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The Impact of Providing Psychological Stimulus on Improvement Cognitive Ability of Stunted Children Under 36 Months of Age

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ABSTRACT

The 2022 study found that 21.6% stunting. Six million short toddlers risk losing 10 - 15 points of intelligence, requiring 300-400 trillion to recover. Vocabulary scores of short children are 16.1% lower and 48.8%. The balance of growth and development and the first two years have 20 points higher intelligence. Brain volume reaches 70-80% at the beginning of life; the brain of a three-month-old baby forms a double adult connection of about 1000 trillion through psychological stimulation, observation, hearing, sensing, and movement. The study aimed to determine the benefits of providing psychological stimulation of knowledge. Using a quasi-experimental design, the population of children aged 24-36 with a sample of 24 children was determined by census. The inclusion criteria were children under three years of age with no postural abnormalities. Exclusion criteria were suffering from mental disorders.
There was an increase (p=0.000) of 3.20833 ±2.84344 cognitive points. In the first week, the average cognitive score of 10.8 points increased to 14.0 points. In week four, there was a difference of 1.02857 ± 0.93348 points (p=0.057) in gender-based knowledge. When differentiated by age group, there was a difference of 0.7111 ± 0.96465 points (p=0.107). In the first week, the children felt afraid and reluctant and did not dare to show their abilities, and the provision of psychological stimulation changed. The child is easy to interact with and does not hesitate to say names or make movements. There is an increase in cognitive ability of 3.20833 ± 2.84344 points. It is recommended that psychological stimulation is given to increase knowledge.

Keywords: Stimulation; knowledge; short; movement; developmental

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INTRODUCTION

The Head of State of the Republic of Indonesia hopes that in 2085, Indonesia's human intelligence will excel globally. In the health sector, there is an increase in life expectancy, an increase in the quality of life, and a better health system. [1] The 2022 survey results revealed that children under five were underweight 7.7%, underweight 17.1%, overweight 3.5%, and short 21.6%.[2] Meanwhile, the problem of short children under five in Indonesia is ranked fourth in the world and second in Southeast Asia. [3,4] The problem of short toddlers is commensurate, with 6 million Indonesian children at risk of losing their intelligence or Intelligence Quotient (IQ) 10 to 15. To restore nutrition for short children, the country is predicted to need 300-400 trillion. A study by Tassew Woldehanna et al. l in 2018 in Ethiopia explained that short children scored 16.1% lower in vocabulary tests and 48.8% lower in quantitative assessment tests.[5,6] The study concluded that the first thousand days of life (1000 HPK) is the right time to restore growth and development. This period is known as the golden age, the stage of optimal growth and development. [7] The study results of feeding high animal protein diets to children successfully increased or added 0.42 to 0.53 cm. [8,9] Healthy individuals must have a balance between physical and intelligence, or there is a balance of growth and development.

The golden period of children under two years old is the right time to stimulate or stimulate brain activity, the first three years of life receive stimulation. In the first two years of life, children have an IQ 20 points higher than children with less sensitivity, which determines their brain development and future life. Brain growth is very rapid, reaching 70-80% at the beginning of a child's life at three months. The brain has twice as many links as an adult, about 1,000 trillion, through 10 functions of vision, hearing, sensing, and movement.[10] The growth/division of brain nerve cells requires optimal nutrient intake, especially from Birth to 3 years old. As brain nerve cells proliferate at birth, stimulation is vital in reducing degraded brain nerve cells.[11] Essential nutrients needed in the preparation of the central nervous system include Vitamin E, Iodine, iron, zinc, selenium, essential amino acids, choline, Omega-3 fatty acids, DHA, arachidonic acid, Vitamin B complex, folic acid, Vitamin C, and antioxidants. [12] From Birth to 3 years of age, children should be given various stimuli or more complex ones to stimulate brain cells and children's intelligence.[13] The growth and development of children in the golden period are reversible and can still be improved, it is necessary to provide stimulation to short children aged less than 36 months to stimulate cognitive development. [14,15] Individual intellectual abilities develop from an early age and last throughout their lives. Along with providing stimulation, increasing knowledge and experience and fostering appropriate surroundings are expected to help develop and improve individual intellectual abilities.

