

The Correlation between the Concentration of Hemoglobin and Vital Lung Capacity with the Cardio-respiratory Resistance of the Students Who Participated in Basketball Extracurricular

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Abstract: This research was conducted due to the insignificant achievement of the basketball extracurricular members at SMP N 4 Banguntapan Yogyakarta. The aim of this study was to determine the correlation between the hemoglobin levels and vital capacity of the lung with the cardiorespiratory endurance of female students who joined basketball extracurricular activity at SMP N 4 Banguntapan Yogyakarta. The subject of this study included 20 female students who participated in basketball extracurricular at that school. This study is a correlational study to determine whether there was a significant correlation between the hemoglobin level and vital lung capacity with the cardiorespiratory endurance. The method used in this study was survey using test and measurement instruments of blood hemoglobin levels, lung vital capacity and multi stage fitness. The data were analyzed using product moment correlation test and multiple correlations with a significance level of 0.05 in SPSS 17.0 for Windows. The result of the study showed that there was a correlation between the hemoglobin levels and vital lung capacity with the cardiorespiratory endurance of basketball extracurricular participants at SMP N 4 Banguntapan Yogyakarta. This analysis resulted in $r_{x1y}=0,576$, $r_{x2y}=0,609$, $R_{x1x2y}=0,779$ and significance value (p) of $<0,05$.

I INTRODUCTION

A person's physical condition can be seen through the level of physical fitness. The components of physical fitness include speed, cardiorespiratory endurance, muscle strength, muscle endurance, muscle explosive power and flexibility (DPN, 2000). Someone who has high cardiorespiratory endurance is able to carry out activities effectively without experiencing significant fatigue. Meanwhile, cardiorespiration is a combination of the two systems which are the heart system and the respiratory system.

There are a number of Physical Education materials taught at schools including athletics, big ball games, small ball games, etc. Big ball games consist of several sub materials, like soccer, volleyball and basketball. The basketball game is divided into 4 quarters x 10 minutes of net time for each play. Therefore, this type of sport consumes much energy so that fatigue may possibly occur. Based on observations on basketball extracurricular

activities at SMP N 4 Banguntapan, the members showed insignificant achievement in which many students were easily tired. During the practices, they seemed breathing heavily and turned over easily. The rapid frequency of players' turn over and heavy breath are characteristics of the low vital lung capacity and low hemoglobin.

The ability of vital capacity is to store oxygen and the ability of hemoglobin is to supply oxygen for muscle work for a long period of time, especially when exercising.

Based on the research conducted by Taufik Arif Setyawan (2010), it was found that there was a significant influence between hemoglobin levels and cardiorespiratory endurance. Added to this, Tri Setyanto Kurniawan's study in 2007 resulted in the conclusion that vital lung capacity essentially contributed to one's physical fitness including the cardiorespiratory endurance.

Someone who has a good level of physical fitness will be able to carry out daily tasks effectively in a relatively longer time without experiencing fatigue. One of the causes of suffering

fatigue is the inability of blood muscles to supply oxygen. As for the transport of oxygen in the blood is aided by hemoglobin, the more hemoglobin in the blood, the more oxygen is transported for tissue needs.

On this basis, a study of the relationship between the hemoglobin levels and vital lung capacity with the cardiorespiratory endurance of the students who participated in basketball extracurricular activities at SMP Negeri 4 Banguntapan, Yogyakarta was conducted.

2 METHOD

2.1 Types of Research

This research is a correlational study to find out the relationship between two independent variables with a dependent variable. The method used in this study is survey with product moment correlation analysis techniques and multiple correlations by SPSS 17.0 for windows.

2.2 Time and Place of Research

The research data were collected on November 9, 2015. This research involved 2 teachers, 2 students, 1 trainer, and 1 medical staff in collecting the data.

2.3 Population and Research Samples

The population in this study included the students of SMP Negeri 4 Banguntapan who joined basketball extracurricular activity. The research sample included female students who participated in basketball extracurricular activities at SMP Negeri 4 Banguntapan, Yogyakarta, totaling 18 students. The sampling technique is total sampling (Sugiyono, 2006).

