

Analysis of Massage Effect on Infant's Growth and Development

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ABSTRACT

Background: Infancy is a stage of where growth and development occurs very fast, starting from a newborn until the age of 12 months. Developmental delays in Indonesia is about 12.8-16%, while in West Sumatra Province, it ranks 8th and Padang City is in the first place which experiences impaired infant growth, to optimize the infant growth and development, infant massages can be given. Infant massage is the part of treatment with touch therapy using certain techniques in infants. The purpose of this study is to determine the massages effect on infant's growth and development.

Research Method: This is an experimental study with pre and post control group design conducted in the working area of Padang City in Indonesia Primary Health Center from November 2018-November 2019. The sample of this study was 66 three-month-old infants selected by purposive sampling. Each group consists of 33 infants in the experimental and control groups. Infant's growth assessment is performed by using the Denver II form and infant's development assessment is performed by using baby scales. Data were analyzed by using the *Chi-Square test* and *Mann Whitney test*.

Research Result: The results showed that infant massage increased growth of $p = 0.001$, and infant massage increased development of $p = 0.001$

Research Conclusion: It can be concluded that infant massage influences infant's growth and development in the working area of Seberang Padang Public Health Center in 2019.

Keywords: Infant massage, growth, development

INTRODUCTION

Infant is a beneficial asset for the economic growth and sustainable development of a country because it is the life expectancy of family and nation. [1,2]

Infancy is a stage of where growth and development occurs very fast which is until the age of 12 months. [3] This period is considered being the golden age as well as a critical period of development because this period lasts very short and belongs to the first 1000 days of life. [4]

According to data of World Health Organization (WHO), based on the regional division of the country in 2018, 12% of

children under five in the world experienced weight gain disorders with detailed data showing that Southeast Asia has the highest prevalence of 14.1%, then followed by the United Arab Emirates of 13, 9% and occupied by West Asia Pacific with a prevalence of 10.5%. [5] Data from the United Nations Children's Fund (UNICEF) and the Lancet Series show that the prevalence of more than 25% (250 million) of children under five does not reach development potential in the world. Asia ranks third in the world after the Continent of Africa and Europe. [1,6,7]

West Sumatra Province ranks 8th experiencing growth disorders with a prevalence of 60.36% meaning that from 34 provinces in Indonesia, West Sumatra is a province which is still fairly high in the incidence of infants with growth disorders. [8] Padang ranks first in the category of city with children under two years old experiencing under red line (BGM) with a prevalence of 2% with 408 children, so that it can be calculated that Padang should get special attention on infant's growth data. [9]

Coordination Working Unit (UKK) on Growth and Development - Social Pediatrics of Indonesian Pediatrician Association (IDAI) develops one of the stimulations that can be done namely infant massage. Infant massage is a form of multi-modal stimulation, namely touch (tactile) and move (kinesthetic) carried out by trained health workers, parents or other family members. [10] Infant massage is the part of the oldest and the most popular touch therapies given to infants so that it can guarantee continuous body contact, provide a sense of security to the infant and strengthen the affection binding between parents and infants. [11]

LITERATURE REVIEW

Infant massage in addition to helping growth in increasing growth, it can also provide benefits for the infant development. [11,12] The basic mechanism (physiology) of infant massage occurs, among others, is because beta endorphin affects the growth mechanism, vagus nerve activity affects the food absorption mechanism, vagus nerve activity increases milk volume, serotonin production increases endurance and massage will change waves in the brain. This is what explains why infant growth and development occurs. [13-16]

The development from the moment from the baby is born to the age of 1 occurs very fast because at this age the development of brain cells is very rapid and also the strength of muscles from cranial to caudal grows fast which makes muscle tone symmetrical. The development depends on

the disappearance of primitive reflexes and the appearance of postural reactions at the age of 3 months. [17] In addition, at the age of 3 months and over, the infant is able to receive stimulation and touch/massage the infant perfectly. [18] Having a neck control that has begun to be mature. [19] In this age, nerve development is so rapid that massage is expected to help the infant's nerve maturation. [20] The most rapid weight gain occurs at the age of the first 3 months since birth which is around 700-1000 grams. [20]

The study conducted by Field & Scafidi (1986 & 1990) showed that studies on term infants who are massaged for 15 minutes twice a week for 6 weeks have gained more weight than the control group. [11] The development of study by Field et al (2011) showed that conducting 3 times infant massages for 15 minutes for 5-10 days showed an increase in infant weight by 14-47% compared to infants who were not massaged. [16]

