Nutrition and Physical Fitness of Primary School Pupils of Grades 5 and in Palembang City

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Abstract: The study aimed to find out the nutritional state of physical fitness of 120 primary school pupils of grades 5, 6, and 4 (3 public primary schools and one private primary school). Anthropometric nutritional status was assessed by measuring the height and weight standards and assessment of hemoglobin levels. Physical fitness was assessed by using the ergocyle Rost method. The result of the study showed that the nutrition and physical fitness of overweight pupils had the lowest physical fitness while those with malnutrition/border had the highest physical fitness.

1 INTRODUCTION

Lately, there has been increased attention to physical fitness because it is considered essential for optimal health. Physical fitness is defined as the ability one's body fitness to perform everyday tasks with ease, without feeling excessive fatigue, and still having a reserve of energy to fill his/her spare time as well for immediate purposes (Sadoso, 2004). Child physical fitness gets great attention, in line with the greater number of young athletes who take part in international matches. It is proven that attention will increase the level of physical fitness. Humans require food as their fuel to perform daily task. Thus, it is reasonable to assume that there is a relationship between the state of nutrition and fitness (Geoff. DS, 2005). Several studies show that lack of nutrition or having poor nutrition in childhood leads to have less physical fitness in adulthood. Research on the state of nutrition and physical fitness in children is quite few, especially in developing countries. Primary school age children seem to need to get special attention, because the primary school age is a very important period in terms of education and nutrition. In terms of education, this period is the most appropriate period to instill healthy living norms applied throughout one's life. In terms of nutrition, it is time to prepare to face adolescence where there is a very rapid growth. (Adams, 1961).

This study aimed to find out the relationship between the state of nutrition and physical fitness of primary school pupils of grades 5 and 6. Physical fitness consisted of a variety of elements; however, in this study it refers to body's ability to take and use O2 for metabolism in tissues (aerobic capacity). Factors of physical activity, nutritional intake, socio-economic circumstances that may affect the nutritional status and physical fitness of the primary school children were not discussed.

2 METHODS

The sample consisted of public and private primary schools, namely the private primary school of Xaverius Maria, and Public Primary Schools Numbers 113, 117 and 123. The samples were taken from two different types of schools, to increase the likelihood of getting a variety of different variables studied. (Pratiknya, 2007). The number of samples was 120 pupils comprising 30 males and 30 females taken from the private and public primary schools with the same number of samples. They were randomly selected from the sample group that exceeded the first selection, the body height of 1.40 m, which was the minimal *body height* to be tested with adult Ergocycle.

After obtaining verification of parental consent, the samples underwent examination, measurement and record of the following:

1. *Physical examination*: This examination excluded samples that could not undergo the

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physical fitness test. The history of present or past disease was confirmed by having home visits.

2. *Anthropometric measurement*: Measurement was conducted to classify the samples according to the nutritional state in accordance with the standards of weight to height of the Department of Health (2005) as follows: 91-110% good nutrition, 81-90% malnutrition, and 110% average nutrition. Body weight was measured with a sliding scale and with microtoise. Fat thickness was measured with Harpenden calipers on triset. Obese children have fat thickness of more than 20 mm. LLA was measured with a fiberglass tape arm. The limit of malnutrition is 185 cm (Department of Health, 2005).
3. *Laboratory tests*: Hb examination was conducted by the method of sianmethemoglobin. The anemia limit is 12.5 g/dl; Hematocrit was examined with microhematokrit method, with a limit of 37% anemia. (Rost *et al*, 2004).
4. *Physical fitness tests*: These were performed by the method of Rost *et al* (2004), modified to submaximal field tests. Pupils were given a gradual load: 25 - 50-75 Matt and so on, using ergocyle Monark with mechanical brakes of 60/minute pedaling speed, controlled by a built-in speedometer. Each load lasted for 2 minutes and heart rate was measured with a stethoscope during the last 30 seconds of loading. Samples were motivated to pedal to exhaustion or until the pulse reached a minimum load of 170/minute or approximately 85% of maximal heart rate for pupils of grades 5 and 6.