2.4 Data Collection Techniques and Instruments

The data were collected using survey method with some techniques, namely tests and measurements. The instruments used are: (1) Hemoglobin level is the amount of hemoglobin contained in the blood of the students who joined basketball extracurricular activities at SMP Negeri 4 Banguntapan, Yogyakarta. The hemoglobin levels were measured using Diaspect Hemoglobin T in g / dl units; (2) Lung vital capacity in this study is owned by the

students who joined basketball extracurricular activities at SMP Negeri 4 Banguntapan, Yogyakarta. The vital lung capacity was measured using a Spirometer with units of L / BTPS; (3) Cardiorespiratory endurance is the ability of students who joined basketball extracurricular activities at SMP Negeri 4 Banguntapan, Yogyakarta. The measurement was conducted through a Multi Stage Fitness Test.

2.5 Data Analysis Technique

2.5.1 Normality Test

The normality test aims to ensure that the data obtained from the study are normally distributed. The calculation of this study uses Kolmogorof-Smirnov data analysis techniques and uses SPSS 17.0 for Windows tools.

2.5.2 Linearity Test

Linearity test is used to determine the nature of the linear relationship between dependent variables and independent variables (F-test). Linearity analysis in this study was done using ANOVA in SPSS 17.0 for windows.

2.5.3 Hypothesis Testing

Correlation analysis in this study was used to find whether there was a relationship between two or more variables. Hypothesis testing in this study was done using product moment analysis and multiple correlation (R-Test). The percentage effect of the independent variable on the dependent variable is shown by the magnitude of the determinant coefficient (R²) (Algifari, 1997: 61).

3 RESULTS AND DISCUSSION

3.2 Hemoglobin Levels

The results obtained in the calculation of the hemoglobin level data for basketball extracurricular participants in SMP Negeri 4 Banguntapan Yogyakarta were in the excellent category. Based on the WHO table (2002), it can be seen that most of the hemoglobin levels of basketball extracurricular participants at SMP Negeri 4 Banguntapan, Yogyakarta were in the very good category with a percentage of 90% (16 female students) and a good category with a percentage of 10% (2 female

students). When displayed in a graphical form, the hemoglobin level data were described in the picture as follows:

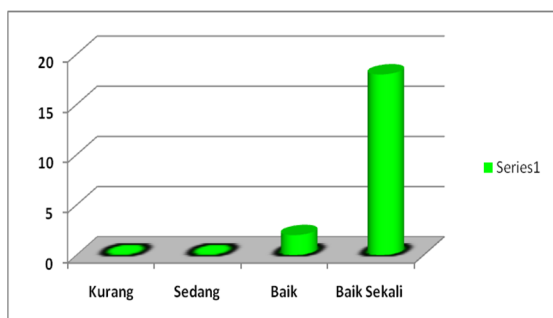


Figure 1: Histogram of Hemoglobin Levels.

3.3 Lung Vital Capacity

The results obtained in the calculation of vital lung capacital data for the basketball extracurricular participants were in the poor category based on the lung vital capacity data according to Puskesjasrek in Sugianto and Nanang Indardi (2007). The lung vital capacity of basketball extracurricular participants at SMP Negeri 4 Banguntapan Yogyakarta varied into several categories consisting of 0% (0 female student) in very good level, 5% (1 female student) in good level, 30% (5 female students) in fairly good level, 55% (10 female students) in a poor category and 10% (2 female students) in a very poor family. When displayed in a graphical form, the lung vital capacity data of the participants were described as follows:

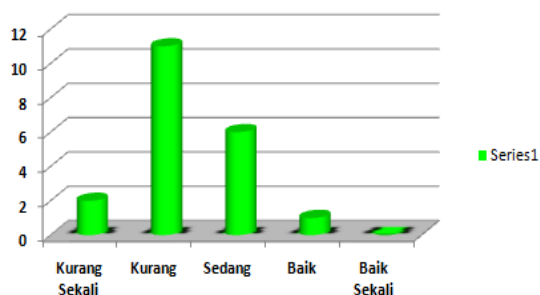


Figure 2: Histogram of Lung Vital Capacity

3.4 Cardiorespiratory Endurance

The results obtained in the cardiorespiratory endurance data calculation for basketball extracurricular members at SMP Negeri 4 Banguntapan Yogyakarta were in the poor category based on the cardiorespiratory endurance data

distribution table according to Brian Mackenzie (2001). The cardiorespiratory endurance of basketball extracurricular participants at SMP Negeri 4 Banguntapan Yogyakarta varied into several categories consisting of 0% (0 female student) in very good category, 0% (0 female student) in good category, 0% (0 female students) in fairly good category, 60% (10 female students) in poor category and 40% (8 female students) in very poor category. When displayed in a graphical form, the cardiorespiratory endurance data were described as follows:

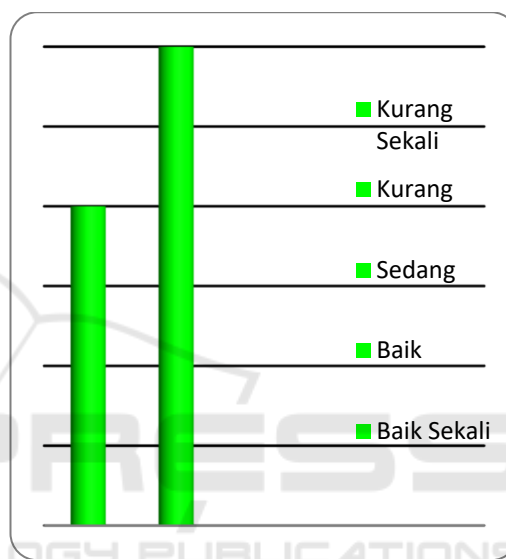


Figure 3: Histogram Cardiorespiratory endurance

3.5 Hypothesis Test and Discussion

The results of the product moment correlation analysis with the help of SPSS with the Pearson correlation test between X1 and Y amounted to 0.576, X2 with Y amounted to 0.609 and the multiple correlation (R) amounted to 0.779. Meanwhile, the determinant value (R²) was 0.635 which indicated the effect of independent variable on dependent variable with the percentage of 51%.

According to Giri Wiarto (2013: 31) hemoglobin has the property of combining oxygen with oxyhemoglobin in the red blood cells. Hemoglobin which binds oxygen from the lungs is circulated throughout the body.

Ganong William (1999: 627-646) suggested that the transport of oxygen to the tissue depends on the amount of oxygen entering the lungs, blood flow and blood transport capacity. The amount of oxygen in the blood is determined by the amount of dissolved

oxygen, the level of hemoglobin in the blood and the binding process of hemoglobin to oxygen. Zullies Ikawati (2014: 1) suggested that O₂ will be bound by hemoglobin in the blood and transported to body cells through a network of blood vessels, while CO₂ will be released.

The ability of the lungs to hold oxygen is called the vital lung capacity. Saryono in Giri Wiarto (2013: 11) states that people who have a large vital capacity will be more fortunate because the frequency of breathing is not too fast, ventilation (the process of air exchange) tends to quickly meet the needs of oxygen. The role of the lungs is to exchange oxygen with carbon dioxide through the respiratory process. The purpose of breathing is to provide oxygen to the tissues and remove carbon dioxide. The vital lung capacity level is thought to have a contribution and a close relationship with the body. Having a good lung vital capacity causes students to run sports optimally. The higher lung vital capacity a person has, the more oxygen that can be used for the cardiorespiratory system and the better for cardiorespiratory endurance.

Lungs and heart endurance has an important role in everyday life. The lungs and heart play a role in supplying oxygen for muscle work for a long period of time, meaning that the better the endurance of the heart's lungs the better the physical fitness of a person.

Based on the results of the correlation, it was proven that there is a significant relationship between hemoglobin and lung vital capacity with cardiorespiratory endurance of 51% with a sign value of 0.006. The more hemoglobin in the body and the greater the vital capacity of a person the more helpful it will be to transport the large volume of oxygen in the body.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

Based on the research findings and discussions, the following conclusions can be drawn as follows: a) There is a significant relationship between the hemoglobin levels and the cardiorespiratory endurance of basketball extracurricular participants at SMP Negeri 4 Banguntapan, Yogyakarta; b) There is a significant relationship between lung vital capacity and the cardiorespiratory endurance of basketball extracurricular participants at SMP

Negeri 4 Banguntapan, Yogyakarta; c) There is a significant relationship between the hemoglobin levels and the vital lung capacity with cardiorespiratory endurance for basketball extracurricular participants at SMP Negeri 4 Banguntapan, Yogyakarta. This is indicated by the results of $p < 0.05$.

4.2 Suggestion

Based on the research conclusions above, there are a number of suggestions that can be delivered, namely: a) Trainers and students should pay attention to the factors that affect the condition of the students' body before conducting a trial; b) The ability of vital lung capacity and cardiorespiratory endurance of students who joined basketball extracurricular activities at SMP Negeri 4 Banguntapan Yogyakarta is considered low, due to the lack of training. Therefore, further research can take into account the factor of sample training; c) There were still many shortcomings in this research. Consequently, the next researcher should develop and improve this research by adding variables and research subjects.

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