Efforts are made to determine the development of individual intelligence by measuring knowledge. Knowledge is measured by giving children a set of stimuli within a certain period. Providing stimuli such as word enrichment, numbers, numerical recognition skills, movement skills (writing and coloring), arranging puzzles, blocks, origami, and others is expected to increase children's knowledge. The study of short children will see the difference before and after being given stimulation so that the difference in knowledge abilities can be seen, and an evaluation and plan for the continuation of

providing stimulation by parents/caregivers will be made. This description is the basis for researching the impact of stimulus on improving the cognitive abilities of stunted children aged under 36 months in the stunting locus area of Jagakarsa District, South Jakarta City

METHOD

The study was conducted from May to October 2023 using a quasi-experimental design. 16 The population of this study consisted of children aged 24-36 months, with a sample of 24 children in the stunting locus area of South Jakarta City. The census determined the research subjects. [17] Inclusion criteria in the study were children under three years of age, in good health, and without postural and mental abnormalities. Exclusion criteria are subjects who get stimuli other than during the study. This study has received a recommendation from the Poltekkes Kemenkes Jakarta II Ethics Unit with number LB.02.01/I/KE/31/612/2023. [18] The independent variable was stimulus and the dependent variable was cognitive ability. The variables collected included parent characteristics, child characteristics, nutritional status, and nutrient intake. The developmental instrument used is a checklist model observation sheet containing 16 aspects of children's cognitive development, which includes the ability to introduce themselves, pronunciation skills, motor skills of as many as five aspects, mental abilities of as many as six aspects, and social-emotional abilities as many as three aspects. In addition to quantitative development, the quality of qualitative development was also measured.[19,20] The subject's mother or guardian had filled out an informed consent form before collecting research data. They were acting as enumerators and trained graduate students of the Nutrition Department. Body weight was measured using a scale, and height was measured using a stadiometer and microtonal with an accuracy of 0.1 cm and an electronic scale with an accuracy of 0.1 kg. [21] Data were processed and analyzed using computerized statistical software. A paired sample t-test was used to determine the difference in children's cognition before and after being given a stimulus. [22]

RESULTS

The child's age was 30.75 ± 3.639 months, birth weight was 2813.333 ± 545.5724 g, and birth length was 47.042 ± 2.6618 cm. Cesarean birth status was 16.7%, and no early breastfeeding initiation (IMD) was 29.2%. The father's age was 37.04 ± 6.417 years, the father's education level was college by 4.2%, and working as self-employed by 50.0%. Mother's age was 33.62 ± 5.717 years, mother's education level was college by 12.5% and worked as a housewife by 91.6%.

There is an increase in the quantity of development in each provision of stimuli, including children's cognitive development, which includes the ability to introduce themselves, pronunciation skills, motor skills, cognitive abilities, and social-emotional abilities carried out every week for 4 weeks from week 1 an average of 10.8 points increased to an average of 14.0 points in week four there was a significant increase (p=0.000) of 3.20833 ±2.84344 points. At the beginning of the stimulus, the development of male stunted children was slightly higher than that of short children and always increased for three consecutive weeks from 11 points and sloped in week four at 14 points.

Table 1. Subject Characteristics

Variable	Mean ± SD / %
Age (Month)	30,75 ±3,639
Birth Weight (g)	2813,333 ± 545,5724
Birth Length (cm)	47,042 ± 2,6618
H/A Zscore	-2,7217 ± 0,50238
W/A Zscore	-2,488 ± 0,5848
Gender	
Male	41,7
Female	58,3
Birth Status	
Normal	83,3
Premature/Cesarean	16,7
Early initiation of breastfeeding is practiced.	
Yes	70,8
No	29,2
Father	
Age (Year)	37,04 ± 6,417
Education	
Elementary School	4,2
Junior High School	20,8
High School	70,8
University	4,2
Occupation	
PNS/TNI/POLRI	4,2
Laborer/Private	20,8
Self-employed	50,0
Not Employed	4,2
Other	20,8
Mother	
Age (Year)	33,62 ± 5,717
Education	
Elementary School	12,5
Junior High School	25,0
High School	50,0
University	12,5
Occupation	
Laborer/Private	4,2
Self-employed	4,2
Housewife	91,6

