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THE EFFECT OF OMEGA-3 FATTY ACID SUPPLEMENTATION ON LANGUAGE AND PERSONAL-SOCIAL DEVELOPMENT OF STUNTED TODDLERS IN THE BAKUNASE PUBLIC HEALTH CENTER AREA

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ABSTRACT

This quasi-experimental study with a non-equivalent control group aimed to analyze the effects of omega-3 supplementation on early childhood development, focusing on gross motor skills, fine motor skills, language development, and social skills among stunted children aged 1–3 years in the Bakunase Health Center area. Malnutrition remains a serious issue in Indonesia, with 20.6% underweight, 18.4% stunted, and 9.4% wasting toddlers reported in Kupang City in 2024. A total of 20 participants were divided into treatment and control groups (10 each), and data were collected using questionnaires and analyzed with the Wilcoxon Signed Rank and Mann-Whitney tests. Results showed that omega-3 supplementation significantly improved language ($p = 0.034$) and social skills ($p = 0.046$) in the treatment group, with no significant changes observed in gross ($p = 1.000$) or fine motor skills ($p = 0.317$). No improvements were found in any domain in the control group, while the Mann-Whitney test confirmed significant differences between the two groups in language and social development (both $p = 0.012$).

KEYWORDS *omega-3, language development, social personal, toddler, stunting*

INTRODUCTION

Nutrition is one of the determinants of the quality of human resources. The importance of nutritional fulfillment in children needs extra attention, because the nutritional intake received by children has a direct impact on the quality of their growth and development. Adequate nutritional intake plays a crucial role in ensuring that children can grow and develop optimally. Balanced nutrition refers to the food consumed by individuals in their daily lives that are of various types and meet the nutritional needs of children in the right amount, without excess or deficiency (Fitriana, 2020).

The nutritional status of toddlers is crucial and must be known as a basis for providing interventions to prevent malnutrition cases and to design more effective planning to prevent similar suffering in other children. Dermawan et al. (2022) stated that malnutrition conditions in toddlers can have a difficult impact on recovery and have long-term effects. In addition, malnutrition in toddlers can also affect their brain development, weaken the immune system, and make them susceptible to disease.

Currently, nutrition problems at the national level show that many children under the age of two experience malnutrition on a regular basis. Based on statistics, the rate of malnutrition in the early age group reaches an alarming level. *Riskesdas* data in 2021 shows that 24.40% of Indonesian toddlers are short, 7.10% are acutely malnourished, and 17% are underweight. According to the results of the 2022 Indonesian Nutrition Status (*SSGI*) survey revealed at the National Working Meeting of the National Population and Family Planning Agency (*BKKBN*),

the Ministry of Health stated that the prevalence of malnutrition reached 21.6% in Indonesia, and this condition is more common in children aged 6 to 24 months who are predominantly receiving interventions (Inggriani et al., 2019).

The overview of the nutritional status of children under five based on data obtained from the *Kupang* City Health Office as a result of the *e-PPGM* in August 2024, shows there are 4,564 (20.6%) underweight toddlers, 4,086 (18.40%) with stunting, and 2,079 (9.4%) with wasting.

Suhaimi (2019) stated that the high rate of malnutrition in children under five in Indonesia is caused by several factors, including lack of adequate intervention, limited access to nutritious food, limited knowledge about healthy diets, and family economic challenges in providing adequate nutrition. Together, these factors create an environment that is prone to malnutrition in that age group.

The development of children aged 1–3 years is a critical phase characterized by rapid physical growth and cognitive development, so it requires special attention (Rahmad, 2017). At this stage, children begin to develop gross and fine motor skills, language skills, and social interactions. Proper nutrition plays a key role in supporting this development. One of the nutrients that has received special attention is omega-3 fatty acids, which have been shown to have various benefits for brain health and child development.

Omega-3s, which are made up of essential fatty acids such as *EPA* (*Eicosapentaenoic Acid*) and *DHA* (*Docosahexaenoic Acid*), have been widely recognized as nutritional fats that play a major role in the development of the brain and central nervous system. Various studies show that *DHA* has an important role in improving cognitive function, while *EPA* focuses more on improving emotional and behavioral function. Given these benefits, omega-3s are identified as important nutrients in improving children's ability to develop motor and language skills optimally. However, although omega-3s have great potential in supporting child development, the level of omega-3 intake in early childhood in Indonesia is often insufficient, so special interventions in the form of omega-3 supplementation are needed.

