have demonstrated that *Oketani massage* effectively increases breast milk volume among postpartum mothers.¹⁶ Other studies have reported that *Oketani massage* produces better outcomes than *breast care* in enhancing breast milk production.¹³ Furthermore, *Oketani massage* has been reported to have a positive effect on lactation performance among postpartum mothers.¹²

The *Marmet technique* is a manual breast milk expression method intended to optimize the effective emptying of the lactiferous sinuses.¹⁷ This technique operates based on the principle of *supply and demand*, whereby more effective breast emptying leads to greater stimulation of subsequent breast milk production.¹⁸ Adequate breast emptying helps maintain prolactin activity, thereby enabling continuous breast milk synthesis.¹⁰ Previous studies have shown that the *Marmet technique* is effective in increasing breast milk production among postpartum mothers.¹⁹ Physiologically, the combination of *Oketani massage* and the *Marmet technique* has the potential to enhance *milk ejection* through oxytocin stimulation while simultaneously increasing *milk synthesis* through optimal breast emptying.⁹ Therefore, the combination of these two methods has a stronger theoretical basis than single interventions that focus on only one lactation mechanism.

Numerous studies have demonstrated the effectiveness of *Oketani massage* in increasing breast milk production among postpartum mothers.¹⁶ The effectiveness of the *Marmet technique* in improving breast milk production has also been reported in various previous studies.¹⁸ Findings from a systematic literature review indicated that *Oketani massage* has a positive effect on both the quantity and quality of breast milk production.¹⁴ A recent scoping review reported that most studies on increasing breast milk production have focused on single interventions such as oxytocin massage, *breast care*, or acupressure.¹¹ Recent systematic reviews and meta-analyses have shown that breast massage is effective in increasing breast milk production among postpartum mothers; however, they have not specifically evaluated the combination of *Oketani massage* and the *Marmet technique* as an integrated intervention.²⁰

Based on the literature review, the research gap in this study lies in the limited scientific evidence regarding the effectiveness of the combination of *Oketani massage* and the *Marmet technique*, which simultaneously targets the mechanisms of *milk ejection* and *milk synthesis* in postpartum mothers.²⁰ Most previous studies have evaluated these interventions separately; therefore, the benefits of combining the two methods have not been comprehensively explained.¹¹ Furthermore, research investigating the combination of *Oketani massage* and the *Marmet technique* in primary healthcare facilities in Indonesia remains very limited.⁶ Therefore, this study was conducted to analyze the effect of the combination of *Oketani massage* and the *Marmet technique* on increasing breast milk volume among postpartum mothers. The findings are expected to strengthen the scientific evidence regarding non-

pharmacological interventions that support successful lactation and to serve as a foundation for the development of evidence-based maternity nursing practices.

METHODS

Study design

This study employed a quantitative method with a quasi-experimental design using a nonequivalent control group approach. The study involved two groups, namely an intervention group and a control group, without randomization. The intervention group received a combination of Oketani massage and the Marmet technique from the first to the third postpartum day. The intervention was administered twice daily (morning and afternoon), with each session lasting approximately 15–20 minutes, consisting of Oketani massage for approximately 10–15 minutes and the Marmet technique for approximately 5–10 minutes. Meanwhile, the control group received standard breastfeeding care, including education on proper breastfeeding positioning and latch-on techniques, as well as encouragement to breastfeed according to the infant's needs (on demand). The intervention was performed by the researcher who had received training in both the Oketani massage and Marmet technique. All intervention procedures were implemented in accordance with the established Standard Operating Procedures (SOPs).

Data source and sampling procedure

The study was conducted in the working area of Kedaton Community Health Center (*Puskesmas Kedaton*), Bandar Lampung, from March 16 to April 18, 2026. The study population comprised all postpartum mothers experiencing problems with breast milk volume. A non-probability sampling technique with a consecutive sampling method was employed, whereby eligible participants who met the inclusion criteria were recruited consecutively until the required sample size was achieved, without randomization.

The sample size was calculated using the formula for comparing two independent means based on a power analysis approach. The calculation was performed using a significance level (α) of 0.05, a statistical power of 80% ($\beta = 0.20$), and a large effect size assumption ($d = 0.80$), based on Cohen's recommendations for experimental studies and sample size calculation guidelines in health and nursing research.²¹

The calculation indicated a minimum requirement of 13 participants in each group. To anticipate potential participant attrition during the study, the sample size was increased to 15 participants per group, resulting in a total sample of 30 respondents.²¹

The inclusion criteria were mothers on the first to third postpartum day, fully conscious, able to communicate effectively, willing to participate in the study, and without contraindications to breastfeeding. The exclusion criteria included mothers with severe postpartum complications, breast abnormalities, or medical conditions that could affect the lactation process.