The test results from 34 studies assessing the effectiveness of infant massages found that infant massage is effective in increasing infant's growth and development. [21] The study conducted by Jin et al (2007) also showed the results that infants undergoing massage will have a more tendency to increase growth and development by 7-11% that infants who are not massaged. [22]

Some other studies also prove that infant massage can significantly increase the growth of preterm infants compared to the control group. [16,23,24] Irva et al (2014) in their research proved that infant massage can increase growth in term infants aged 1-3 months of age and Susila's research (2017) in infants aged 0-7 months also showed significant infant weight gain outcomes. [25,26]

MATERIALS & METHODS

Research Design & Sample

This is an experimental research with pre and post test control group design. The group studied was divided into experimental group and control group began

with (pre-test) given to the two groups, then treated (experiment) and then ended with (post-test) of both groups. [27] The population in this study was all healthy infants aged 3 months who were in the working area of Seberang Padang Public Health Center in 2019. The sample in this study was the part of the population that fulfilled the inclusion and exclusion criteria, namely infants which did not have the history of birth asphyxia and fetal distress, infant with full term of history birth (Aterm), normal birth weight (2500-4000 gr), and infants who were only breastfed.

Data Collection Technique

The sampling technique in this study was conducted with a non-probability sampling technique namely purposive

sampling technique which is a sampling technique with certain consideration based on inclusion and exclusion criteria. Growth assessment is performed by using the Denver II form and development assessment is performed by using baby scales.

Statistical Analysis

The infant's normality weight test uses the Shapiro Wilk test (data < 50 samples), the data is not normally distributed, then the transformation of the data is still not normal, then the test data is tested with non-parametric to assess and to analyze body weight in the experimental and control groups, namely using the Mann-Whitney test. Assessment and analysis on infant's growth are done by using the Chi Square test.

RESULT

Characteristics of Research Respondent

Table 1. Frequency Distribution of Research Respondent Characteristics

Characteristics	Experiment n=33	Control n=33	p value
Father's education			1,000
Elementary school f (%)	1 (3)	0 (0)	
Junior High School f (%)	2 (6,1)	4 (12,1)	
Senior High School f (%)	22 (66,7)	23 (69,7)	
Tertiary Education f (%)	8 (24,2)	6 (18,2)	
Mother's education			0,969
Elementary school f (%)	1 (3)	0 (0)	
Junior High School f (%)	3 (9,1)	0 (0)	
Senior High School f (%)	23 (69,7)	28 (84,8)	
Tertiary Education f (%)	6 (18,2)	5 (15,2)	
Father's occupation			0,969
Labor f (%)	11 (33,3)	7 (21,2)	
Trader f (%)	10 (30,3)	15 (45,5)	
Employee f (%)	6 (18,2)	8 (24,2)	
Civil Servant f (%)	6(18,2)	3 (9,1)	
Mother's occupation			1,000
Working f (%)	6 (18,2)	4 (12,1)	
Not working f (%)	27 (81,8)	29 (87,9)	
Mother's age (year) (Mean ± SD)	28,97 ± 5,32	28,58 ± 4,06	0,737

Based on the results of the study in table 1, most parents' education is senior high school level, with the percentage of father's education (66.7%) and mother's education (69.7%) and 84.8%, then the infant's mothers who do not work (81.8%) and 87.9%, in the experimental and control groups, respectively. The statistical test results of the research respondents' characteristics showed that there are no significant differences in the two groups with a value of (p> 0.05).

The characteristics of research subjects in the form of gender, weight and gross motor skills can be seen in table 5.2 below:

Table 2. Frequency distribution of experiment and control groups research subject

Characteristics	Experiment n=33	Control n=33	p value
Infant Sex			0,503
Male f (%)	14 (42,4)	14 (42,4)	
Female f (%)	19 (57,6)	19 (57,6)	
Initial body weight (gr)	5600	5500	0,883
Median (min-max)	(4800-7000)	(4900-7000)	
Initial gross motor			
Advancef (%)	0 (0)	0 (0)	
Normal f (%)	26 (78,8)	24 (72,7)	1,000
Cautionf (%)	5 (15,1)	5 (15,2)	
Delayf (%)	2 (6,1)	4 (12,1)	

Based on the results of the study in table 2, most initial gross motor skills were normal (78.8%) and 72.7%, median initial body weight was 5600 grams and 5500 grams, the highest percentage of sexes were

women (57.6%) in experimental and control groups respectively. Statistical test results showed there are no significant differences ($p > 0.05$).