Based on previous research reviews, several studies have shown a positive relationship between omega-3 consumption and child development. A meta-analysis conducted by Riediger et al. (2021) found that omega-3 intake is associated with improved cognitive function in children. In addition, research by Mello, C., et al. (2022) showed that children who took omega-3 supplements performed better in motor and language aspects compared to those who did not. Research by González et al. (2020) found that omega-3 deficiency can be associated with cognitive and behavioral impairment in children. The study also noted that children who received omega-3 supplementation showed improvements in attention and cognitive abilities.

The studies on omega-3s described above show that omega-3 supplementation in early childhood is associated with improved cognitive function, which in turn affects language and motor development. However, further studies are needed to understand more deeply the influence of omega-3 supplementation in improving gross motor development, fine motor skills, language development, and social development in children aged 1–3 years. In addition, this research is also important to increase public understanding of children's nutritional needs and the use of omega-3 supplements.

METHOD

The design of this study uses a quasi-experimental approach with a *Non-equivalent Control Group* design with one treatment. In this model, respondents were divided into groups, namely the treatment group and the control group. Before starting the treatment, both groups were given a preliminary test or pretest to measure their initial condition. Furthermore, the experimental group was given treatment, while the control or comparison group was not given any intervention. The treatment group received an intervention in the form of omega-3 supplementation for stunted toddlers for one month. After the completion of the treatment (intervention), both groups were given another test as a post-test or final observation.

This research was carried out from January to February 2025 in the work area of the *Bakunase* Health Center. The population in this study consisted of children aged 1–3 years in the *Bakunase* Health Center area, who were included in the stunting category, totaling 183 children. The selected sample size was 20, with 10 samples each in the treatment group and 10 samples in the control group. The sampling technique used was purposive sampling.

The research variables include independent and dependent variables. The independent variable in this study was the administration of omega-3 supplements, while the dependent variables were gross motor development, fine motor skills, language development, and children's social development.

The data collection tools used were questionnaires and child development measurements using the *Denver Development Screening Test* (*DDST*). Once the data were collected, they were analyzed. Hypothesis testing used the Wilcoxon Signed Rank Test and the Mann-Whitney U Test.

This research has passed and received ethical approval from the Research Ethics Committee of the Faculty of Public Health (*FKM*) Nusa Cendana University *Kupang* with number 002720/KEPK FKM UNDANA/2024.

RESULTS AND DISCUSSION

Respondent Characteristics

Table 1 shows that in the treatment group there were 40.0% of respondents aged 12 – 23 months and 60.0% of other respondents aged 24 – 36 months who were participants in this study. Meanwhile, in the control group, it is known that there are 50.0% of toddlers aged 12-23 months and another 50.0% aged 24-36 months. In the treatment group, the percentage of male sex was 50% and women were also 50%. The same is the case with the control group, where the control group also has a percentage of 50.0% men and 50.0% women. In the treatment group, the age of mothers under five was the age range of 26-30 years, which was 40.0% and the lowest at the age of >40 years, which was 10.0%. Meanwhile, in the treatment group, the age of mothers under five was found in the age range of 36-40 years, which was 50.0% and the age of mothers under five was >40 years old. In the treatment group, it was found that most mothers of toddlers were high school graduates, namely 90.0% and 10.0% of basic education. This is the same as the control group, where most of the mothers of the respondents have a high secondary education, which is 70.0% and 30.0% are graduates of basic education.

Table 1. Distribution of Respondent Characteristics

Characteristic	Treatment Groups		Control Group	
	n	%	n	%
Age Group (Month)				
12 – 23	4	40,0	5	50,0
24 – 36	6	60,0	5	50,0
Gender				
Man	5	50,0	5	50,0
Woman	5	50,0	5	50,0
Mother's Age (Years)				
26 – 30	4	40,0	3	30,0
31 – 35	3	30,0	2	20,0
36 – 40	2	20,0	5	50,0
>40	1	10,0	0	0,0
Mother's Education				
Basis	1	10,0	3	30,0
Upper Intermediate	9	90,0	7	70,0
Mother's Work				
Work	5	50,0	2	20,0
Not Working	5	50,0	8	80,0
Parenting				
Mother	7	70,0	8	80,0
Family	3	30,0	2	20,0