Meanwhile, girls always increased their development from the initial week by 10 points to the fourth week at 15 points. Based on the age group (24-30 months) and 30-36 months, it shows that children in the 30-36 months age group have a higher developmental quantity; in the first week by 12 points, it continued to increase until week three and week four settled at 14 points. For short children in the 24-30 month age group, the increase from week one was 8 points to week four was 14 points. It can be seen that the increase in developmental quantity is more rapid in stunted children aged less than 30 months.

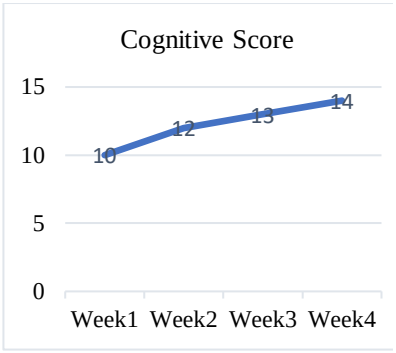

Figure 1.
Increasing Children's Cognitive

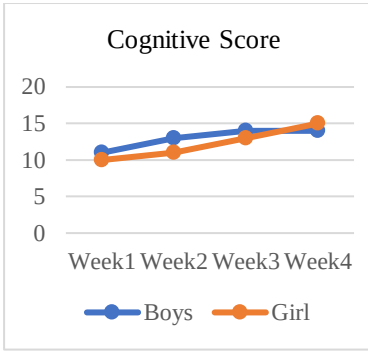

Figure 2.
Children's cognition according to gender

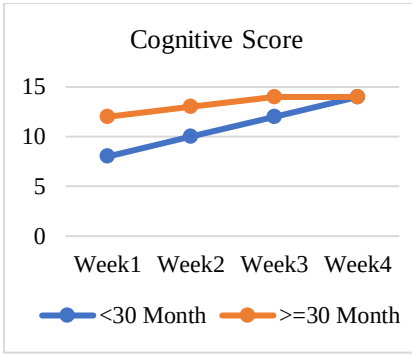

Figure 3.
Children's Cognitive by age group

Table 2: Percentage of low birth weight and short Birth with current shortness

At Birth (%)	Currently (%)		sig
	Severely Stunting	Stunting	
Birth Weight			
Low <2500.0 g)	57,1	42,9	0,208
Normal (>=2500.0 g)	29,4	70,6	
Birth Length			
Stunting (<48.0 cm)	41,7	58,3	0,500
Normal (>=48.0 cm)	33,3	66,7	

The association between birth weight and current condition showed that children born with low birth weight (<2500 g) were currently very short by 57.1% and currently short by 42.9%. There was no significant difference (p=0.208) in the percentage of short children based on birth weight status, while the association between length at Birth and current condition showed that children who were short at Birth (<48 cm) were currently very short by 41.7% and currently short by 58.3%.

Table 3. Cognitive quantity

	Mean ±SD Ability quantity	Mean ±SD Ability quantity difference	p
Stimulation			
Before Intervention	10,7917 ± 3,9999	3,20833 ±2,84344	0,000
After Intervention	14,0000 ±2,2651		
Gender			
Male	14,6000 ± 1,2649	1,02857 ± 0,93348	0,057
Female	13,5700 ± 2,7376		
Age Group			
< 30 Months	13,5555 ± 1,3333	0,7111 ± 0,96465	0.107
≥ 30 Months	14,2667 ± 2,6856		

There was a significant increase (p=0.000) in knowledge by 3.20833 ± 2.84344 points after psychosocial support. If differentiated by gender, there was no difference (p=0.0570) of 1.02857 ± 0.93348 points. Meanwhile, if differentiated by age group, there is no difference (p=0.107) by 0.7111 ± 0.96465 points.