Gross Motor Assessment of 3-Month-Old Infants in the Pre-Post Experiment and Control Groups

Table 3. Gross motor assessment of three-month-old infants in the pre-post experiment and control groups

Gross Motor	Pre-test				Δ	p value	Post-test				Δ	p value
	Experiment		Control				Experiment		Control			
	f	%	f	%			f	%	f	%		
Advance	0	0	0	0	0	0	14	42,4	0	0	14	0,001
Normal	26	78,8	24	72,7	2	0,566	18	54,6	27	81,8	9	0,001
Caution	5	15,1	5	15,2	0	1,000	1	3,0	4	12,1	3	0,355
Delay	2	6,1	4	12,1	2	0,672	0	0	2	6,1	2	0,492

Based on the results of the study in table 3, infant gross motor in the pre-test is in advanced category of the experimental and control groups (0%), statistical tests show that there are no significant differences ($p > 0.05$). Post-test for the advanced category of the experimental and control group obtained 42.4% and (0%) and the statistical test showed a significant difference ($p < 0.05$).

Analysis of Differences in Gross Motor Growth of Three-Month-Old Infants in the Experiment and Control Groups

Table 4. Analysis of differences in gross motor development of three-month-old infants in the experiment and control groups

Difference (Δ)	Experiment n = 33		Control n = 33		p value
	F	%	f	%	
The increase of gross motor occurs	20	60,6	3	9,1	0,001
The increase of gross motor does not occur	13	39,4	30	90,9	

Based on the results of the study in table 4, an increase in the gross motor development of the experimental group was higher (60.6%), when compared to the control (9.1%). Chi-square statistical test showed that there was an effect of infant massage on gross motor development ($p < 0.05$).

pre-test experimental group and the control group of 100 gram, the results of the Mann Whitney statistical test showed that there was no significant difference ($p > 0.05$), while the post-test experimental and control groups experienced a significant increase with a difference of 700 grams. Statistical tests showed that there were significant differences ($p < 0.05$).

Body Weight Assessment for 3-Month-Old Infants in the Pre-Post Experiment and Control Group

Table 5. Body weight assessment of three-month-old infants in the pre-post experiment and control groups

Group	Experiment n = 33	Control n = 33	Δ (gram)	p value
	Median (min - max)	Median (min - max)		
Pre test	5600 (4800-7000)	5500 (4900-7000)	100	0,883
Post test	6500 (5400-8050)	5800 (5300-7500)	700	0,001

Based on the results of the study in table 5, the difference in infant weight of the

Analysis of Difference in Weight Gain of Three-Month-Old Infants in the Experiment and Control Groups

Table 6. Analysis of differences in weight gain of 3-month-old infants in the experiment and control groups

Ber (Δ)	Difference	n	Median (minimum - maximum)	p value
Experiment		33	1000 (500 - 1200)	0,001
Control		33	350 (200 - 700)	

Based on the results of the study in table 6, the difference in difference in weight gain in the infant experimental group was higher with a median of 1000 grams

than the control of only 350 grams. The results of the Mann Whitney statistical test showed that there was an effect of infant massage on infant growth ($p < 0.05$).

DISCUSSION

This study involved 66 infants as research subjects consisting of 33 infants in experimental group and 33 infants in control group. To avoid bias, age and gender were chosen equally between the experimental group and the control group. There were no significant differences on the initial weight of the study between the experimental and control groups, as well as the initial growth obtained did not have significant differences between the two groups, so it can be concluded that the two groups were homogeneous samples.

Gross Motor Assessment of Three-Month-Old Infants in the Pre-Post Experiment and Control Groups

The results of this study reveal that there is no significant difference in the pre-test of the experimental and the control groups. It is proven that one of the conditions for conducting experimental research has been fulfilled, because the initial conditions of the infants of the two groups have balanced characteristics or in other words both groups are homogeneous. Post-test of the experimental and the control groups showed significant differences in gross motor skills in the advanced and normal categories. This can be seen from the number of infants who experienced an increase in gross motor development to the advanced category in the experimental group at the end of the study. Then, in the caution and delay category, there were no significant differences between the two groups, but it can be seen that in the experimental group caution category, there was only one infant who did not experience increased gross motor development after being given a massage.

