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The Effect of Massage Stimulation on Anthropometric Measures of Preschool Aged Children at Integrated PAUD Merpati Anggrek Surabaya

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ABSTRACT
Massage stimulation is a traditional therapy of the Indonesian, which combines auditory, visual and tactile kinesthetic stimuli, which can be given from early to unlimited age. Preschoolers not only need education and protection, but also need stimulation for their growth and development. Massage stimulation for preschoolers in addition to relaxing the child is also reducing stress, increasing immunity, stimulating the vagus nerve, also increasing growth by stimulating cell growth. This research aims to determine the effect of massage stimulation on the anthropometric size of preschoolers. This research method uses true experimental design with pre and posttest with control group design. The number of samples was 25 respondents of integrated early childhood education programs (PAUD) Integrated Anggrek Merpati which divided into 2 groups, 13 children in the massage stimulation group and 12 children in the control group. Data analysis uses Paired Samples Test and Independent Samples Test. The results obtained a significant value of p = 0,000 or p <0.05 in the treatment group, but in the two control groups there was no difference in anthropometric measurements of height and head circumference p> 0.05. In conclusion, there was the effect of massage stimulation on body weight, height, upper arm circumference and head circumference. But the height and head circumference were not found differences in the two groups. Researcher suggests further case studies with a larger sample size. So that massage in preschoolers can be used as a reference as growth stimulation for stunting prevention.

Keywords : Anthropometry, Massage Stimulation, Pre-School Aged Children

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BACKGROUND

Preschoolers or also called early childhood is a golden period where children experience growth and development in all aspects which can be easily stimulated. This period only lasts once throughout the span of human life. Therefore, at an early age it is necessary to develop a comprehensive effort that involves aspects of care, health, education and protection. Based on research results that the child's sensitive learning period starts from the child in the womb until the first 1000 days of his life (Permendikbud: 146). The results of other expert studies report that brain growth and development partly occurs in toddlers (Erhamwilda, 2004). At birth, a baby's brain contains 100 to 200 billion neurons or nerve cells that are ready to make connections between cells. About 50% of the capacity of human intelligence occurs when the age of 4 years, 80% occurs when the age of 8 years, and reaches a 100% culmination when aged 8 to 18 years. Other studies report that stimulation based on affection at birth to 3 years can stimulate 10 trillion brain cells (Permendikbud 146; Erhamwilda, 2004). Preschoolers experience brain development twice as active as adults. The quality of the brain of preschool age is determined by the number of dendritic branches, the quality of synapses and the quality of myelinated axons. Where this quality depends on the quality of nutrition and environmental stimulation. A stimulant-rich environment will increase dendritic branching, proliferation and stability of synapses and change existing circuits or by forming new circuits.

Early detection of growth and development in preschoolers is part of the Early Childhood Education curriculum written in the 2014 Ministry of Education Regulation 146 on the 2013 Early Childhood Education Curriculum. Early detection is done to find out whether a child is growing and developing according to his age. The results of early detection of growth and development of a child become the basis for providing appropriate stimulation and intervention according to their needs. Early detection activities carried out in Early Childhood Education (*Pendidikan Anak Usia Dini*/PAUD) include early detection of growth, namely weighing, measuring height and measuring head circumference, conducted once a month. While hygiene and health checks such as hair, eyes, ears, nose, mouth, teeth, skin, nails, hands and feet are held at least once a week. Other early detection is early detection of development, namely social emotional development and independence, language, physical, cognitive, vision and hearing.

Stunting is a chronic nutritional problem at an early age characterized by a shorter height compared to children his age. Children who suffer from stunting will be more susceptible to disease and as adults are at risk for developing degenerative diseases. Nutrition problems in children have an impact not only in terms of health but also affect the level of intelligence of children (Ministry of Health, 2018). The results of Riskesda 2018, reported the number of toddlers with short and very short nutrition increased in 2017 to 29.6%. The same thing was reported by World Health Organization (WHO) that Indonesia is the third country with the highest prevalence in Southeast Asia / South-East Asia Regional (SEAR) where the average prevalence of stunting under five in 2005-2017 was 36.4%. From the data above, stunting is a major problem facing Indonesia. In addition, other nutritional problems are thin and very thin nutrition by 10.2%, while malnutrition and lack of nutrition are 17.7% (Riskesda, 2018).

The problem encountered in PAUD Anggrek Merpati which was the object of this research was the implementation of early detection of growth and development has been carried out in accordance with the 2013 PAUD curriculum. From the results of anthropometric measurements found some children with a short body, malnutrition and

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underweight nutrition. Efforts that have been made by institutions are by providing supplementary food that is included in the curriculum as a joint meal, while other forms of stimulation have never been done.

