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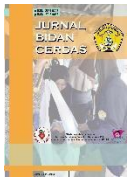

The Impact of Baby Massage on the Growth of Children Aged 0-2 Years

Noviyati Rahardjo Putri, Niken Bayu Argaheni, Iffah Indri Kusmawati, Angesti Nurgraheni, Ika Sumiyarsi Sukamto
Bachelor of Midwifery and Midwifery Professional Education Program, Faculty of Medicine, Universitas Sebelas Maret, Central Java, Indonesia
Corresponding Author: novirahardjo@staff.uns.ac.id

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ABSTRACT

Background: Massage has been widely studied because of its potential to promote growth in children. This study aims to evaluate the effectiveness of massage therapy on weight gain in children under 2 years old at the Jenawi Health Center. **Methods**: A non-randomized controlled trial with a pretest and posttest, involving 70 children under 2 years of age. Participants were divided into an intervention group, which received infant massage therapy for one month, and a control group which did not receive massage. Interventions are given daily by the mother. Data analysis used the Wilcoxon and Mann-Whitney. **Results**: there was a significant increase in body weight compared to the control group. The mean weight change in the intervention and control group was 485.7 and 350 grams. The Wilcoxon test obtained a z-score of -7,280 (p = 0.001), indicating a statistically significant weight gain from baseline to post-intervention. Additionally, the Mann-Whitney U test revealed a statistically significant difference in weight change between the control and intervention groups (z = -3.269, p = 0.001). Therefore, it can be concluded that massage is effective in increasing the Infant's weight so massage can be used as a routine treatment method to support the weight growth of children under two years old.

INTRODUCTION

Infant massage has long been recognized as a valuable practice for promoting healthy development and growth in young children. This ancient form of touch therapy has been shown to have numerous benefits, from improving weight gain and sleep patterns to enhancing emotional bonding and reducing the risk of infections (Ifalahma & Cahyani, 2019; Mrljak et al., 2022; Tekgündüz et al., 2014)

In Indonesia, the implementation of infant massage in the community has primarily been carried out by traditional birth attendants, often only when the infant is unhealthy (Nurhasanah Amir et al., 2022). However, research indicates that regular massage during healthy periods can be particularly beneficial for a child's overall growth and development (Fatmawati et al., 2021; Fitriyanti et al., 2019; Hartati et al., 2020; Nur et al., 2020; Puji Lestari et al., 2021; Tekgündüz et al., 2014; Widyawati et al., 2019)

Studies have demonstrated the lasting positive impacts of infant massage, with

stimulated infants exhibiting improved weight gain, higher scores on developmental assessments, and a reduced incidence of neurological soft signs even months after initial massage interventions. Research on infant massage with infant subjects aged 0-1 month concluded that infant massage can improve sleep quality, which indirectly stimulates the optimization of infant growth and development (Eka Nur Fitriana & Rofi, 2019; Geok Chan et al., 2018; Gunardi et al., 2019; Nur et al., 2020). A cohort study on the effects of infant massage on growth aspects concluded that infant massage could stimulate more weight gain after week 12 and height after week 20 than the control group (Harun et al., 2021).The positive effects of infant massage extend beyond just physical growth; baby massage has also been linked to enhanced emotional bonding and a reduction in the stress hormone cortisol, leading to a more relaxed and calm state the infant. In turn, this can foster optimal development across various domains.

Recognizing the significance of this practice, efforts to educate and empower parents, especially mothers, to independently massage their infants have proven effective in increasing community knowledge (Alawiyah et al., 2023) and understanding the importance of baby massage (Alawiyah et al., 2023; Esty Pamungkas et al., 2021). By providing training and resources, healthcare professionals can equip caregivers with the skills and confidence to incorporate this nurturing touch into their daily routines, ultimately supporting the holistic well-being of infants and young children.

Jenawi is one of the assisted villages of the Bachelor of Midwifery and Midwife Professional Education study program. In the 2023 report, there were 12 underweight toddlers, 4 short toddlers, and 6 malnourished toddlers recorded in Jenawi sub-district, Karanganyar (Karanganyar, 2024). In areas like Jenawi, where malnutrition among under-fives is still a significant problem, the application of infant massage can be a practical intervention to improve growth outcomes. Based on this background, this study investigated the effectiveness of massage therapy on growth in children under 2 years old.

