

# Effect of Stunting Handling and Physical Activity on Motor Ability and Concentration of School Children

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**Abstract** Improving the quality of Indonesia's human resources is a national development goal. The achievement of quality resources is supported by improved nutrition starting at an early age. The impact of malnutrition, including stunting at an early age, causes impaired motor development of children and ultimately reduces the quality of adult human resources. This study aims to reveal the causes of stunting and physical activity at an early age and the impact of stunting on motor development. The long-term goal of this research is to find ways or methods to prevent stunting and minimize the long-term effects of stunting and physical activity and their effects on children's motor skills and concentration. The design of this research is quantitative research with cross sectional approach. The study was conducted in Padang Pariaman Regency, West Sumatra Province, Indonesia. The research subjects were school children and their families. The variables to be studied are stunting and motoric status of children. The data were analyzed using a different t test. The results of statistical tests with t-test stated that there were significant differences in students' motor skills before and after breakfast and physical activity. There is an effect of breakfast and the treatment of the traditional game of Sembalakon on the motor skills of students as indicated by t count (3,36) > t table (1,67) for the standing long jump test, t count (7,4) > t table (1, 67) for softball throws, t count (1,74) > t table (1,67) for zigzag run, t count (1,70) > t table (1,67) for put medicine ball, t count (4.42) > t table (1. 67) for a 50 m run.

**Keywords** Physical Activity, Stunting, Motor Ability, Concentration

## 1. Introduction

The 2013 Basic Health Research noted that the national stunting prevalence reached 37.2 percent, an increase from 2010 (35.6%) and 2007 (36.8%) [1]. According to the 2019 Indonesian Toddler Nutritional Status Survey conducted by the Ministry of Health of the Republic of Indonesia, one in four Indonesian children under the age of five suffers from stunting [2]. This means that around 8 million Indonesian children experience less than optimal growth, or one in three Indonesian children. In Indonesia, the prevalence of stunting is much higher compared to neighboring countries such as Malaysia (8.4%) [3], Thailand (4.1 to 8.4%) [4] and Vietnam (14 to 15%) [5]. According to 2007 Basic Health Research data, the stunting rate for children under five in Padang Pariaman Regency is 12.9% very short toddlers and 22.1% short toddlers [6]. It is a risk factor for low cognitive abilities, impaired motor development and imbalance in body functions and even an increase in mortality due to stunting [7]. Stunting can be caused by poverty at the community and household levels, thereby reducing access to healthy and nutritious food. Stunting is also directly caused by the interaction between nutritional deficiencies in food both in terms of quantity and quality and the presence of infectious

diseases such as diarrhea, thereby reducing access to healthy and nutritious food. Stunting is also directly caused by the interaction between nutritional deficiencies in food both in terms of quantity and quality and the presence of infectious diseases such as diarrhea, thereby reducing access to healthy and nutritious food.

Another factor that causes stunting in children is that it begins with inadequate breastfeeding, inadequate quality and quantity of complementary feeding during toddlers, resulting in impaired absorption of nutrients due to infection/parasites in the digestive tract [8]. Developmental disorders in early childhood, including stunting, can result in reduced cognitive and motor skills in children, in addition to having a negative impact on the development of emotions, behavior, education and other abilities [9]. One of the consequences of malnutrition is stunting. Stunting or height problems are caused by chronic malnutrition due to lack of nutritional intake for a long time since the fetus is in the womb [10]. The more dangerous result of malnutrition at an early age is increasing infant and child mortality and this is very dangerous.

Due to malnutrition at an early age, sufferers get sick easily and have a posture that is not ideal as an adult and even tends to be disturbed [11], thus affecting life expectancy [12]. In addition, GDP growth significantly reduces infant mortality but any increase in per capita income is not accompanied by a decrease in child mortality [13]. No clinical signs of malnutrition or chronic infection were seen in stunted children [14]. Actually, what are the consequences of stunting, up-to-date and more data are needed to strengthen previous findings to make them more consistent.