By considering those facts, it becomes the background of the researcher to provide massage stimulation in early childhood or preschool as a form of stimulation from the point of health. The results of the study are expected to be a reference by *Bunda* (female teacher) of PAUD to provide counseling and train the child's parents to be able to provide massage stimulation at home and can be included in activities that exist in the curriculum. Massage stimulation is stimulation in the form of massage on all limbs with the techniques of rubbing, kneading, shaking and sorting. This stimulation has been carried out for a long time by the Indonesian people but with a different purpose that is to be carried out on infants or sick children. There have been many studies about the benefits of massage stimulation on the growth and development of children. Diego, et al (2005) reported that massage therapy enhances growth and development in premature infants, as well as in other studies that moderate-pressure massage therapy gives rise to parasympathetic nervous system responses characterized by an increase in the high-frequency component of heart rate variability and increased gastric motility. This increase is related to the weight gain of premature babies (Miguel A.D, 2009).

METHODS

This study used true experimental design with the type of pre-post posttest with control group design. Subjects were preschool children in PAUD Anggrek Merpati Dukuh Menanggal Surabaya, as many as 25 children with inclusion criteria: 1) children did not suffer from skin diseases or eczema; 2) socioeconomic parents of lower middle; 3) parents are willing to do massage stimulation routinely 2 days for 2 months. Sampling is done by simple random sampling, where every child gets the same opportunity to take one randomized serial number. Children who get odd numbers are included in the intervention group and those who get even numbers are included in the control group. So that the sample size obtained in the intervention group of 13 children, and the control group of 12 children. Subject parents, PAUD teachers and children did not know the number drawn. Prior to the study, the child's parents gave informed consent by filling in the consent form. Anthropometric measurements using the WHO z-score anthropometric standard (2005) were carried out before and after the implementation of massage stimulation. Then after agreeing to determine the day and date, parents in the intervention group were given massage stimulation training.

The massage stimulation movement used is recommended by Tiffany Field, which is massage stimulation on all limbs with the techniques of rubbing, kneading, shaking and sorting. Stimulation is done once every 2 days with 10-15 minutes for 8 consecutive weeks. The schedule for stimulation performed by parents or family at home is left entirely to parents, while staying in accordance with the implementation procedure. Once a week the officer comes to class to evaluate the stimulation activities carried out.

RESULTS

1) Distribution of Respondents by Gender and Age

Table 1.1 Distribution of Respondent

Variable	Number	Percentage
Gender		
Male	18	72

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Female	7	28
Child Age		
24-35 month	2	8
36-47 month	2	8
48-60 month	11	44

It can be seen from Table 1.1 that the highest frequency of male sex children is 72% and aged between 48-60 as much as 44%.

2) Children Nutritional Status

Table 1. 2 Child Nutritional Status based on Anthropometric Measures

Nutritional Status	Treatment Group	Control Group
Height/Age		
a. Tall	1	0
b. Normal	6	11
c. Short	5	1
d. Stunting	1	0
Weight/Age		
a. Severe Malnutrition	0	0
b. Under Nutrition	4	4
c. Normal Nutrition	9	7
d. Over Nutrition	0	1
Weight/Height		
a. Wasting	0	0
b. Under Weight	2	3
c. Normal	11	8
d. Obese	0	1
Upper Arm Circumference		
Normal	10	8
Malnutrition	3	3
Over Nutrition	0	1
Head Circumference		
Normal	13	12
Microcephalus	0	0
Macrocephalus	0	0

From Table 1.2 on nutritional status data of children based on the Height/Age index found 5 short stature children in the treatment group, and 1 child in the control group. Based on the Weight/Age index, there are 4 children with underweight nutrition in the treatment group and 4 children in the control group.

Nutritional status of children based on the Weight/Height index is known to children with underweight nutrition 2 children in the treatment group and 3 children in the control group. Status of upper arm circumference is known to 3 children with malnutrition in the treatment group and 3 children in the control group. Whereas, the status of head circumference in all groups has normal head circumference.