Table 4. Macronutrient Intake

	Pyschosocial Stimulation		sig
	Mean ±SD	SD Difference	
Energy Intake (Cal)			
Before Intervention	1247,9206±329,2675	139,3630±457,1493	0,149
After Intervention	1108,5575±485,3218		
Protein Intake (g)			
Before Intervention	33,5487±5,8932	2,9175±9,5512	0,148
After Intervention	30,6312±7,2617		
Carbohydrate Intake (g)			
Before Intervention	164,1067±1067	16,9431±53,1849	0,132
After Intervention	147,1636±1636		
Fat Intake (g)			
Before Intervention	33,5487±5,8932	2,9175±22,1539	0,148
After Intervention	30,6312±7,2617		

After psychosocial stimulation, there was no significant difference in energy consumption (p=0.1493) of 139.3630±457.1493 Cal. There was no significant difference in the consumption of building substances or protein (p=0.148) amounting to 2.9175 ± 9.5512g. There was no significant difference in starch/carbohydrate intake (p=0.132) of 16.9431±53.1849g. There was no significant difference in fat intake (p=0.148) of 2.9175±22.1539g.

Table 5. Children's cognitive combination after psychological stimulus

Cognitive ability	%
▪ Mingle with friends, direct to cooperate, invoice lenders increase, smart, enthusiastic, cheerful	20.8
▪ Can do together with enumerators, smart, can communicate, speak even if small/slow, willing to play with enumerators	4.2
▪ Speaks a little clearer, gain new vocabulary, smart but ignorant, better communication, dares to talk	4.2
▪ Blends in with friends, cooperative, active, increasing voice volume, smart but still thinking a little, excited	4.2
▪ Can be invited to communicate, play alone without his mother, increase voice volume, smart but moody, can be separated from his mother's lap	8.3
▪ Tantrums began to subside, can be invited to communicate, walk slowly, dare to speak, can be separated from his mother's lap	4.2
▪ Quick to respond, dare to speak, more active, increasing voice volume, smart, excited, cheerful	4.2
▪ Can concentrate well, moody if doing stimulus, cooperation, dare to play, smart but moody	4.2
▪ Mingle with friends, dare to speak, cooperate, increase voice volume, smart, more energetic	16.7
▪ Can follow simple commands, show desire, or be invited to non-verbal communication, often smile, increase more focus	4.2
▪ Good concentration, cooperation, daring to play, voice volume increases, communication at the end of the word only, smarter, more energetic	4.2
▪ Good concentration, a good mood, cooperation, daring to play, smart	4.2
▪ Mingle with friends, communication interspersed with English, cooperation, smart, enthusiasm	8.3
▪ Tremors began to subside, dare to speak, do not ask to go home quickly, can be invited to communicate, smart	8.3
Total	100,0

Qualitatively, there is an increase in developmental vocabulary, such as being brave, having a louder voice, being excited, mood, being more focused, concentration, easy and brave interaction, and so on. 20.8% of children began to easily mingle with friends, dare to speak, cooperate, increase voice volume, smart, enthusiastic, and cheerful. Furthermore, 16.7% of children easily mingle with friends, dare to speak, cooperate, increase voice volume, and are smart and enthusiastic. More details of the combination of several types of cognitive children can be seen in Table 5.

