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The Effect of Morning and Evening Aerobic Gymnastics Training towards Blood Hemoglobin Level Enhancement on Adolescence Girls

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ABSTRACT

Background: The purpose of this research was to know and to analyze (1) the different effect of aerobic gymnastics training in the morning and in the evening toward blood hemoglobin level, (2) the different of enhancement of blood hemoglobin level between beginning and the end adolescence age group, (3) interaction effect between training times with adolescence age group towards blood hemoglobin level. **Subject and Method:** This research employed an experimental method consisting of independent variables and dependent variable. The research used experimental method with 2x2 factorial design. The population in this research was all female students from Muhammadiyah Vocational high school and junior high school Kradenan Blora, Central Java.

Result: The results of ANOVA test obtained p-value calculated on amount of aerobic gymnastics training time-giving0,041 < sig. alpha 0,05 it means that there was a difference of blood hemoglobin level on night and morning aerobic gymnastics training. The results of the test in the age group of adolescence obtained the p-value amount 0.039 < sig. alpha 0.05, it means that there was a difference of blood hemoglobin level on the group of the early and late adolescence age. The result of interaction test (A X B) obtained p-value amount 0.028 < sig. alpha 0.05, it means that there was interaction effect between aerobic gymnastic training time-giving and adolescence girl age group.

Conclution: The combination of aerobic gymnastic training time–giving and adolescence girl group age is taking effect towards blood hemoglobin level.

Key words: aerobic gymnastics, hemoglobin, adolescence

INTRODUCTION

Adolescence girl is one of the groups that vulnerable to anemia, teenage girl have a higher risk for suffering anemia compared to the adolescence boy. The factor is because the adolescence girl experience menstruation every month and in the growth period so that will need more iron supply. The imbalance of nutrients supplies is another factor of anemia on adolescence.

Anemia is an ailment where the level of hemoglobin within the blood is low. Factors that influence the level of hemoglobin level within the blood are the sufficient of iron and iron metabolism within the body. Hemoglobin is a protein in eritrosit that bind the molecule not the protein, which is compound of iron called heme. Hemoglobin has important role, which is bind and bring the oxygen from the lungs to be spread to the whole body. Lack of hemoglobin will result in the lack of oxygen to whole body or brain, so will generate the symptom of weary, sluggish, weak and get tired quickly. Another effect of lack of hemoglobin is low productivity. Obstruction of intelligence and mental development, the decrease of immunity and the increase of number of pain (Rizka Chibriyah, 2017: 3). Several factors that cause the decrease of hemoglobin were dietary habit and physical activity.

According to Sharkey (2003:97), aerobic fitness is related to the total hemoglobin, which hemoglobin and blood volume increased with training. Therefore, the alteration of blood volume caused by exercise related to the alteration of cardiovascular that this alteration can follow changing the blood volume.

Junusul Hairy (2009) stated that regular exercise will increase the blood volume and hemoglobin level, aside from the increasing blood volume and hemoglobin level also decreasing the pulse, increasing stroke volume and capillary change and muscle hypertrophy. Human's physical activity is very affecting the hemoglobin level within the blood. Individual that regularly exercising his hemoglobin will slightly increase, this thing caused by network or cell will need more O2 (oxygen) when doing an activity.

According to research conducted by Shanti Iswara (1995), hemoglobin level increase after done the physical activity regularly for 12 weeks. Corresponding with the statement above so we know that hemoglobin level within the blood is an important factor for the body so that the body not suffering anemia. Therefore, hemoglobin within the blood have very important role especially when there is connection about anemia ailment. If we doing exercise regularly the hemoglobin level within the body can be maintained so that the risk of anemia will be subtracted. Aerobic gymnastics is one of the physical

activity forms that benefit to increase hemoglobin level within the body.

The different condition in the morning and in the evening also a factor that take effect in the increase of hemoglobin level because of exercise. In the morning O2 is more than CO2 on the contrary at night CO2 is more than O2, while our body always need oxygen to support every chemical reaction within the body and this thing is an interesting to be researched.

MATERIAL AND METHODS

1. Study Design

This research used an experimental method and a 2x2 factorial design (Sudjana, 1992). This research conducted in Muhammadiyah Vocational high school and junior high school Kradenan Blora, Central Java for 3 months in november 2018 until January 2019.

Population and Sample

The population in this research was all female students from Muhammadiyah Vocational high school and junior high school Kradenan Blora, Central Java.The samples of the research amounted to 28 people that were obtained by using purposive sampling.

2. Study Variables

This research was consist independen variables and dependent variable. The independent variables namely manipulative independent variable (morning and evening aerobic gymnastic training) and attribute independent variables (early adolescence and lately adolescence girl). While the dependent variable is blood hemoglobin level.

3. Data Analysis

Data analysis technique was divided into two namely prerequisite test and hypothesis test. The prerequisite test was divided into two, namely normality test and homogeneity test, while hypothesis test using two ways ANAVA.