Source: Primary data, 2025

As many as 50.0% of the treatment group had working mothers and the other 50.0% did not work. The most popular types of jobs are Civil Servants (PNS) and Teachers. Meanwhile, in the control group, most mothers under five did not work, 80.0% and the other 20.0% worked. According to the data above, it is known that in the treatment group, most of the toddlers are cared for by their own mothers, which is 70.0% and the other 30% are cared for by their families. Meanwhile, in the control group, as many as 80.0% of toddlers were cared for by their mothers and the other 20.0% were cared for by their families.

Table 2. Average Infant Weight in the Treatment and Control Group

Group	Body Weight (kg)			
	n	Beginning	End	Difference
Treatment	10	10.32 ± 1.36	11.02 ± 1.59	0.70 ± 0.23
Control	10	9.22 ± 0.71	9.14 ± 0.80	-0.08 ± 0.09

Source; Data processed, 2025

Table 2 shows that the average weight of early toddlers in the treatment group was 10.32 ± 1.36. After being given treatment or intervention in the form of Omega 3 administration, the average weight of toddlers became 11.02 ± 1.59. So, it is known that there is an increase with the difference in average body weight is 0.70 ± 0.23. On the contrary, it occurred in the control group, it was known that the average weight of toddlers was initially 9.22 ± 0.71 and at the end of the study the weight of toddlers was measured again so that it was known that the average weight was 9.14 ± 0.80. Therefore, it is known that the average weight of toddlers decreased in the control group, namely with an average of -0.08 ± 0.09.

Table 3. Data on the Distribution of Personal Social Development in Toddlers

Social Personal (Independence)	Treatment Groups				Control Group			
	Pretest		Posttest		Pretest		Posttest	
	n	%	n	%	n	%	n	%
Usual	6	60,0	10	100,0	4	40,0	4	40,0
Hampered	4	40,0	0	0,0	6	60,0	6	60,0
Total	**10**	**100**	**10**	**100**	**10**	**100**	**10**	**100**
Wilcoxon Signed Rank Test	0,046				1,000			
Mann Whitney U Test	0,012							

Source: Data processed, 2025

The data above shows that in the treatment group, it was found that as many as 60.0% of toddlers had normal social personalities and 40.0% were hampered during the pretest. However, after being treated for a month or 30 days, it was found that as many as 100.0% of toddlers with normal social personality were found. In contrast to the control group which showed no difference in percentage both during the pretest and posttest, which was as much as 40.0% of toddlers with normal social personal categories at the time of the pretest and at the time of the posttest the percentage was also 40.0%. There are 60.0% of toddlers who have social personality with the category of inhibited at the pretest and at the posttest the percentage is also 60.0%.

Statistical test results with *Wilcoxon Signed Rank Test* In the treatment group, a significance value (p) = 0.046 was obtained that was smaller than α= 0.05 so that it was known that there were differences in the personal categories of toddlers before and after being given treatment or intervention in the form of giving omega 3 to toddlers at the Bakunase Health Center in October 2024. Meanwhile, in the control group, a significance value (p) = 1,000 > α= 0.05 was obtained. So, there is no difference in the personal category of toddlers during the pretest and posttest. Statistical test results using the *Mann Whitney U Test* obtained a significance value (p) = 0.012 less than α = 0.05. Thus, there were significant differences in the personal categories of control and treatment groups.

Table 4. Data on the Distribution of Fine Motor Development in Toddlers

Fine Motor	Treatment Groups				Control Group			
	Pretest		Posttest		Pretest		Posttest	
	n	%	n	%	n	%	n	%
Usual	9	90,0	10	100,0	9	90,0	10	100,0
Hampered	1	10,0	0	0,0	1	10,0	0	0,0
Total	10	100	10	100	10	100	10	100
Wilcoxon Signed Rank Test	0,317				0,317			
Mann Whitney U Test	0,819							

Source: Data processed, 2025

Table 4 shows the categories of fine motor pretest and posttest toddlers in the treatment group and control group. In the treatment group, 90.0% of respondents had fine motor with the normal category and another 10.0% in the inhibited category. After intervention or treatment, it was found that 100.0% of toddlers had fine motors with the normal category. In the control group, it was found that 90.0% of toddlers with fine motor skills were in the normal category and 10.0% were in the inhibited category. At the time of the post-test, there were 100.0% of toddlers with fine motor in the normal category.