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Tabel 1.3 Paired Samples Test Weight, Height, Head Circumference & Upper Arm Circumference

Group		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Treatment	Weight Pre & Post Test	-1.592	.647	.180	-1.984	-1.201	-8.868	13	.000
	Height Pre & Post Test	-1.723	.556	.154	-2.059	-1.387	-11.184	13	.000
	Head Circumference Pre & Post Test	-.731	.259	.072	-.888	-.574	-10.156	13	.000
	Upper Arm Circumference Pre & Post Test	-1.615	.650	.180	-2.008	-1.222	-8.954	13	.000
Control	Weight Pre & Post Test	-.267	.308	.089	-.463	-.071	-2.995	12	.012
	Height Pre & Post Test	-.900	1.022	.295	-1.550	-.250	-3.049	12	.011
	Head Circumference Pre & Post Test	-.375	.377	.109	-.614	-.136	-3.447	12	.005
	Upper Arm Circumference Pre & Post Test	-.625	.678	.196	-1.056	-.194	-3.191	12	.009

From Table 1.3, it can be seen that there are differences in anthropometric size in the two groups. In the treatment group, a significant difference in body weight was obtained p = 0,000 (p <0.05). In the measurement of height also found a significant difference p = 0,000 (p <0.05), as well as head circumference and upper arm circumference p = 0,000 (p <0.05). So there is the effect of massage stimulation on body weight, body length, head circumference and upper arm circumference in the treatment group.

In the control group weight obtained p = 0.012, body length p = 0.011. While the size of the head circumference p = 0.005 and the circumference of the upper arm p = 0.009 which means that although not significant but there is a difference.

Table 1.4 Independent Samples Test Weight, Height, Head Circumference & Upper Arm Circumference

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Weight	Equal variances assumed	.021	.887	2.234	23	.029	3.4058	1.4653	.3746	6.4370
	Equal variances not assumed			2.299	20.598	.032	3.4058	1.4813	.3215	6.4901
Height	Equal variances assumed	1.753	.198	.774	23	.447	.2244	2.8746	-3.7221	8.1709
	Equal variances not assumed			.787	20.952	.440	.2244	2.8281	-3.6579	8.1066

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Table 1.4 Independent Samples Test Weight, Height, Head Circumference & Upper Arm Circumference

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Weight	Equal variances assumed	.021	.887	2.234	23	.029	3.4058	1.4653	.3746	6.4370
Head Circumference	Equal variances assumed	3.834	.062	1.109	23	.279	.7660	.6909	-.6631	2.1952
	Equal variances not assumed			1.130	19.986	.272	.7660	.6776	-.6475	2.1796
Upper Arm Circumference	Equal variances assumed	.407	.503	2.102	23	.047	2.1442	1.0212	.0338	4.2546
	Equal variances not assumed			2.064	18.157	.054	2.1442	1.0389	-0.365	4.320

Table 1.4 shows that the anthropometric size p = 0.029 (p <0.05), height p = 0.447 (p> 0.05), head circumference p = 0.279 (p> 0.05), and upper arm circumference p = 0.047 (p < 0.05), so it can be concluded that there are differences in body weight and upper arm circumference but there is no difference in anthropometric size in height and head circumference in the treatment group with the control group

DISCUSSIONS

Respondents who are students in PAUD Anggrek Merpati are mostly male. Although both gender requires optimal physical growth, however boys are slower in physical growth compared to girls. As stated by Soetjiningsih (2015), growth spurts for girls are faster than boys. But the growth of girls stops faster than boys. The growth of children is influenced by internal and external factors, in this logic massage stimulation is an external factor that can affect the child's growth.

From the data found in students in PAUD Anggrek Merpati who are of short stature, underweight nutrition and malnutrition. This identifies if there are still many preschool age children who have nutritional problems. Low nutrition is a condition where body weight is below the WHO growth curve, while stunting is a condition where a child fails to grow due to low nutrition and recurring illnesses for a long time during fetal age until the first two years of a child's life (Anif Munjidah, 2019). The Head of the Indonesian Ministry of Health's Data and Information Center (2018) reports that stunting is a major nutritional problem facing Indonesia. Low nutrition has the highest prevalence compared to other nutritional problems such as malnutrition, thinness and fat. In 2017 stunting was reported at 29.6%.

To control the number of stunting incidents, it requires the participation of various parties, including educational institutions. Massage is a form of combined stimulation of auditory, visual and tactile kinesthetic stimuli, which can be given from early brain development to infinite age. With the hope of stimulating the quantity and quality of brain cell synapses to optimize brain function. Researchers report that massage pressure, especially with tactile kinesthetic stimulation, can increase a baby's weight Low Birth Weight (LBW) with a mechanism for increased vagal activity, increased insulin release, reduced energy expenditure, increased gastric motility, better absorption of nutrients, decreased cortisol and non-epinephrine serum levels, as well as reducing neonatal stress behavior (Karbasi et al. 2013).