RESULTS AND DISCUSION

Hemoglobin level description in this research either for early adolescence or late adolescence in the morning or in the evening can be seen in the table below:

Table 1. Total of Hemoglobin Level Descriptive Statistics

Groups	Pre-Test			Post-Test		
	N	**Mean**	**STDEV**	**N**	**Mean**	**STDEV**
Early Adolescence Morning	7	11,85	0,21	7	13,00	085
Late Adolescence Morning	7	11,85	0,68	7	13,60	0,76
Early Adolescence Evening	7	11,95	0,49	7	12,55	0,72
Late Adolescence Evening	7	12,15	0,63	7	13,15	0,31

Source: Primary data that is processed, 2019

Table 1 shown that there is a different between early adolescence and late adolescence that doing morning or evening aerobic before and after. On early adolescence that did morning aerobic has 11.85gr % of hemoglobin level and turns into 1.00gr% after got the treatment. On the late adolescence that did the morning aerobic in the beginning has 11.85gr% of hemoglobin level and turns into 13.60gr% after got the treatment.

The same thing also happened to the respondent who did the aerobic in the evening. For the early adolescence the hemoglobin level before treatment is 11.95gr% turns into 12.55gr% after the treatment, while for the late adolescence hemoglobin level before treatment is 12.15gr% turns into 13.15gr% after the treatment.

An analysis requirement test is needed to determine whether the data analysis for hypothesis testing can be preceded or not. In this research, there are two prerequisite analysis tests namely normality test and homogeneity test.

Normality test uses Liliefors test. The results of normality data test that were performed on each group were as follows:

Table 2. Normality Test Data

Groups	Liliefors				
	N	**Lcount**	**Ltable**	**α**	**Category**
Early Adolescence morning	7	0,010	3,39	0,05	Normal
Late Adolescence Evening	7	0,021	3,39	0,05	Normal
Early Adolescence Evening	7	0,028	3,39	0,05	Normal
Late Adolescence Evening	7	0,036	3,39	0,05	Normal

Source: Primary data that is processed, 2019

In α = 0.05 indicates that the value of test statistic L count < Lt able thus, the above data is normally distributed.

Homogeneity test was conducted to obtain the information from the four groups of samples that have a homogeneous variant or not. Homogeneity test in this research was conducted by using Bartlett test. The description of the results is presented in the following table:

Table 3. Homogeneity Test Data

Group	Bartlett			
	N	χ^2_{count}	χ^2_{table}	**Category**
4	7	5,919	7,81	Homogeny

Source : Primary data that is processed, 2019

From homogeneity test results obtained χ^2_{count} was 5.919 while the result for χ^2_{tabel} was 7.81. So, it can be concluded that between the groups in this study has a homogeneous variance.

Table 4. The Results of Two Ways ANAVA Test of A and B Factors.

Variant Sources	F_{count}	p	Conclusion
Aerobic Gymnastics raining Time-giving (A)	3.256	0.041	Ho rejected
Adolescence Girl Age Group (B)	2.428	0.039	Ho rejected
Interaction (AB)	2.851	0.028	Ho rejected

Source: Primary data that is processed, 2019

The result seen from table 4 can be interpreted as follow:

Together influence of adolescence variable, treatment and adolescence*treatment towards hemoglobin with the significance score of 0.029 (< 0.05) means that together, adolescence and treatment received by the subject take effect towards the owned hemoglobin level. Besides that seeing from f test that is bigger from the F table for 7 respondents with the alpha of 5% (22,090 > 4.35) strengthen the result that there is a together influence between adolescence and treatment towards research subject's hemoglobin level.

The change of hemoglobin without influenced of training time and treatment with the sig of 0.039 (< 0.05) so that the score significant intercept, which means there is a significant change towards hemoglobin level change on research subject.

The influence of adolescence score, treatment, and time*treatment towards hemoglobin level seen from the significance score on adolescence (0.041 < 0.05) and the treatment (0.039 < 0.05), and adolescence*treatment (0.028 < 0.05), so from that result there is a significant influence of time variable, treatment, and time*treatment towards hemoglobin level.

The different of Aerobic Training in the Morning and in the Evening towards Hemoglobin Level

The result of analysis proven that there is statistically different between aerobic training done by Muhammadiyah junior high school female student and Muhammadiyah vocational high school Kradenan which is done in the morning with the aerobic training done in the evening, so that the hypothesisi 1 that stated there is a different of aerobic training done in the morning and in the evening towards blood hemoglobin level, supported but the difference of hemoglobin level that produced not significantly different. This research result is parallel with the research conducted by Angga Rangga Dinata in 2015, where in that research Angga brings up that morning aerobic exercise have influence of VO2 max enhancement better compared with evening aerobic exercise. In this research it is proven that on average there is an enhancement of hemoglobin level on the subjects that doing training in the morning and in the evening.

Subject that doing aerobics training in the morning before given the treatment has the hemoglobin level of 11.95gr% increase to 12.95gr%. For the training done in the evening before given the treatment has the hemoglobin level of 12.25gr% increase to 13.35gr%.