Baseline participant characteristics, including age, body mass index (BMI), parity, educational level, employment status, and mode of delivery, were assessed at study entry to determine group equivalence. The results of the homogeneity analysis indicated no significant differences between the intervention and control groups for any baseline characteristic ($p > 0.05$), suggesting that the groups were comparable before the intervention was administered.

Variables of the study

The independent variable in this study was the combination of Oketani massage and the Marmet technique, while the dependent variable was breast milk volume, measured based on the volume of expressed breast milk (mL). Breast milk volume was measured before and after the intervention using manual expression performed on

both breasts. The expressed milk volume was recorded in milliliters (mL) as an indicator of breast milk volume.

Measurement and instruments

Breast milk production was measured based on the volume of breast milk obtained through manual expression. Breast milk expression was performed on both breasts for approximately 15 minutes or until milk flow decreased significantly, using the same procedure for all participants. The expressed milk was collected in a graduated measuring cup or measuring bottle and recorded in milliliters (mL). Measurements were conducted before the intervention (pretest) and after completion of the intervention period (posttest). To minimize measurement variability, all assessments were performed using standardized procedures and at relatively similar times for all participants.

The instruments used in this study included a respondent characteristics questionnaire, a breast milk volume observation sheet, a graduated measuring cup or measuring bottle calibrated in milliliters (mL), and Standard Operating Procedures (SOPs) for Oketani massage, the Marmet technique, and breast milk volume measurement.

Data collection

The data collection procedure began with a baseline (*pretest*) measurement of breast milk volume in both groups. Subsequently, the intervention group received the combination of *Oketani massage* and the *Marmet technique* according to the intervention protocol, while the control group received standard breastfeeding care. After the intervention period was completed, a final (*posttest*) measurement was conducted to evaluate changes in breast milk volume. Throughout the intervention period, maternal condition and comfort levels were continuously monitored to ensure the safety and smooth implementation of the procedures.

Ethical considerations

This study received ethical approval from the Health Research Ethics Committee under approval number S.45/080/FKES10/2026. All participants voluntarily signed a written informed consent form before participating in the study.

Data analysis

Data were analyzed using univariate and bivariate analyses. Univariate analysis was performed to describe participant characteristics and the distribution of breast milk volume, which were presented as mean, median, standard deviation, minimum value, and maximum value.

Prior to bivariate analysis, data normality was assessed using the Shapiro–Wilk test. The normality test results indicated that breast milk volume data in both the intervention and control groups were normally distributed ($p > 0.05$); therefore, subsequent analyses employed parametric tests.

Differences in breast milk volume before and after the intervention within each group were analyzed using the paired t-test, whereas differences in breast milk volume between the intervention and control groups after treatment were analyzed using the independent t-test. Statistical significance was set at $\alpha = 0.05$ with a 95% confidence interval.

RESULTS

This study involved 30 postpartum mothers who were divided into an intervention group ($n=15$) and a control group ($n=15$). The analysis was conducted to evaluate changes in breast milk volume before and after the intervention, as well as differences between the two groups.

Tabel 1 The findings indicated that the characteristics of respondents in the

intervention and control groups were relatively homogeneous. The mean age of respondents in the intervention group was 28.7 ± 4.2 years, while that of the control group was 29.1 ± 4.5 years. The mean body mass index (BMI) was 24.8 ± 2.9 kg/m² in the intervention group and 25.2 ± 3.1 kg/m² in the control group. Most respondents in both groups were multiparous, had primary to secondary educational backgrounds, were unemployed, and had delivered vaginally.

The homogeneity test results showed no statistically significant differences in any respondent characteristics between the intervention and control groups ($p > 0.05$). Therefore, the two groups were considered comparable prior to the implementation of the intervention.

Table 1. Characteristics of Respondent by Research Group

Characteristics	Intervention (n=15)	Control (n=15)	p-value
Age (years) Mean $\pm$ SD	28.7 ± 4.2	29.1 ± 4.5	0.812
MT (kg/m ²) Mean $\pm$ SD	24.8 ± 2.9	25.2 ± 3.1	0.724
Parity, n (%)			0.713
Primitive	6 (40.0)	7 (46.7)	
Multipara	9 (60.0)	8 (53.3)	
Education, n (%)			0.705
Primary – Secondary	8 (53.3)	9 (60.0)	
College	7 (46.7)	6 (40.0)	
Occupation, n (%)			0.699
Work	5 (33.3)	4 (26.7)	
Not Working	10 (66.7)	11 (73.3)	
Type of Delivery, n (%)			0.702
Spontan	11 (73.3)	10 (66.7)	
Cesarean section	4 (26.7)	5 (33.3)	

Table 2 shows that the mean breast milk volume in the intervention group increased from 42.6 ml to 78.3 ml. Meanwhile, in the control group, the mean breast milk volume increased from 44.1 ml to 52.7 ml.