   Max O2 consumption (VO2 max, ml / min) was first calculated by the formula of 12 x 350 ml + load (Watt), which was expected to break 350 ml O2 and O2 needs increased per Watt load was approximately 12 ml. (Geoff, 2005). To calculate VO2 max per unit of body weight, the above calculation was projected to 200/minute of heart rate based on the relationship between heart rate with VO2 maax. (Par, 1989), and then divided by the weight.
5. *Physical activity recording*: Recording was done using time-motion analysis. (Rost *et al*, 2004) It was conducted by the sample itself, and the data obtained were then confirmed by the testimony of any teacher at home visits. Because all samples were in school from 07.00 to 12.00, the recording was carried out outside of these times. The recording was made for 3 consecutive days, and 1 day of which was Sunday. Each day was divided into units of time of @ 15 minutes to enhance the accuracy of the recording. Activities were classified by mild, moderate and severe standards. The sample spent an average of 30 min / day of moderate activity and strenuous activity of a given category, 30-50 minutes; activity two, 50 minutes; activity three, the last classification was arbitrary and took place after a preliminary study using a small number of sample (24 children).
6. Statistical analysis: it was performed by the computer program Stat Pac (Sudjana, 2000). The calculations of average standard ANOVA and correlation-regression were used. (Asmoro A, 2005).

3 RESULTS

Tables 1 and 2 show the significant differences of nutritional status, VO2 max, and time of activity. VO2 max was found in subjects with the lowest overweight and the highest malnutrition.

Table 1: 60 Characteristics of the sample children classified according to the nutritional status of women.

Variabel	Good nutrition (n = 36)	More nutrition (n = 9)	Less Nutrition (n = 15)
Age (month)	138.0 ± 7.9	135.0 ± 7.3	137.5 ± 9.3
Weight	37.0 ± 4.3	52.1 ± 11.3	32.9 ± 3.3
Height	145.2 ± 4.7	147.3 ± 4.3	147.9 ± 4.8
% Weight/Height	103.7 ± 9.5	136.4 ± 17.4	85.1 ± 32**
Thick fat (mm)	14.9 ± 4.2	25.3 ± 4.5	11.7 ± 22**
LLA (cm)	21.7 ± 1.7	26.8 ± 2.6	19.4 ± 0.7*
Hemoglobin (g/dl)	12.9 ± 0.8	13.2 ± 1.0	12.7 ± 1.1
Hemotokrit (%)	38.7 ± 4.2	38.5 ± 2.4	37.8 ± 1.8
Heartbeat max/minute	186.0 ± 10.0	189.0 ± 11.0	184.0 ± 80
VO_2 max (ml/kg/min)			

Active Time (men)	33.7 ± 4.2 36.3 ± 15.0	25.8 ± 3.5 20.8 ± 5.0	36.9 ± 3.5* 38.9 ± 17.9#
** P < 0.0005	* P < 0.005	# P < 0.02	$ P < 0.05

Child nutrition (obesity) has a proportion of body fat which was quite large because the sample included here. The category 'obsession' (height/ weight of 120%) and not just 'overweight' (height/ weight of 110 – 120% standard) Departement of Health (2005). As we know relatively fat tissue is metabolically active than muscle tissue is. Geoff, DS found out that VO2 max is inversely proportional to the percentage of body fat.

Table 2: Characteristics of the 60 male sample children classified according to the nutritional state.