Statistical testing using *Wilcoxon Signed Rank Test* showed a significant value (p) of 0.317 in both the treatment group and the control group. The value of p= 0.317 > α = 0.05. Thus, it can be concluded that there was no difference in the category of subtle motoric variables during the pretest and posttest in the treated group or in the control group in the Bakunase Health Center Work Area. The results of the Mann Whitney U Test showed a value of p = 0.819 > α = 0.05. Thus, there was no difference in fine motor categories in the control and treatment groups.

Table 5. Data on the Distribution of Language Development in Toddlers

Language	Treatment Groups				Control Group			
	Pretest		Posttest		Pretest		Posttest	
	n	%	n	%	n	%	n	%
Usual	3	30,0	9	90,0	3	30,0	3	30,0
Hampered	7	70,0	1	10,0	7	70,0	7	70,0
Total	10	100	10	100	10	100	10	100
Wilcoxon Signed Rank Test	0,034				1,000			
Mann Whitney U Test	0,012							

Source: Data processed, 2025

The table above shows the word or language skills that toddlers use during the pretest and posttest. In the treatment group, there were as many as 30.0% of respondents who had language skills in the normal category and another 70.0% in the inhibited category. At the time of the posttest, precisely after being given treatment or intervention, it was found that as many as 90.0% of toddlers had language skills in the normal category and 10.0% in the inhibited category. Meanwhile, in the control group, it was found that as many as 30.0% of toddlers had normal language skills and 70.0% of other toddlers had language skills with an inhibited

category. At the time of the posttest, it was found that as many as 30.0% of toddlers had normal language skills and 70.0% with the inhibited category.

The results of statistical testing using *the Wilcoxon Signed Rank Test* obtained a significant value (p) = 0.034 in the treatment group, which means that the value of p = 0.034 <α = 0.05. Thus, there are differences in the language category of treatment groups for toddlers in the work area of the Bakunase Health Center in October 2024. Statistical testing on the control group obtained a p value of 1,000, which means p value = 1,000 >α = 0.05. So there is no difference in language categories both during the pretest and posttest. The results of the statistical test using the Mann Whitney U Test obtained p value = 0.012. The value of p = 0.012 <α = 0.05, which means that there are differences in language categories in the control group and in the group given treatment or intervention.

Table 6. Data on the Distribution of Gross Motor Development in Toddlers

Gross Motor	Treatment Groups				Control Group			
	Pretest		Posttest		Pretest		Posttest	
	n	%	n	%	n	%	n	%
Usual	9	90,0	9	90,0	8	80,0	9	90,0
Hampered	1	10,0	1	10,0	2	20,0	1	10,0
Total	10	100	10	100	10	100	10	100
Wilcoxon Signed Rank Test	1,000				0,317			
Mann Whitney U Test	0,542							

Source: Data processed, 2025

The table above is a table of gross motor categories during the pretest and posttest in toddlers in the work area of the Bakunase Health Center in October 2024. In the treatment group, it is known that there are as many as 90.0% of toddlers who have a gross motor with the normal category and 10.0% with the inhibited category during the pretest. After intervention and post-tests, it was found that as many as 90.0% of toddlers were in the normal category and another 10.0% in the inhibited category. In the control group, it was also found that as many as 90.0% of toddlers had normal gross motor motors and 10.0% were inhibited. At the time of the posttest, the same percentage was also shown, namely as many as 90.0% had normal gross motor and the other 10.0% were in the inhibited category.

The results of the statistical test with the Wilcoxon Signed rank Test in the treatment group obtained a significance value (p) of 1,000 and in the control group a significance value of 0.317. The p-value in the treatment and control group was greater than α= 0.05. Therefore, it can be concluded that there is no difference in the category of gross motor variables in the treatment group (pretest – posttest) and in the control group (pretest – posttest). In the Mann Whitney U Test, the significance value (p) = 0.542 was obtained greater than α= 0.05, so it can be concluded that there was no difference in gross motor categories in the control group and the treatment group.