METHODS

This was a quasi-experimental controlled trial with a pre-test and post-test design involving two groups. The intervention group received massage therapy administered by the parents, whereas the control group did not receive any massage therapy. Although full randomization of participants was not possible due to logistical constraints, a random allocation of participants into intervention and control groups was conducted where feasible. The study was conducted at the Jenawi Health Center in Karanganyar District.

The population included 70 children under 2 years of age who were patients at the Jenawi Health Center, Karanganyar District. All 70 children were included in the study using total sampling. Simple random sampling was then used to assign the participants into two groups, with 35 participants in each group, while considering the age of the respondents. The inclusion criteria were children under 2 years of age whose parents consented to participate, while children with chronic illnesses or developmental disabilities were excluded

The intervention group underwent massage therapy. Mothers in the intervention group were trained to administer the massage, which was performed independently by the mothers every day for one month in the morning for approximately 20 minutes. Compliance was monitored via an online, in which mothers submitted daily updates through WhatsApp. The massage movements were based on the curriculum provided

by International Association of Infant Massage. Pre-test weight measurements were conducted for both the intervention and control groups one week prior to the start of the intervention, and post-test weight measurements were taken at the end of the 1-month intervention period.

The independent variable was massage therapy, and body weight the dependent variable. Data were analyzed using bivariate analysis to compare changes in body weight between the control and intervention groups. Normality tests were conducted on the two main variables of the study, body weight before massage therapy and body weight after massage therapy, using the Shapiro-Wilk test to determine whether the data followed a normal distribution, which is a critical assumption for parametric statistical analysis. The results showed that the body weight before massage therapy had a W value of 0.936 and a p-value of 0.001,whereas the body weight after massage therapy variable had a W value of 0.950 and a p-value of 0.007. As the p-values for both variables were less than 0.05, the null hypothesis of normally distributed data was rejected. This indicates that the data distributions for body weight did not meet the normality assumption. For paired comparisons, the Wilcoxon Signed-Rank Test was used instead of the paired t-test, as it does not assume normality and is suitable for analyzing changes in the same subjects before and after the intervention. To compare two independent groups, the Mann-Whitney U test was employed as a substitute for the independent t-test, as it compares differences between two independent groups without requiring a normal distribution. All analyses were performed using the Stata 17 software.

The study was approved by the Institutional Review Board of Dr. Moewardi General Hospital (No. 1.477/VI/HREC/2024). Prior to enrollment, informed consent was obtained from all participants.

RESULTS

The Results section of this manuscript outlines three key findings. First, it presents a descriptive analysis of respondent characteristics, including Sex (Boy and Girl), Posyandu (Posyandu Dopo, Posyandu Kuwang, Posyandu Noyu, Posyandu Sedondong, and Posyandu Sidorejo), and Birth Weight (table 1). Second, it details the comparison of Baseline Weight and Post-Treatment Weight using the Wilcoxon Signed-Rank Test (Figure 1). Lastly, the results will compare the change in weight across the control and intervention groups using the Mann-Whitney U Test (Table 2).

The characteristics of the respondents in the control and massage therapy intervention groups are summarized in table 1. Percentages were read across rows to, compare the distribution within each group. The gender distribution showeds that in the control group, 15 respondents (42.9%) were boys and 20 respondents (57.1%) were girls, while in the intervention group, 19 (54.3%) were boys and 16 (44.4%) were girls. For Posyandu (community health post) distribution, in the control group, 12 respondents (52.2%) were from Posyandu Dopo, 10 (52.6%) were from Posyandu Kuwang, 3 (25%) were from Posyandu Noyu, 5(55.6%) were from Posyandu Sedondong, and 5 respondents (71.4%) were from Posyandu Sidorejo. In the intervention group, 11 respondents (47.8%) were from Posyandu Dopo, 9(47.4%) were from Posyandu Kuwang, 9(75%) were from Posyandu Noyu, 4(44.4%) from Posyandu Sedondong, and 2(28.6%) from Posyandu Sidorejo. The mean birth weight of respondents in the control group was 3015.4 grams (SD = 444.3 g), while the mean birth weight in the intervention group was slightly lower at 2973.3 grams (SD = 333.2 g) that in the control group.