DISCUSSION

During pregnancy, maternal chronic energy deficiency (CED), complications or stress can interfere with fetal growth and development. This process affects the subsequent growth and development of children under 5 years of age, when the fetus is born with a length below 50.0 cm, it can affect the height of the child during childhood and after adulthood. The correlation between percentile birth status and short stature showed no significant difference (p=0.208). This contradicts a study in Minahasa Regency (Umbulrejo Village, Sonder Health Center) that showed a significant correlation between low birth weight (LBW) and short stature in children aged 2-5 years and a study in Sungai Karias Hulu Sungai Utara that showed a significant correlation between LBW and stunting in children under two years of age. Children born with LBW have a 5.87 times chance of being short compared to children born with normal weight. [23–25] The correlation between birth length and shortness showed no significant association, in line with the study in ten villages in Pidie which showed no correlation between birth length and shortness in children under five. This situation contradicts the results of a study that showed a correlation between birth length and shortness in children under five years of age 0-59 months that birth length is correlated with the incidence of shortness. The intervention of psychosocial stimulation of cognitive development consists of the ability to introduce oneself, pronunciation skills, movement skills, knowledge skills, and social-emotional skills. After psychosocial stimulation showed an increase of 3.20833 ± 2.84344 points (p = 0.000) of children's knowledge. These results are in line with research that found a real increase in movement ability and knowledge of children aged 4-5 years after being given the educational game “puzzle puzzle" in children aged 4-5 years. This situation is also following the study on children with autism handling cognitive occupation (remembering pictures) of school age that there is a difference. [26,27] According to Rischa Devi Hayuningtyas, et al (2019) factors that can affect the development of motor movements include the influence of nutritional consumption, stimulation, physical readiness, gender, and culture. Providing stimuli such as inviting children to play continuously such as crawling, running, and others to improve children's skills. Physical readiness means the readiness of the child itself both from nerves and physical maturity. If the child has been trained but has not been able to walk, it may be due to physical readiness factors and there is an influence of providing psychosocial stimuli on the development of gross movement.[28–31]

From the results of providing psychological stimuli which include general abilities, motor skills, cognitive abilities, and social-emotional abilities, there are significant changes experienced by

children who suffer from stunting. In the first week of providing stimulus, it was seen that children were still afraid, reluctant, and did not dare to show their abilities, but as more stimulus was given to them, changes were seen. Children become easier to interact with others, including with new people, children also do not hesitate to mention the names of people around them. The child can also do the motor movements taught by the observers, although, at the beginning of the meeting, this was still difficult to do. The child can introduce himself/herself, express his/her wishes, mention the names of animals, recognize numbers and colors, and classify objects according to the specified categories (based on colour, shape, size, etc.). The child is also able to name his/her body members and explain their benefits with simple expressions. The psychological stimulation given to these stunted children helps improve their abilities. Based on four meetings, there are quite diverse changes, so by providing more frequent stimuli it is hoped that it will improve the abilities of children who are stunted. In the development of language skills, for example in mentioning one's name, the name of an object, and being interested in story pictures, mathematical abilities such as classifying objects, classifying geometric shapes, distinguishing large and small, mentioning numbers 1-10, and classifying colors.[32] The result of providing stimulus is an important part of forming abilities, thinking, and acting consistently.[33]

Boys' thinking is higher than girls' thinking, as an argument boys emphasize fairness, while girls emphasize relationships, responsibility, and concern for others. Morality in females focuses on others compared to moral thinking in males. Girls are more likely than boys to experience social anxiety. When differentiating the gender of children (boys and girls), there is a difference of 1.02857 ± 0.93348 points (p=0.057) in children's cognitive abilities. This is in line with research on the ability to adjust colors using finger painting rides for preschool children on gender variables which states that there is a real correlation. The results of another study stated that there was no significant difference in the mean scores of male and female students. [33-35] Furthermore, if age groups (less than 24-30 months and 31-36 months) are distinguished, then there is a difference of 0.7111 ± 0.96465 points (p=0.107) in children's knowledge. The results of this study contradict the results of a study which states that there is a significant correlation of children's knowledge based on age group. [36] Furthermore, nutrient consumption showed no significant difference in the amount of nutrient consumption after education. This contradicts the study that stated that there was a difference in iron consumption after the provision of nutrition education between groups and the study that stated that there was an effect of nutrition education on iron consumption in adolescents.[37]

CONCLUSION AND RECOMMENDATIONS

There is a significant increase in general ability, motor ability, cognitive ability, and socio-emotional ability of cognitive ability. Children become easier to interact with others, children also do not hesitate to say their names and the names of people around them. Children can introduce themselves, express their wishes, mention the names of animals, recognize numbers and colors, and classify objects according to the specified category. The child is also able to name his/her body members and explain their functions with simple sentences. It is recommended that more frequent stimulus is expected to

improve the cognitive abilities of stunted children.

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