Physical activity (PA) affects children's motor skills, especially those related to the ability to perform automatic movements [15]. The effect of physical activity on the development of motor skills in children is proven to be good [16]. Effect of PA on motor skill development in healthy children, of which 25 (Randomized Controlled Trials) RCTs were included, 20 (80%) of which reported a significant improvement in children's motor skill performance [17]. Both physical activity and stunting simultaneously affect children's motor skills [18]. However, how much influence it has on children's motor skills needs to be supported by the latest data. Stunting has an overall negative impact on the height of girls and boys [19]. Other findings are needed to prove and strengthen the results of these studies. Thus, what are the influencing factors and children's physical activity that affects motor skills will be explained in the findings of this study.

The impact of stunting can interfere with cognitive development [20], emotion [21], behavior [22], education and productivity [23]. Children who are stunted at the age of less than 2 years have a lower IQ in pre-school and school-age children and there is a tendency to become stunted adults so that they are at risk of giving birth to children with low birth weight and stunting as well [24]. According to the World Health Organization (WHO),

children who are stunted at an early age will be at risk of becoming obese as adults, making them vulnerable to various non-communicable diseases. Prevention of stunting in children needs to be done considering the magnitude of the impact of stunting on the decline in the quality of human resources [25]. Indicators of height or body length in children under the age of 2 years can be used as predictors of the quality of good human resources, particularly related to children's cognitive performance [26]. It is important to recognize the importance of investing early in children's health and nutrition up to the age of five for children's cognitive performance [27]. The 20-week physical activity program contributes to the maintenance of academic performance among schoolchildren who are particularly in low socioeconomic communities [28]. School administrators must ensure that their school staff implement physical activity lessons, which are a component of the compulsory school curriculum. It is important to recognize the importance of investing early in children's health and nutrition up to the age of five for children's cognitive performance. The 20-week physical activity intervention contributed to the maintenance of academic performance among socioeconomically deficient schoolchildren [29]. Principals must ensure that their school staff carry out physical activity lessons, as well as supervision on nutrition which is part of the school curriculum [30]. Thus the educational goals will be achieved as expected. In particular, the purpose of this paper is to ensure that physical activity and stunting have a real influence on the development of movement and academic abilities of students.

## 2. Research Methodology

### 2.1. Research Design

This type of research is a cross-sectional quantitative approach that explores cross-sectional information [31]. The stages that will be passed are the selection of research samples that will be used as respondents, elementary school student and their families. In the first year, measurements of nutritional factors, socio-cultural factors, economic factors and the impact of stunting on the growth and development of school-age children were carried out. In the second year, the development of game models and the development of breakfast for stunting children were carried out. The growth of children's motor skills is measured by barrow motor skills (Standing Broad Jump, Throwing Softball, Zig Zag Running, and Throwing Medicine Ball)

### 2.2. Sample Collection

The location chosen as the research location is Padang Pariaman Regency. The selection of the study area was

based on the prevalence of stunting in children [32]. The sampling technique was carried out in groups and in the selected villages the sample was selected by random sampling with a sample of 70 people. The sample is children who have good or normal nutritional status and nutritional status in the stunting category who are netted through examination of children's height and weight based on age. In each sub-district, one village was chosen at random to be used as the research location, then one area was chosen at random and the sample was determined with the following criteria: 7-12 years old, family willing to be the study respondents, the child has no physical abnormalities and is not sick. After the research subjects were taken, interviews and research questionnaires were filled out. Interviews and filling out questionnaires include sample data and family characteristics, recall of children's consumption 1x24 hours. This research involves humans therefore the researcher has taken care of the ethics letter with No.02.01/KEPK-UNP/II/2021.

**2.3. Statistical Test**

The data analysis in this study was carried out descriptively and inferentially using the Statistical Package for the Social Science (SPSS) Statistics 23 [33,34]. The inferential test was carried out using multiple regression and path analysis to determine the factors that influence the incidence of stunting. To determine whether there is a difference between the stunting and non-stunted groups, data analysis was carried out using the t-test [35].