That result shown that if it seen from the time of aerobic training that done in the evening gives the higher enhancement of hemoglobin level compared to the aerobic that done in the morning (8.11% in the morning and8.97% in the evening). Higher level of hemoglobin in the evening caused by the high level of CO_2 in the evening. Plant releasing CO_2 in the evening, this thing is contrast in the day time where the plant will absorb the CO_2. This condition causing the air in the evening contain more CO_2, this thing indirectly affect air circulation in human respiratory system. Someone will earn less O_2 if someone doing activities in the evening. Therefore, the researcher expects that someone will have different result if the source or metabolism source is different.

The Different of Blood Hemoglobin Level between Early and Late Adolescence Age Group

The result of analysis proven that there is statistically difference between training aerobic done by the female students of Muhammadiyah junior high school Kradenan with the range of age from 12-15 years old (early adolescence) with the female students of Muhammadiyah vocational high school Kradenan with the range of age from 15-18 years old (late adolescence) so that the hypothesis 2 that stated there is a difference of hemoglobin level between early and late adolescence age group, supported. In this research proven that on average there is enhancement of hemoglobin level on the subject that doing training in the morning and evening.

Research subject that doing aerobics training in the morning before given the treatment has hemoglobin level of 11.90gr% (early adolescence) and 12.20gr% (late adolescence) increase to 13.2gr% (early adolescence) and 12.70gr% (late adolescence). For the training that done in the evening before given the treatment has hemoglobin level of 12.20gr% (early adolescence) and 12.30gr% (late adolescence) increase to 13.60gr% (early adolescence) and 13.10gr% (late adolescence).

Hemoglobin within red blood cell has a function for binding the oxygen (O_2). With the amount of oxygen that can be tied and brought by the blood, with the existence of hemoglobin within the blood cell, oxygen supply to any place in the body even the most isolated one can be reached. Around 80% body iron is located in hemoglobin (Sadikin, 2002). Menstruation cycle is physiological circumstances where there is blood expenditure and the remnant of the cells which originated from mukosa uterus periodically, with the interval that regular more or less starting from menarche until menaupose, except on a pregnancy and lactation period. Early adolescence has capability to bind and supply their red blood better compared with late adolescence.

Interaction Effect between Training Time and Adolescence Age Group towards Blood Hemoglobin Level

The result of analysis proven that there is a statistically difference between aerobic training with group that done by female students of Muhammadiyah junior high school and vocational high school Kradenan that done in the morning with the aerobic training that done in the evening, so that the hypothesis 3 that stated there is a difference of interaction effect between training time with adolescence age group towards blood hemoglobin level, supported. The result of analysis shown that aerobic training done in the morning either for early adolescence or late adolescence giving the significant difference, while in the aerobic training done in the evening, either it is for early adolescence or late adolescence there is no significant difference.

This research result is parallel with the research conducted by Angga Rangga Dinata in 2015, where in that research Angga brings up that morning aerobic exercise have influence of VO2 max enhancement better compared with evening aerobic exercise. In this research it is proven that on average there is an enhancement of hemoglobin level on the research subjects that doing training in the morning and in the evening.

The different of oxygen binding capability by hemoglobin in the morning and the evening, also strengthen the difference of different hemoglobin level between morning and evening will impact to the aerobic gymnastics effect towards the enhancement of VO_2 max respiratory function. On the other side external factor such as air temperature that commonly different between evening and morning, although the aerobic done in the same room it is also impact to the difference of the maximum aerobic capability between evening and morning.

CONCLUSION

Based on data analysis and test which have been mentioned above, this it can be drawn conclusions of the research results, those are (1) there is a difference effect of aerobic training in the morning and the evening towards blood hemoglobin level enhancement. (2) There is a difference of blood hemoglobin enhancement between early and late adolescence age group, (3) there is an interaction influence between training times with adolescence age group towards blood hemoglobin enhancement.

REFERENCE

Chibriyah, Riska. Hubungan Pola Makan dan Aktivitas Fisik Terhadap Kadar Hemoglobin Santriwati Pondok Pesantren Al-Munawwir Krapyak Bantul. Jurnal Fakultas Ilmu Kesehatan Universitas 'Aisyiyah Yogyakarta. 2017.

Shanti Iswara. (1995). Perubahan kadar hemoglobin dan feritin serum pada siswa wanita setelah menjalani pendidikan khusus selama 12 minggu di Jakarta Selatan. Universitas Indonesia.

Sharkey, B. (2003). Kebugaran & Kesehatan. (E. D. Nasution, Ed.). Jakarta: PT Raja Grafindo Persad.

Sudjana (1992) Metode Statistika. 5th edn. Bandung: Tarsito.

Sugiyono, 2010. Statistika untuk Penelitian, Bandung: Alfabeta.

Suharsimi Arikunto. 2010. Prosedur Penelitian Suatu Pendekatan Praktik. Jakarta: Rineka Cipta.