Variable	Good Nutrition (n = 36)	Excessive Nutrition (n = 9)	Poor Nutrition (n = 15)
Age (month)	142.6 ± 8.7	136.0 ± 7.0	143.0 ± 7.0
Weight	35.6 ± 4.6	47.1 ± 3.0	29.9 ± 3.0**
Height	145.5 ± 4.9	145.1 ± 3.0	145.2 ± 3.5
% Weight/Height	100.9 ± 8.0	134.1 ± 7.3	85.6 ± 2.6**
Thick fat (mm)	13.5 ± 4.9	23.1 ± 7.0	8.4 ± 1.2**
LLA (cm)	20.8 ± 1.7	26.1 ± 0.7	18.3 ± 0.7$
Hemoglobin (g/dl)	13.2 ± 1.1	13.0 ± 0.8	12.8 ± 1.2
Hemotokrit (%)	38.6 ± 2.9	38.7 ± 2.4	37.8 ± 1.8
Heartbeat max/minute	191.0 ± 10.0	186.0 ± 11.0	185.0 ± 11.0
VO_2 max (ml/kg/min)	39.4 ± 3.8	30.7 ± 3.0	47.6 ± 3.0**
Active Time (male)	55.3 ± 17.5	33.1 ± 18.3	69.6 ± 5.9**

** P < 0.0005 SP < 0,05

Samples in this group spent least time of moderate activity and weight compared to the other groups. This is clearly seen in the whole female samples of the group of Activity one, on the eve of puberty, children, especially female ones were very concerned about their appearance. They were ashamed of being engaged in activities outside their homes because they were afraid of being ridiculed.

It should be noted that in this study malnutrition was very mild or at the limit value (85% standard of weight / height). Consequently, functional impairment did not occur. LLA was supported by the data that were within normal limits, ruling out the possibility of muscle atrophy. These children did not suffer from anemia based on the average Hb value; therefore, there was no disruption in the transport of O2 and nutrients. In terms of activity, the children in the nutrition group spent moderate activity and the most weight compared to the other groups. These results were consistent with the previous studies showing that the state of malnutrition could be compensated by adequate physical activity (Husaini, 2006).

4 DISCUSSION

The implication that can be drawn from the study is that child nutrition (obesity) has a large body fat proportion. As we know, the fat tissue is metabolically relatively inactive compared to the muscle tissue. Bar-Or found out that VO_2 Max is inversely proportional to the percentage of body fat. The samples of this group spent time on activities of moderate and fewer than the other groups. As a result, they were trapped in a "vicious circle", hipoactivities → positive energy balance → obesity → low physical fitness → increases hipoaktivities (Huttunen, 1996).

Par (1989) points out that VO_2 max value is inversely proportional to the percentage of body fat, where children with malnutrition have the highest VO_2 max value. It is not appropriate to some previous researches showing that malnourished children will have a low level of physical fitness (Adams, 1961). Whereas the results of this study show that the daily physical activity level has a great influence on VO_2 max. An adequate physical activity will improve aerobic capacity as a key element of physical fitness Mc. Ardle *et al*, (2007), these results are consistent with previous studies showing that the state of malnutrition can be

compensated with adequate physical activity. Conversely, if the study of daily physical activity performed by close observation, for example, researchers lived at home or with research in the laboratory, the results obtained do not reflect the real situation. Recognized that the observation of the 'habits', such as eating habits and physical activity are very difficult to do. (Goeeow and James 2003).

5 CONCLUSION AND SUGGESTION

5.1 Conclusion

This study shows that there was a relationship between nutritional status and physical fitness. The lowest level of physical fitness was studied. It occurred in the sample nutrition and more, while the highest was child malnutrition. In this study the degree of malnutrition was very mild or minimal that did not result in functional impairment. Relatively high physical activity of the group was also a contributing factor for achieving a good level of physical fitness. The level of activity could not be classified with certainty because there was no standard for the standard.

Samples with good nutrition had a VO2 max value of the average value among the other two groups. In terms of the activity, they were among the two groups. However, it was not easy to determine how much daily physical activity affected the physical fitness compared to the nutritional state. First, there is no basic standard for measuring the level of daily physical activity. Thus it was difficult to determine whether a child included in the category of less physical activity was good or better. Second, this study was conducted in the field, making it difficult to be observed continually by the researchers.

5.2 Suggestion

It is advisable to do some research with larger sample sizes and more controlled method. The effects of physical activity on the relationship between nutritional status and physical fitness will be more clearly observed with longitudinal studies. Health education should be given to all primary school pupils, teachers, and parents in Palembang about the importance of nutrition and healthy living habits for the life of the children.

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