The Effect of Omega 3 Supplementation on Personal Social Development

Personal social or social behavior is an aspect of a child's growth related to the ability to be independent, socialize and interact with his environment (Yulizawati & Afrah, 2018). In this

study, there were 20 toddlers divided into two groups, namely 10 (100.0%) the treatment group and 10 (100.0%) the control group. In the treatment group before being given an intervention in the form of giving Omega 3 to toddlers, it was found that as many as 60.0% of toddlers had normal social behavior and 40.0% were categorized as inhibited and in the control group, it was found that as many as 40.0% in the normal category and 60.0% in the inhibited category. This means that stunted toddlers show symptoms of not being able to socialize well with the surrounding environment where they play, even though the percentage scale in the treatment group is still small, but in the control group shows a large percentage. In fact, the ability to socialize with the environment is very important because it is related to community life and a form of life defense.

The results of statistical testing showed that there was an effect of Omega 3 administration on the social behavior or personal social of stunted toddlers in the work area of the Bakunase Health Center in October 2024. Essential fatty acids (Omega 3 and omega 6) are part of the fatty acids that are important for the human body and cannot be made in the body, but must be obtained from food (Pijaryani, 2018). Omega 3 intake is obtained from breast milk, fish, eggs, chicken, milk and others. In line with previous research that found an increase in social communication in the intervention group of Omega 3 supplement consumption (Doaei et al., 2021) in children with autism. Other studies show that the consumption of Omega 3 and Omega 6 supplements for 3 months can improve language development in children who are at risk of autism spectrum disorder (Lachman, 2014). This study can be a representation of the results of the researcher's research, where the consumption of Omega 3 supplements can improve the personal social development of toddlers from 40.0% of toddlers from the treatment group in the inhibited category, consuming Omega 3 supplements for a month experienced an increase in personal social development. Research by (Vollet et al., 2017) indicates the consumption of fish oil supplements (*Fish Oil*) that contains a lot of Omega 3 before and during pregnancy can improve personal social and problem-solving abilities in children.

In Omega 3 itself, there are nutrient components that are important for the body such as DHA (docosahexaenoic acid), EPA (eicosapentaenoic acid), and LNA (linolenic acid). DHA and EPA are found in many fish while LNA in plants including green vegetables. Each component has a different function in the body. DHA functions as a neural wrapping network that plays a role in transmitting neural commands and delivering nerve stimuli to the brain (Moehji, 2009). Omega 3 is an essential fatty acid, a group of eicosanoid compounds because it is obtained from hormone-like 20 carbon fatty acids, namely prostaglandins, prostasiclins, thrombosans, and leukotrienes. These compounds regulate blood pressure, heart rate, immune function and nervous system stimulation, muscle contraction as well as wound healing (Reynolds & Fletcher-Janzen, 2009). The research article review study explains the benefits of DHA on cognition and behavior areas (Kuratko et al., 2013).

The Effect of Omega 3 Supplementation on Fine Motor Development

Fine motor movements are aspects related to the child's ability to observe things, perform movements that involve certain parts of the body and are performed by small muscles, but require careful coordination (Safitri, 2018). Motor development is often used as the first indicator to observe the progress of a child's growth and development, because changes in this

aspect can be easily seen, such as changes in the child's body size (Samaloisa, 2024). Fine motor development begins to have the ability to shake toes, draw two or three parts, draw people, be able to pinch objects, wave hands and so on (Hidayat, 2012).

One of the nutrients that has a role in improving children's motor skills is Omega 3. Omega-3s, especially DHA, play an important role in the formation of myelin, the protective layer of neuronal axons that facilitates the transmission of nerve impulses. Effective myeleniation will improve motor coordination and reflex response. (Nevins et al, 2021). A clinical study conducted on children with autism disorder found that omega-3 supplementation may improve stereotypical behavior and social interaction, although not all motor aspects were set as the primary evaluation parameters. (Doaei et al, 2021). However, an overall improvement in motor activity can be assumed if children are more likely to perform spontaneous and flexible movements. This is not in line with the results of the researcher's research which found that there is no effect of Omega 3 consumption on the fine motor of toddlers. Even so, in the treatment group at the time of the pretest, as many as 90.0% of toddlers with fine motor skills were in the normal category and 10.0% were in the inhibited category. After being given treatment, namely the administration of Omega 3 for consumption by toddlers for a month, it was found that 100.0% of toddlers had a normal fine motor movement system. This shows that there is an increase in fine motor in toddlers in the treatment group. Omega-3 deficiency, which is essential for neural development, has also been found to be associated with disorders in motor coordination. Omega-3 fatty acids play a role in nerve function and the formation of brain tissue. Children who are deficient in omega-3s tend to have problems with balance and coordination, which impacts their ability in activities that involve fine motor skills, such as grasping and manipulating objects (Samaloisa, 2024).