Table 2. Distribution of Breast Milk Volume Before and After the Intervention

Breast Milk Production Variable (ml)	Group	n	Mean	Median	SD	Min	Max
Pretest	Intervention	15	42.6	40	10.8	25	65
	Control	15	44.1	45	11.2	28	66
Posttest	Intervention	15	78.3	80	12.5	55	100
	Control	15	52.7	50	13.1	30	75

Table 3 The results of the paired t-test showed that there was a statistically significant increase in the intervention group ($p < 0.001$). In contrast, no significant difference was found in the control group ($p = 0.082 > 0.05$).

Table 3. Differences in Breast Milk Volume Before and After the Intervention in Each Group

Group	Breast Milk Production	Mean	SD	p-value	n
Intervention	Pretest	42.6	10.8	0.000	15
	Posttest	78.3	12.5		
Control	Pretest	44.1	11.2	0.082	15
	Posttest	52.7	13.1		

Table 4 The Independent Samples t-test revealed a significant difference in post-intervention breast milk volume between the intervention and control groups ($p =$

0.001). The intervention group demonstrated a higher mean breast milk volume (78.3 ± 12.5 mL) compared with the control group (52.7 ± 13.1 mL). The mean difference was 25.6 mL (95% CI: 16.01–35.19 mL). Furthermore, the effect size analysis showed a Cohen's *d* value of 2.00, indicating a very large effect of the combined Oketani massage and Marmet technique on breast milk volume.

Table 4. Differences in Breast Milk Volume Between Groups (Posttest)

Group	Mean $\pm$ SD (mL)	Mean Difference (mL)	95% CI	Cohen's <i>d</i>	p-value
Intervention	78.3 ± 12.5	25.6	16.01 –	2.00	0.001
Control	52.7 ± 13.1		35.19		

Table 5 The Paired Samples t-test demonstrated a significant increase in breast milk volume in the intervention group, rising from 42.6 ± 10.8 mL at baseline to 78.3 ± 12.5 mL after the intervention ($\Delta = 35.7$ mL; $p < 0.001$). In contrast, the control group showed a smaller increase in breast milk volume, from 44.1 ± 11.2 mL to 52.7 ± 13.1 mL ($\Delta = 8.6$ mL), which was not statistically significant ($p = 0.082$).

Table 5. Difference in Increased Breast Milk Volume

Group	Pretest Mean $\pm$ SD	Posttest Mean $\pm$ SD	Δ Mean Difference	p-value
Intervention	42.6 ± 10.8	78.3 ± 12.5	+35.7	<0.001
Control	44.1 ± 11.2	52.7 ± 13.1	+8.6	0.082

DISCUSSION

Effect of the Combination of *Oketani* Massage and the *Marmet* Technique on Breast Milk Volume

The results of this study demonstrated that the combination of *Oketani* massage and the *Marmet* technique significantly increased breast milk volume among postpartum mothers. The mean breast milk volume in the intervention group increased from 42.6 mL to 78.3 mL, representing an increase of 35.7 mL, whereas the control group experienced an increase of only 8.6 mL. These findings indicate that the intervention provided not only statistical significance but also clinically meaningful benefits in increasing breast milk volume during the early postpartum period.

The increase in breast milk production observed in the intervention group can be explained by the physiological mechanisms of lactation. *Oketani* massage works by enhancing blood circulation within breast tissue, improving the elasticity of the alveoli and lactiferous ducts, and stimulating the release of oxytocin, which plays a crucial role in the *let-down* reflex.²² These physiological effects facilitate more effective milk ejection, thereby reducing the risk of breast engorgement and improving maternal comfort during breastfeeding.¹⁴

In contrast, the *Marmet* technique promotes effective breast emptying, thereby stimulating prolactin secretion through the *supply-and-demand* mechanism.¹⁰ Adequate breast emptying reduces the accumulation of the *feedback inhibitor of lactation* (FIL), allowing breast milk synthesis to continue optimally.⁹ Therefore, the combination of these two techniques provides simultaneous stimulation of the two primary mechanisms of lactation: milk volume through increased prolactin secretion and milk ejection through oxytocin stimulation.