Table 1. Characteristics of Respondents by Treatment Group

Variables	Baby Massage			
	Control n=35		Intervention n=35	
	n(%)	Mean (SD)	n(%)	Mean (SD)
Sex				
Boy	15 (42.9%)		19 (54.3%)	
Girl	20 (57.1%)		16 (45.7%)	
Posyandu				
Posyandu Dopo	12(52.2%)		11(47.8%)	
Posyandu Kuwang	10(52.6%)		9(47.4%)	
Posyandu Noyu	3(25.0%)		9(75%)	
Posyandu Sedondong	5(55.6%)		4(44.4%)	
Posyandu Sidorejo	5(71.4%)		2(28.6%)	
Birth Weight (gram)		3015.4(444.3)		2973.3(333.2)

Note: Since the variables **sex** and **posyandu** are categorical data, their descriptive statistics are presented as counts and proportions, whereas for the variable **birth weight**, which is numerical data, the descriptive statistics are presented as mean and standard deviation.

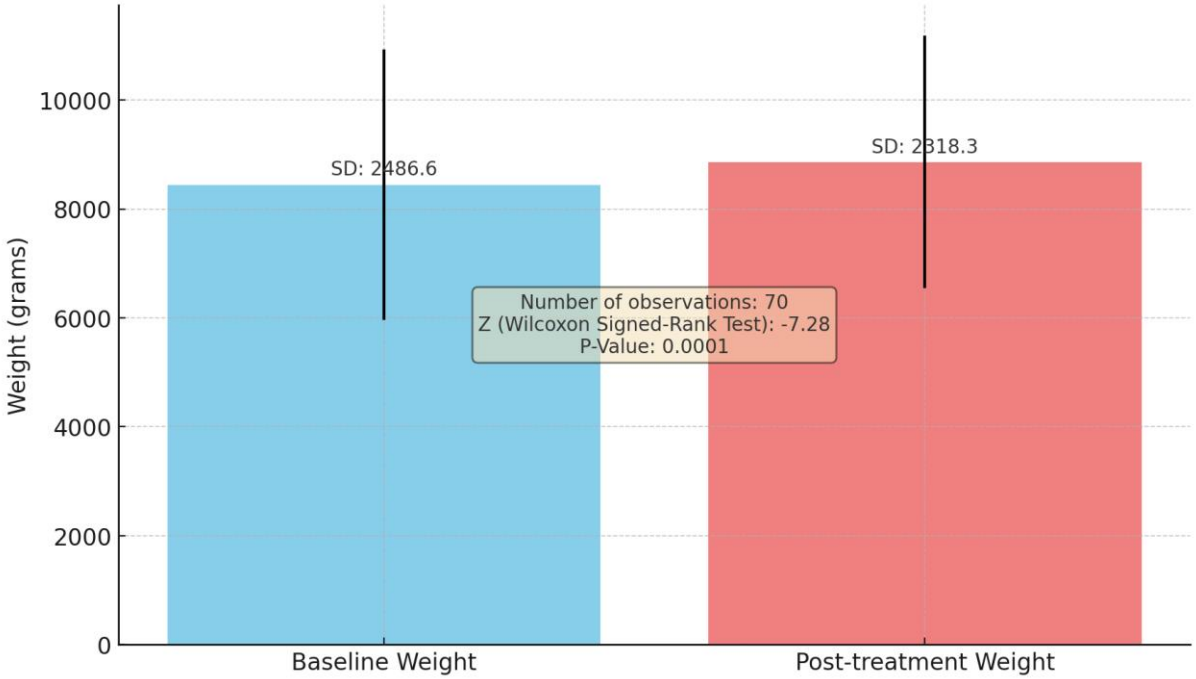

Figure 1. Bar Chart The Comparison of Baseline Weight and Post-Treatment Weight Assessed Using the Wilcoxon Signed-Rank Test (Statistical Significance: An alpha (α) level of 0.05 was used to determine statistical significance)

Figure 1 presents the results of the Wilcoxon Signed-Rank Test comparing baseline weight (pre-test) and post-treatment weight. The analysis included 70 observations. The mean baseline weight was 8444.3 grams with a standard deviation of 2486.6 grams, while the mean post-treatment weight was 8862.1 grams with a standard deviation of 2318.3 grams. The Wilcoxon Signed-Rank Test yielded a z-score of -7.280 with a p-value of 0.0001, indicating a statistically significant difference between the baseline and post-treatment weights. As the p-value was less than the alpha level of 0.05, we reject the null hypothesis and concluded that there was a

significant increase in weight following the intervention. The negative z-score suggests that post-treatment weight was generally higher than baseline weight.