The Effect of Omega 3 Supplementation on Language Development

Giving Omega 3 to toddlers can help improve toddlers' language skills. The results of this study showed that in the treatment group, it was found that as many as 70.0% of toddlers had impaired language skills and 30.0% in the normal category. After being given omega 3 for a month, it showed a significant change where the data showed as many as 10.0% of toddlers with impaired language skills and 90.0% in the normal category. Meanwhile, in the control group, there was no change where the data showed before or at the time of the pretest it was 70.0% in the inhibited category and 30.0% in the normal category and at the posttest showed the same data, namely 70.0% of the inhibited category and 30.0% in the normal category.

Giving Omega 3 to toddlers can make a big difference in toddlers' communication skills. Research on children born prematurely and affected by ASD shows an increase in children's social communication skills (Sheppard et al., 2017). This can be interpreted that even though children cannot communicate what they want to say or ask, they can make gestures or movements that help the mother in understanding the child's intentions.

The brain plays an important role in the human body. One of the functions of the brain is to play a role in communication. The left brain plays a major role in language skills and the right brain plays a role in processing the language itself. The brain helps process what is happening in the surrounding environment and helps children understand the environment well. Through the brain, children can also respond to the environment according to the stimulus

received by the child. Therefore, the brain needs to be nourished in order to grow and develop optimally. The process of brain growth and development is very complex and goes through several stages, namely the addition of nerve cells (polyferation), the transfer of nerve cells (migration), the change of nerve cells (differentiation), the formation of nerve networks with others (synapses), and the formation of nerve sheaths (myelination). The growth of this nervous system can be said to take place very quickly during the womb and 3-4 years after birth. During the nervous system the number and size of nerve cells are mainly growing rapidly. After the baby is born, the growth of the nervous system is more directed towards the development of undeveloped nerve cells. After the child is more than 4 years old, the growth of the nervous system takes place more slowly.

The increase in toddlers' communication ability is due to omega 3 which contains DHA. One of the roles of DHA is for the growth and function of nerves related to cognitive and social behavior in toddlers (Nadeak, 2013). DHA has a significant effect on hippocampal nerve development and synaptic function (Cao et al., 2009). This hippocampus is related to the child's memory. Long Chain Polyunsaturated fatty acids especially docosahexaenoic acid (DHA) are neurobiological agents that affect neuronal membrane structure, synaptogenesis, and myelination (Georgieff, 2007). Thus, DHA is an essential component for myelination. DHA functions as a nerve wrapping network, this substance is able to launch commands to the nerves and deliver nerve stimuli to the brain. In addition to DHA, Omega 3 also contains EPA which also includes linolenic acid which is usually contained in breast milk or breast milk which functions for the formation of spingomielin. EPA is useful for the formation of cell membranes. Spingomielin is formed by EPA and DHA is used to form the membrane of brain cells and myelin of nerve cells.

Brain development is a prone thing that needs to be paid attention to by mothers during pregnancy and after pregnancy. Therefore, there is a need for education for mothers in paying attention to the growth and development of children both in the womb and when the child is born until the age of 4 years. The importance of a good understanding of nutrition and nutritional fulfillment in pregnant women and toddlers not only prevents maternal and child deaths but can also prevent children from stunting. Stunted children are not only characterized by a child's short height and not in accordance with the average height of children of his age but also characterized by a decline in children's cognition. Children's socializing skills are low and affect children's language skills. As a mother, attention to children's food is not only seen from the quantity, but also from the quality of their nutritional fulfillment and the mother's understanding in processing food to maintain the nutritional value of a food. The non-fulfillment of children's nutritional sources is a consideration by looking for other alternatives so that children continue to get essential nutrients that are not obtained from food, namely by consuming omega 3 supplements. In this study and the series of explanations above, it provides an understanding of the importance of fulfilling this omega 3 essential nutrient for children's language skills and its relation to children's cognition.