The researchers suggest that this synergistic effect may be the primary reason why the increase in breast milk production in the intervention group was substantially greater than that observed in the control group. The combination of *Oketani* massage and the *Marmet* technique not only improves the flow of already-produced milk but also

enhances subsequent milk volume through more effective breast emptying. This mechanism makes the combined intervention more comprehensive than the use of a single lactation stimulation method alone.¹¹

The findings of this study are consistent with those reported by Rahayu et al., who demonstrated that *Oketani massage* significantly improved lactation performance and breast milk production among postpartum mothers through enhanced hormonal stimulation and improved breast circulation.²² These findings are further supported by the study conducted by Purnani and Darmining, which showed that *Oketani massage* resulted in greater improvements in breast milk production compared with oxytocin massage among postpartum mothers.¹² Furthermore, Mukminin et al. found that *Oketani massage* was more effective than conventional *breast care* in increasing breast milk production because it directly stimulates breast tissue and lactiferous ducts.¹³

Stronger evidence has been provided by recent systematic reviews and meta-analyses involving various lactation stimulation interventions among postpartum mothers. Chaloemram et al. reported that breast massage significantly improved breast milk production, prolactin levels, and supported breastfeeding practices compared with control groups across multiple randomized controlled trials.²⁰ These findings reinforce the results of the present study, suggesting that mechanical breast stimulation is an effective intervention for enhancing breast milk production during the postpartum period.

In addition, a systematic review conducted by Chang et al. demonstrated that various lactation stimulation methods act through activation of neuroendocrine pathways that increase prolactin and oxytocin secretion, thereby accelerating lactogenesis and milk ejection²⁴. These findings support the study hypothesis that the combination of *Oketani massage* and the *Marmet technique* may produce greater effects because it simultaneously targets two physiological pathways involved in lactation.

Comparison with the Control Group

The control group showed an increase in breast milk production from 44.1 mL to 52.7 mL; however, this increase was not statistically significant ($p = 0.082$). This modest increase may reflect the normal physiological postpartum process, characterized by a decline in progesterone levels following childbirth, which allows prolactin to function more effectively in initiating Stage II lactogenesis.⁷

Nevertheless, the increase in breast milk volume observed in the control group was considerably lower than that in the intervention group. The difference in volume gain between the intervention group (35.7 mL) and the control group (8.6 mL) suggests that the combination of *Oketani massage* and the *Marmet technique* may provide additional benefits beyond the normal physiological changes that occur during the postpartum period. Clinically, the increased breast milk volume may help support the nutritional requirements of newborns in the early postpartum period and may facilitate optimal breastfeeding practices.³

The effect size value (Cohen's $d = 1.99$) indicated a very large effect. According to Polit and Beck, an effect size greater than 0.80 represents a strong intervention effect and has important clinical relevance in healthcare practice.²¹ Therefore, the findings of this study are not only statistically significant but also clinically meaningful for application in maternity nursing practice.

Study Limitations

Several limitations should be considered when interpreting the findings of this study. First, the relatively small sample size may limit the generalizability of the findings to broader populations. Second, the quasi-experimental design without randomization

may have introduced selection bias; therefore, the observed causal relationship should be interpreted with caution.²¹

Third, several factors known to influence breast milk volume and lactation outcomes, including early breastfeeding initiation (IMD), breastfeeding frequency, maternal nutritional intake, hydration status, family support, quality of rest, and postpartum psychological conditions, were not specifically controlled during the study and may have acted as potential confounding variables.⁸ Fourth, breast milk production was measured using the volume of expressed milk, which may have been influenced by individual differences in mothers' milk expression techniques.

Despite these limitations, this study offers a novel contribution by evaluating the combination of *Oketani massage* and the *Marmet technique* as an integrated intervention targeting two key lactation mechanisms simultaneously. To date, studies specifically examining the combination of these two techniques remain very limited in Indonesia. Therefore, the findings may serve as a foundation for the development of evidence-based non-pharmacological interventions in postpartum lactation care.

CONCLUSION

This study demonstrated that the combination of *Oketani massage* and the *Marmet technique* was effective in increasing breast milk volume among postpartum mothers compared with standard breastfeeding care. The greater increase in breast milk volume observed in the intervention group suggests that this combination may serve as an evidence-based non-pharmacological intervention to support lactation during the early postpartum period through the stimulation of prolactin and oxytocin-related physiological mechanisms.

The findings provide practical implications for healthcare professionals, particularly maternity nurses, as an alternative intervention for managing insufficient breast milk volume in the early postpartum period. However, the study was limited to the assessment of breast milk volume during the intervention period and did not evaluate long-term exclusive breastfeeding outcomes.

Future studies should involve larger sample sizes, employ randomized controlled trial (RCT) designs, and control for potential confounding factors, including breastfeeding frequency, maternal nutritional status, psychological condition, rest quality, and family support. Further research is also needed to develop standardized intervention protocols and evaluate the long-term effects of the intervention on lactation and breastfeeding outcomes.

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