Table 2. Comparison of Weight Change Between Control and Intervention Groups Using the Mann-Whitney U Test

Variables	Number of Observations	Mean	Median	IQR	Mann-Whitney U Test (Z)	P-Value
Baseline weight (gram)						
Control	35	8400.0	8600	2300		
Intervention	35	8488.571	8600	2600		
posttest weight (gram)						
Control	35	8750.0	8800	2100		
Intervention	35	8974.286	8900	2600		
Weight Change						
Control	35	350.0	200	300	-3.269	0.001
Intervention	35	485.7143	400	300		

Statistical Significance: An alpha (α) level of 0.05 was used to determine statistical significance.
IQR: is a measure of data dispersion that represents the range between the first quartile (Q1) and the third quartile (Q3), or in other words, it includes the data from the 25th percentile to the 75th percentile of the distribution.

Table 2 presents the comparison of weight changes between the control and intervention groups using the Mann-Whitney U test. The control group had a baseline weight of 8400g and a post-treatment weight of 8750g, resulting in a mean weight change of 350 g. The Mann-Whitney U Test yielded a z-score of -3.269, indicating that the control group had systematically lower ranks in weight change than the intervention group. The p-value was 0.0011, which was less than significance level of 0,05, confirming that the difference in weight change between the two groups was statistically significant. In the intervention group, the baseline weight averaged 8488.5 grams, and the post-treatment weight averaged 8974.3 grams, resulting in a larger mean weight change of 485.7 grams. Since the p-value was below 0.05, we rejected the null hypothesis and conclude that the intervention group experienced a significantly greater weight increase than the control group, as reflected by the negative z-score (-3.269). This suggests that the intervention effectively led to a more substantial weight gain compared to the control group.

DISCUSSION

The results of this study highlight several important findings regarding the effectiveness of massage interventions of weight gain. First, the descriptive analysis of respondent characteristics (Table 1) showed a relatively balanced distribution across sex and posyandu health post categories between the control and intervention groups. The mean birth weight was slightly lower in the intervention group compared to the control group, although this difference was minimal. These similarities in baseline characteristics help strengthen the internal validity of the subsequent analyses.

The Wilcoxon Signed-Rank Test (Figure 1) provided strong evidence of a significant increase in weight following the Baby Massage intervention, as indicated by a z-score of -7.280 and a p-value of 0.0001. This significant change suggests that the Baby Massage intervention had a positive impact on weight gain, with post-treatment weight generally higher than the baseline weight in the overall sample. A negative z-score indicates that weight gain was consistent across participants, further

emphasizing the effectiveness of the intervention. The results suggest that this intervention not only strengthens the emotional bond between caregivers and infants but also leads to significant health benefits, such as improved weight gain, which is particularly important given that many infants do not meet healthy weight criteria during key stages of early development. These findings emphasize the need for public health initiatives and educational programs that promote practices such as e massage to support optimal weight gain, especially in populations where inadequate weight gain is common and is linked to negative health outcomes (Lu et al., 2022). Furthermore, the strong association between intervention and increased weight gain is critical, as insufficient weight gain during infancy can result in various adverse health effects, including developmental delays and a heightened risk of chronic diseases later in life (Nunnery et al., 2018).

The z-score of -3.269 and p-value of 0.0011 in the Mann-Whitney U Test confirmed that the intervention group experienced more substantial weight gain than the control group. This finding underscores the effectiveness of the intervention in promoting greater weight gain than standard care, as reflected by the larger mean weight change in the intervention group. Research indicates that engaging in regular baby massage may facilitate improved weight gain in infants by promoting relaxation, enhancing parent-infant bonding, and potentially stimulating metabolic processes that contribute to growth. Furthermore, consistent findings from related studies suggest that interventions aimed at enhancing physical interaction, such as massage, can significantly influence infant weight and overall health outcomes, highlighting the importance of integrating such practices into early child care (Goldstein et al., 2017). Moreover, similar research has underscored the positive correlation between physical touch and infant development, revealing that those who receive regular tactile stimulation, whether through massage or other forms of engagement, tend to exhibit healthier growth patterns than their counterparts who do not receive such interventions (Goldstein et al., 2017).

CONCLUSION

The massage intervention led to a significant increase in weight compared with the control group, providing strong evidence for its efficacy in improving weight gain in children. These results suggest that the intervention may be beneficial in similar contexts, particularly in settings where child weight gain is a common concern.

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