The Effect of Omega 3 Intake on Gross Motor Development

Supartini's theory (2015) says that an important period in children's gross motor development is the toddler period, because this period of basic development will affect and

determine the child's gross motor skills later. At the age of 12-36 months, the development of body movement skills, creativity, social awareness, and emotions is very fast and is the foundation of the next gross motor development. For this reason, to support the development of children's body movements, it is necessary to have Exclusive Breastfeeding for the First 1000 Days of Life (1000 HPK). Menuru (Soejhiningsih, 2013), many breast milk compositions that are very beneficial for gross motor development include DHA and AA which are long-bonded saturated fats that form optimal brain cells for gross motor development. Breast milk is also a complex fluid that contains all the nutrients needed for gross motor development. Its easily absorbed nature by the baby's body makes it meet the requirements for the baby's gross motor and should be given exclusively. But unfortunately, the fulfillment of Exclusive Breastfeeding is sometimes not fulfilled, causing children to have to get extra nutrition from the outside. One of them is to consume omega 3 for the growth and development of toddlers. Consuming Omega 3 supplements is indeed no better than consuming breast milk itself exclusively. Omega 3 is just one of the essential nutrients contained in breast milk that toddlers really need for growth and development.

Omega 3 contains EPA and DHA which also include linolenic acid which is usually contained in breast milk or breast milk which functions for the formation of spingomielin. EPA is useful for the formation of cell membranes. Spingomielin is formed by EPA and DHA is used to form brain cell membranes and myelon nerve cells. If EPA and DHA in the brain are sufficient, the signals conveyed from the brain will be forwarded to the axons and myelin will speed up the flow of signals conveyed by the brain. The message conveyed by the brain will be forwarded by the neurontransmitter according to the brain's commands so that the resulting body's motor development becomes fast and well developed (Diana, 2013). Conversely, if the amount of EPA and DHA is in an insufficient amount in the brain, the cell membrane dies so that the transmission of signals forwarded to the axon is not smooth, as a result of which neurotransmitters do not work and the body's motor movements slow down and motor development slows down. Neurotransmitters function as messengers from nerve cells (Diana, 2013).

The results of this study show that there is no effect of omega 3 consumption with gross motor movements in toddlers, which can also be seen through the percentage of data attached, where at the time of the pretest it was found that as many as 10.0% of toddlers with gross motor impairment in the inhibited category and 90.0% in the normal category and after the posttest, the percentage did not change, namely 10.0% in the inhibited category and 90.0% in the normal category. This means that there is no change after the consumption of omega 3 for a month. Researchers argue that the absence of these changes is due to insufficient consumption of omega 3 for a long time with inappropriate doses. So, it does not show a significant effect. Even though the respondents of the treatment group experienced an increase in average weight. Weight gain indicates that the nutritional status of toddlers is starting to show improvement. Findings (Astyorini, 2014) mentioned the relationship between nutritional status and gross motor in Grade 1 children at SDN Krembangan Utara I/56 Surabaya.

CONCLUSION

The findings of this study indicate that administering omega-3 supplements for one month positively impacts children's personal, social (independence), and language development, while no significant changes were observed in fine or gross motor development. This lack of effect on motor skills may be attributed to the short duration of supplementation or an inappropriate dosage of omega-3. Therefore, future research should collaborate with the pharmaceutical field to determine and provide the optimal dosage of omega-3 supplements for stunted children, ensuring more valid results. Additionally, it is recommended that the Health Office and related agencies consider incorporating omega-3 supplementation and promote the use of local, omega-3-rich ingredients to enhance nutritional intake as part of broader child nutrition programs, especially in regions with high stunting rates or among children at risk of developmental delays.

REFERENCES

Astyorini, Y. D. (2014). Hubungan Status Gizi Terhadap Kemampuan Motorik Kasar Anak Sekolah Dasar Kelas 1 di SDN Krembangan Utara I/56 Surabaya. *Jurnal Kesehatan Olahraga*, *2*(2), 33–39.