The dominant factors that affect gross motor development are genetic and environmental factors. Genetic ability can

appear optimally if supported by a conducive environmental factor, what is meant by environmental factor here is nutrient intake. Nutrition given for infants is obtained from breast milk which is given exclusively; thus, the nutrient intake obtained by the mother plays an important role to support the development of the infant. Another factor that cannot be ignored is the socio-economic factor. Poverty is always associated with food shortages, poor environmental health, and lack of knowledge.^[20]

Analysis of Differences in Gross Motor Growth of Three-Month-Old Infants in the Experiment and Control Groups

The results of this study reveal that infants in the experimental group have better gross motor development than the control group, so that it can be concluded that there is an effect of infant massage on the infant development. Infant massage will further accelerate the development because baby massage is a touch therapy or stimulation which is useful for stimulating development. A gentle touch on a infant's massage that interacts directly with nerve endings on the surface of the skin will send messages to the brain through the nerve tissue that is in the spinal cord. Touch will also stimulate blood circulation so that more fresh oxygen will be sent to the brain and throughout the body, so that there will be a balance between the limbs and the brain that helps accelerate motor development in infants.^[28]

The results of this study show significant differences in infant development between groups of infants massaged and those who were not massaged. It can be seen that infants who were massaged had increased development by 20 infants compared to the control group of only 3 infants. The information obtained from the mother is that after being given a massage; the infant was more active in moving, sleeping more soundly and for a long time, rarely fussy and rarely sick. The infant in experimental group, even if massage has been done, still did not show

an increase of 13 infants. This can be caused by several factors that affect gross motor development, such as internal and external factors. External factors that affect infant development are nutrient intake, nurturing environment, socio-economic, and stimulation. [20]

Body Weight Assessment for Three-Month-Old Infants in the Pre-Post Experiment and Control Groups

The results of this study obtaining an assessment of differences in body weight of infants aged 3 months in the pre-test in the experimental and the control did not show significant differences between the two groups.

Post-test in the experimental and control groups revealed there were significant differences between the two groups. This is indicated by the significant difference in body weight difference between the experimental and control groups. It can be seen from the difference in body weight in the post-test in experimental and control groups of 700 grams, compared to the pre-test in experimental and control groups which only obtained a difference of 100 grams.

According to Soetjningsih & Ranuh (2017), it is stated that genetic factors are the basis for achieving growth results. Internal factors such as biological, including genetic and external factors such as nutritional status. Internal factors (genetic) include, among others, innate factors, sex, age, and race or ethnicity. External factors (environmental) include pre-natal and post-natal factors, so that the strong determinants that affect weight growth are the infant's care environment and nutritional intake, while other factors that indirectly affect the growth and development of infants are nutritional conditions and maternal health as well as socioeconomic family condition. [20]

Analysis of Difference in Weight Gain of Three-Month-Old Infants in the Experiment and Control Groups

The significant increase in body weight in infants occurs due to the effect of infant massage for 6 weeks. According to the theory, it can be explained that giving infant massage can stimulate the vagus nerve which is the 10th cranial nerve that regulates the function of organs including the chest and abdomen. Stimulation of the vagus nerve (parasympathetic nerve) will stimulate the stomach to secrete the hormone gastrin. Gastrin hormone will stimulate insulin release, hydrochloric acid, pepsinogen, pancreatic enzymes, and increase the flow of liver bile and stimulate gastric motility. It also facilitates receptive relaxation of the stomach (temporary relaxation), so that the stomach can increase its volume very easily without increasing pressure. [11,14,16]

According to the analysis of the researcher, the massage given regularly twice a week for 6 weeks span of 15 minutes can help increase body weight. This is because infant massage helps the digestive process because massage increases the levels of enzymes absorption of food and insulin so that absorption of food juices becomes better; thus, the baby becomes hungry quickly. Besides, the differences in weight gain due to massage can increase the release of growth hormone. [11] The results of this study are in line with research conducted by Elvira & Azizah (2017) showing that there are significant differences between massage groups and those without massage of ($p < 0,000$). The weight gain of the massaged group was 800 gr/month and the group that was not massaged of 233 grams month. However, the difference between this study and the study carried out by Elvira & Azizah was the relatively short research process time that was conducted for 30 days. [29]

CONCLUSION

The conclusion of this study is the massages increased growth and development of infant. Futher studies are needed to evaluate the massages effect

during 1st years baby phase growth and development.

Research Code of Ethics

This study was approved by the team of research ethics commission of Faculty of Medicine, Andalas University with ethics test number 111/ KEP/FK/2019.

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