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The results of this study report that there are significant differences in the weight of the intervention group before and after massage stimulation. According to Utami (2001) massage stimulation can increase vagus nerve tone (tenth brain nerve). Increased vagus nerve activity will cause an increase in the production of absorption enzymes such as gastro and insulin so that food absorption is better. Research conducted by Karbasi et al (2013) reports that effective infant massage can be used as a way to increase infant weight and is a safe non-medical measure for infants with LBW. In addition to increasing vagus activity, stimulation or massage therapy causes weight gain by increasing insulin and IGF-1, this is because insulin converts glucose to glycogen better in the short term and long-term storage (lipids). IGF-1 plays an important role in promoting growth by stimulating cell growth and inhibiting apoptosis. Massage stimulation decreases or inhibits the hormone of cortisol in insulin secretion thereby causing greater weight gain (Field., Et al. 2008). While research on children aged less than 5 years, reported by Annif Munjidah (2019) that the stimulation of Tui Na massage affects the growth status of children (p = 0.019). The research subjects were children aged less than 5 years with KMS (toddler growth indicator card) which shows T status (body weight did not increase). An increase in body weight of a child who receives automatic massage stimulation will increase the child's arm circumference, these two anthropometric measurements are interrelated.

Significant differences also occurred in height in the intervention group before and after massage stimulation. Massage stimulation can prevent stunting by stimulating growth hormone. The results of the research Yusari Asih and I Gusti Ayu (2019) reported that although there was no significant difference in the mean increase in infant weight between the intervention group and the control group p = 0.116, but baby massage and spa could increase the length of the body in the intervention group p = 0,000 . In line with the results of Lia's study (2018) in premature infants who received H-Hope plus kinesthetic stimulation with VCO for 14 days reported that the interventions given could increase body weight and length with significant values p = 0.001 and p = 0.009. Likewise, the results of I Dewa AAS research (2019) conducted at Dr. Soetomo Hospital in Surabaya where stimulation of massage performed on premature infants increases IGF-1 so that there is a positive correlation between an increase in average IGF-1 and body length (0.347).

Another result of the study was that there were significant differences in head circumference and arm circumference over the intervention group before and after massage stimulation. This result is in line with research by Yusari Asih and I Gusti Ayu (2019) who reported that there was a significant difference (p = 0,000) between the head circumference of infants aged 3-5 months of the first and second measurements. These results are not the same as a study conducted by Abedi et al (2018) reported in nursing mothers who were trained in massage, where massage stimulation was carried out for 28 consecutive days, 2 times a day for 25 minutes.

Then the growth index (body weight, body length and head circumference) was measured 24 hours after birth, 14th and 28th days. The conclusion was that no significant differences were found between the average body weight and neonatal head circumference in both group (p> 0.05). 50% increase in head circumference of children occurs from birth to adulthood occurs in the first 6 months of life, then after that it will slow down where an increase of 10 cm then occurs in the rest of his life.

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Massage stimulation is a nor-pharmacological therapy that has been carried out by people since time immemorial. In the past, massages were performed by old medicaster, which carried out on children and adults.

Parents give their children a massage because they are sick. In line with the changing times, experts have conducted research on the benefits of massage stimulation related to the growth and development of children. In addition to healthy children, massage stimulation is also useful in infants or sick children, such as children with allergies, asthma, digestive disorders, ADHD, etc. Massage stimulation in children, especially in preschool children, stimulates growth. Growth hormone (GH) is made in the anterior pituitary gland, released into the bloodstream and then stimulates the liver to produce Insulin-like growth factor-1 (IGF-1). IGF-1 then stimulates systemic body growth, and has the effect of stimulating growth in almost every cell in the body, especially skeletal muscle, cartilage, bone, liver, kidney, nerves, skin, hematopoietic, and lung cells. Massage stimulation in the abdominal area affects the HPA-axis stimulates the vagus nerve so that it can increase vagal activity and gastric motility and release of insulin (food absorption hormone) so that if the child is given massage stimulation will increase the child's nutritional status increases (I Dewa Ayu. 2019). Massage stimulation also provides comfort to children, thereby reducing the production of glucocorticoid in the adrenal glands, while also reducing the hormone cortisol. Stress experienced by children contributes to the dysregulation of glucose metabolism (hyperglycemia and insulin resistance). Preschoolers who are often stressed will hinder their growth and development because stress conditions will increase the use of glucose stores to meet the child's energy. Besides stress makes children withdraws from their environment, low self-esteem, stuttering, and decreased appetite.

The limitation of this study is the lack of literacy of research results about the effect of massage stimulation on growth in preschool children. Stress that occurs in children also affects the results of this study. In the future, research on larger samples can provide more results than expected.

CONCLUSION

Based on analysis and statistical tests, it can be concluded that there are differences in anthropometric size of body weight, height, head circumference and upper arm circumference in children who receive massage stimulation. But there was no significant difference in anthropometric size between the intervention group and the control group.

Further research needs to be done with the same but larger subjects, this is to provide more references for decision makers of PAUD education institutions in developing curriculum for providing stimulation to their students.

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