**3. Finding**

**3.1. Motor Ability**

Students' motor skills are the development of elements of maturity and body movement control, motor skills and motor control. The t-test to determine whether there is an effect of giving breakfast and traditional game treatment on the students' standing long jump:

Based on the t distribution table with degrees of freedom (dk)  $n-1 = 60-1 = 59$  with a significance level of 0.05, the data obtained are as follows:

$$t_{(1-1/2\alpha)(9)} = 1.67$$

$$t_{table} = 1.67$$

$$t_{count} = 6.21 > t_{table} = 1.67$$

**Table 1.** Summary of Results (t-test) Motor Ability

Dk= (n-1)	Tcount	T Table $\alpha=0.05$	Conclusion
60-1 = 59	3.36	1.67	Significant

Information:

$t_{count}$  = coefficient of difference of arithmetic mean test

$t_{table}$  = average difference test coefficient table

So,  $H_0$  is rejected while  $H_a$  is accepted. Conclusion: There is an effect of giving breakfast and treatment of traditional PA games on standing wide jump.

T-test to determine whether there is an effect of giving breakfast and traditional game PA treatment on students' softball throws:

Based on the t distribution table with degrees of freedom (dk)  $n-1 = 60-1 = 59$  with a significant level of 0.05, the data obtained are as follows:

$$t_{(1-1/2\alpha)(9)} = 1.67$$

$$t_{table} = 1.67$$

$$t_{count} = 7.4 > t_{table} = 1.67$$

**Table 2.** Summary of results (t test) softball throw

Dk= (n-1)	Tcount	T Table $\alpha=0.05$	Conclusion
60-1 = 59	7.4	1.67	Significant

Information:

$t_{count}$  = coefficient of difference of arithmetic mean test

$T_{table}$  = average difference test coefficient table

So,  $H_0$  is rejected while  $H_a$  is accepted. Conclusion: There was an effect of giving breakfast and traditional game treatment on softball throwing.

T-test to determine whether there is an effect of giving breakfast and traditional game PA treatment on students' zig zag running:

Based on the t distribution table with degrees of freedom (dk)  $n-1 = 60-1 = 59$  with a significant level of 0.05, the data obtained are as follows:

$$t_{(1-1/2\alpha)(9)} = 1.67$$

$$t_{table} = 1.67$$

$$t_{count} = 1.74 > t_{table} = 1.67$$

**Table 3.** Summary of results (t test) zig zag run

Dk= (n-1)	T count	T table $\alpha=0.05$	Conclusion
60-1 = 59	1.74	1.67	Significant

Information:

$t_{count}$  = coefficient of difference of arithmetic mean test

$t_{table}$  = average difference test coefficient table

So,  $H_0$  is rejected while  $H_a$  is accepted. Conclusion there was an effect of giving breakfast and traditional game PA treatment on zig zag running.

The t-test was to determine whether there was an effect of giving breakfast and traditional game treatment to the put students' medicine ball game:

Based on the t distribution table with degrees of freedom (dk)  $n-1 = 60-1 = 59$  with a significant level of 0.05, the data obtained are as follows:

$$t_{(1-1/2\alpha)(9)} = 1.67$$

$$t_{table} = 1.67$$

$$t_{count} = 1.74 > t_{table} = 1.67$$

**Table 4.** Summary of results (t test) medicine ball put

Dk= (n-1)	T count	Ttable $\alpha=0.05$	Conclusion
60-1 = 59	1.70	1.67	Significant

Information:

$T_{count}$ = coefficient of difference of arithmetic mean test

$t_{table}$ = average difference test coefficient table

So,  $H_0$  is rejected while  $H_a$  is accepted. Conclusion: There was an effect of giving breakfast and traditional game PA treatment on medicine ball put.

The t-test was to determine whether there was an effect of giving breakfast and traditional game PA treatment to the students' 50 M run:

Based on the t distribution table with degrees of freedom (dk)  $n-1 = 60-1 = 59$  with a significant level of 0.05, the data obtained are as follows:

$$t_{(1-1/2\alpha)(9)} = 1.67$$

$$t_{table} = 1.67$$

$$t_{count} = 1.74 > t_{table} = 1.67$$

**Table 5.** Summary of results (t test) 50 m run

Dk= (n-1)	T count	T table $\alpha=0.05$	Conclusion
60-1 = 59	4.42	1.67	Significant

Information:

$t_{count}$ = coefficient of difference of arithmetic mean test

$t_{table}$  = average difference test coefficient table

So,  $H_0$  is rejected while  $H_a$  is accepted. Conclusion: There was an effect of giving breakfast and traditional game treatment to 50 M. Lari.