Cao, D., Kevala, K., Kim, J., Moon, H. S., Jun, S. B., Lovinger, D., & Kim, H. Y. (2009). Docosahexaenoic acid promotes hippocampal neuronal development and synaptic function. *Journal of Neurochemistry*, *111*(2), 510–521. https://doi.org/10.1111/j.1471-4159.2009.06335.x

Diana, F. M. (2013). Omega 3 dan Kecerdasan Anak. *Jurnal Ksehatan Masyarakat Andalas*, *7*(2), 82–88.

Doaei, S., Bourbour, F., Teymoori, Z., Jafari, F., Kalantari, N., Torki, S. A., Ashoori, N., Gorgani, S. N., & Gholamalizadeh, M. (2021). The effect of omega-3 fatty acids supplementation on social and behavioral disorders of children with autism: A randomized clinical trial. *Pediatric Endocrinology, Diabetes and Metabolism*, *27*(1), 12–18. https://doi.org/10.5114/pedm.2020.101806

Georgieff, M. K. (2007). Nutrition and the developing brain: Nutrient priorities and measurement. *American Journal of Clinical Nutrition*, *85*(2), 614S-620S. https://doi.org/10.1093/ajcn/85.2.614s

Kuratko, C. N., Barrett, E. C., Nelson, E. B., & Salem, N. (2013). The relationship of docosahexaenoic acid (DHA) with learning and behavior in healthy children: A review. *Nutrients*, *5*(7), 2777–2810. https://doi.org/10.3390/nu5072777

Lachman, A. (2014). Developments in diagnosis and treatment upadate: Skizophrenia/first episode psychosis in children and adolsscents. *Journal of Child Adolescents Mental Health*, *26*(2), 109–124. https://doi.org/10.2989/17280583.2014.924416

Moehji. (2009). *Ilmu Gizi "Pengetahuan Dasar ilmu Gizi"*. PT. Bharata Niaga Media.

Nadeak, B. (2013). Peran Asam Lemak Omega 3 Terhadap. *Prosiding Seminar Ilmiah Dosen UKI*, 403–417.

Pijaryani, I. (2018). Hubungan Asupan Protein, Omega 3, Omega 6 Dan Zink Terhadap Tumbuh Kembang Balita. *Jurnal Media Kesehatan*, *7*(2), 150–156. https://doi.org/10.33088/jmk.v7i2.239

Reynolds, C. R., & Fletcher-Janzen, E. (2009). Handbook of Clinical Child Neuropsychology. In *Springer* (Third Edit, Vol. 7, Issue 2). Springer. https://doi.org/10.1007/978-0-387-78867-8

Safitri, D. (2018). Skripsi Hubungan Pemberian ASI Ekslusif dengan Perkembangan Motorik Kasar dan Motorik Halus Bayi Usia 6-12 Bulan di Puskesmas Sewon II Kabupaten Bantul Tahun 2017. In *(Doctoral dissertation, Poltekkes Kemenkes Yogyakarta)*.

Samaloisa, M. S. (2024). Keterlambatan Perkembangan Motorik Anak Akibat Kurangnya Asupan Gizi. *Jurnal Lingkar Pembelajaran Inovatif*, *5*(November), 105–117.

Sheppard, K. W., Boone, K. M., Gracious, B., Klebanoff, M. A., Rogers, L. K., Rausch, J., Bartlett, C., Coury, D. L., & Keim, S. A. (2017). Effect of Omega-3 and -6 Supplementation on Language in Preterm Toddlers Exhibiting Autism Spectrum Disorder Symptoms. *Journal of Autism and Developmental Disorders*, *47*(11), 3358–3369. https://doi.org/10.1007/s10803-017-3249-3

Soejhiningsih. (2013). *ASI*. EGC.

Vollet, K., Ghassabian, A., Sundaram, R., Chahal, N., & Yeung, E. H. (2017). Prenatal fish oil supplementation and early childhood development in the Upstate KIDS Study. *Journal of Developmental Origins of Health and Disease*, *8*(4), 465–473. https://doi.org/10.1017/S2040174417000253

Yulizawati, & Afrah, R. (2018). Pertumbuhan dan Perkembangan Bayi. In *Universitas Muhammadiyah Semarang* (Vol. 51, Issue 1).