### 3.2. Variable of Concentration

After being given breakfast and treatment of traditional sembalakon games, a concentration test was carried out with the same test items, then the following data were obtained.

**Table 6.** Distribution of Student Concentration Test Frequency

No	Score	Category	Amount	Percentage
1	-6.00 to -2.00	Low	2	3%
2	-2.01 to 2.00	Moderate	53	80.3%
3	2.01 to 6.00	High	11	16.7%
Amount			66	100%

From table 6, it is obtained data that 2 students of SDN 26 Batang Anai are in the low concentration category (3%), 53 students of SDN 26 Batang Anai are at a concentration level in the moderate category (80.3%), 11 students of SDN 26 Batang Anai are at high concentration level (16.7%). For more details, see the figure below:



**Figure 1.** Distribution of Student Concentration Test Frequency

Furthermore, a T-test was conducted to determine whether there was an effect of giving breakfast and traditional game treatment on students' concentration as follows:

Based on the t distribution table with degrees of freedom (dk)  $n-1 = 60-1 = 59$  with a significance level of 0.05, the data obtained are as follows:

$$t(1-1/2\alpha)(9) = 1.67$$

$$t \text{ table} = 1.67$$

$$t \text{ count} = 6.21 > t \text{ table} = 1.67.$$

**Table 7.** Summary of results (t test) of children's concentration levels

Dk= (n-1)	T count	T table $\alpha=0.05$	Conclusion
60-1 = 59	6.21	1.67	Significant

Information:

$t_{\text{count}}$  = coefficient of difference of arithmetic mean test

$t_{\text{table}}$  = average difference test coefficient table

## 4. Discussion

The purpose of this study was to find ways or methods of preventing stunting and physical activity as well as minimizing the long-term impact of stunting and its effects on children's motor skills and concentration. Based on the results of the description above, it is clear that the handling of stunting in the form of providing nutritious food and accompanied by physical activity in the form of traditional games for school children is very necessary. According to the results of this study, the effect on motor skills and learning concentration of children is very visible. Findings revealed that increased physical activity had a significant beneficial effect, and studies assessed motor skills and cognitive development [36,37]. Therefore, further research is needed with a larger sample size.

School-age children are considered a critical period to build healthy behavior in the future. Thus, the problem of stunting, especially the provision of nutritious food and physical activity, becomes important for school children. High levels of physical activity supported by the consumption of nutritious foods, especially fruits and vegetables, will have a higher impact on their development [38]. A balanced diet and accompanied by moderate to heavy physical activity will affect the development of children's movements. Physical activity and balanced nutritional intake in early childhood will have an impact on better cognitive outcomes in young children, adults and the elderly [39-41].

In the development of childhood, balanced nutrition is very necessary, especially during the elementary school period. Provision of unbalanced and inadequate nutritional intake will result in child stunting resulting in inhibition of physical and psychological development and this is dangerous. The importance of nutritional intake in children for child development is unfortunately still not getting serious attention from both parents and policy makers [42].

In understanding the influence of nutrition and physical activity factors derived from food on brain development and behavior, it is important to realize that the essentiality of nutrition depends on the timing of its delivery in relation to the period of brain development that results in the ability to understand school lessons [43]. Educational interventions and knowledge sharing are important factors that should be used to raise awareness about AAS abuse prevention [44]. This means that nutritional intake and playing activities during school need to be a concern for every parent, teacher and the surrounding environment so that habituation occurs. Based on the results described above, it is important for all parents to pay attention to their child's nutritional intake so that stunting does not occur in children so that it affects motor skills and concentration. Therefore, further research is needed to support this finding.

## 5. Conclusions

From the results of the study, it can be concluded that there is an effect of breakfast and the treatment of the traditional game of Sembalakon on the learning concentration of the students of SDN 26 Batang Anai. There was an effect of breakfast and the treatment of the traditional game of Sembalakon on the motor skills of students.

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