Physical Fitness of Adolescent Smoker

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Article Info

Abstract

Adolescent smoking behavior has a bad influence on health and fitness. The purpose of this study was to determine vital capacity and hemoglobin level in smoker and non-smoker adolescent towards physical fitness. The study was quantitative research with surveys and measurement tests. The sample size was 40 adolescents which in the neighborhood of Gunungpati. We used t-test, MANOVA and post hoc test to determine the differences in smoker and non-smoker adolescent. This study showed smoker adolescents had lower vital capacity compared than non-smoker adolescents. The value of hemoglobin levels in smoker adolescents were higher than non-smoker adolescents so that it affect the low levels of physical fitness. For adolescents, it is expected to maintain physical fitness through physical activity and reduce the number of cigarettes consumed and even try to stop smoking for smoker adolescents..

Introduction

Adolescents are the next generation of the nation. They are in the main line in economic growth and development in the country. Nowadays, adolescents behavior is so diverse, for example, adolescent smoking habit. Smoking is an adverse behavior, both for smokers health and the environment. According to Indonesian Health Research (RISKESDAS) in 2003, the number of smoker in Indonesia was 29.3% of the total population and 11.2% of them aged 15-19 years which categorized as adolescents (Fadli & Sutysna, 2017).

Smoking behavior carried out by adolescents have a bad influence on health and fitness. Lung cancer and chronic pulmonary disease are often suffered by smoker. Acute respiratory infection (ARI) term is commonly used for diagnosing the respiratory disorders. Bustan (2013) stated that children and adolescents have a greater potential for disease because of the nervous system is inhibited by some of the toxic substances that present in cigarettes such as Nicotine.

Smoking habit have a bad influence on health, especially in the respiratory organs. Various lung diseases occur due to smoking include lung cancer and chronic obstructive pulmonary disease. For smokers, the nervous system will easily be contaminated with poisons or cigarettes substance which greatly disrupt health and mental development such as anxiety disorder and depression (Bakara, Moningka, & Lintong, 2016). Environment and society are the initial factors introduce cigarette. When an adolescent knows and consumes cigarette, his

physical fitness will be disrupted slowly. The same thing was also mentioned by Makawekes et al., (2016); Wiarto (2013) which is if someone smoke, the level of CO that is sucked will reduce the value of VO_2max which will affect their durability. The transport of oxygen in the blood is carried by hemoglobin. If hemoglobin levels is low, the oxygen that carried by blood cells is also low. Hemoglobin is a protein that is rich in iron. Hemoglobin has an affinity with oxygen which forms oxyhemoglobin in blood cells. From the background described above, we interested in knowing more about lung vital capacity and hemoglobin levels in adolescent smokers to their physical fitness. This is a major problem to immediately find a solution in overcoming the habit of adolescent who like smoking because it is feared that it will affect their academic.

Method

This study was a quantitative observational analytic study using a cross sectional study design. We used a survey with test and measurement techniques. The sample of the study were adolescents in the Sekaran, Gunungpati subdistrict. We used a purposive sampling technique with sample size 40 participants. Participants were divided into two groups: smokers (n = 20) and non-smokers (n = 20). The inclusion criteria was based on the characteristics of the population that have been previously known. Then, their lung vital capacity and hemoglobin levels were measured followed by doing a *multi fitness test* (MFT) to measure physical fitness.

The inclusion criteria consisted of adolescents lived in Sekaran, Gunungpati Subdistrict, male, in good health condition, smoker and non smoker adolesscents, and were willing to become participant in the study, indicated by filling out the informed consent form. This study had been approved by Ethic Committe. This study had two variables namely adolescents as independent variable and vital lung capacity, Hb levels and physical fitness as dependent variables. For measurement, we used spirometer, Hb quick check test, field or flat surface of at least 22 meters, MFT mp3 audio test, speaker sound, ruler, cone, MFT form and stationery. We analyzed the data using independents sample t-test. MANOVA

and post hoc tests were used to determine differences in smoker with non-smoker to vital lung capacity, hemoglobin levels, and physical fitness. All statistical data were analyzed using SPSS version 22 software.

Result and Discussion

The results obtained by compared the value of vital capacity, hemoglobin level, and physical fitness of smoker and non-smoker adolescents. Based on table 1, it showed that 2 smoker and 10 non-smoker adolescents had very good vital capacity, 4 smoker and 4 non-smoker adolescents had good vital capacity, 8 smoker and 6 non-smoker adolescents had moderate vital capacity, and 6 smoker adolescents had a poor vital capacity.

Table 1 shows 4 smoker and 1 non-smoker adolescents had a high hemoglobin level, 13 smoker and 14 non-smoker adolescents had normal hemoglobin level, while 3 smoker and 5 non-smokers adolescents had low hemoglobin level.

The results of physical fitness level showed that 1 smoker adolescent had very good physical fitness, 8 smoker and 12 non-smoker adolescents had good physical fitness, 4 smoker and 7 non-smoker physical fitness, while 7

Table 1. Vital Capacity, Physical Fitness, and Hemoglobin Level

Category	Vital Capacity	Physical Fitness	Hemoglobin Level
Very Good	2	1	
Good	4	8	
Moderate	8	4	
Poor	6	7	
Very Poor	0	0	
High			4
Normal			13
Low			3
Non-smoker			
Very Good	10	0	
Good	4	12	
Moderate	6	7	
Poor	0	1	
Very Poor	0	0	
High			1
Normal			14
Low			5

Table 2. Adolescent Smoker Hypothesis Test

Effect		value	F	Hypothesis df	Error df	sig	Noncent. Parameter	Observed Powerc
Intercept	Pillai's Trace	.994	1908.449b	3.000	36.000	.000	5725.348	1.000
	Wilks' Lambda	.006	1908.449b	3.000	36.000	.000	5725.348	1.000
	Hotelling's Trace	159.037	1908.449b	3.000	36.000	.000	5725.348	1.000
	Roy's Largest Root	159.037	1908.449b	3.000	36.000	.000	5725.348	1.000
Adolescent	Pillai's Trace	.451	9.866b	3.000	36.000	.000	29.599	.996
	Wilks' Lambda	.549	9.866b	3.000	36.000	.000	29.599	.996
	Hotelling's Trace	.822	9.866b	3.000	36.000	.000	29.599	.996
	Roy's Largest Root	.822	9.866b	3.000	36.000	.000	29.599	.996

Design: Intercept + Adolescent
a. Exact statistic
b. Computed using alpha = .05

smoker and 1 non-smoker adolescents had poor physical fitness.

Ho is accepted if the value of Sig. > 0.05. Table 2 showed the overall significance value was lower than 0.05, it mean that there was a difference between smoker and non-smoker adolescents on their vital lung capacity, hemoglobin levels, and physical fitness.

We obtained significance value for vital lung capacity was 0.001, 0.027 for hemoglobin level and 0.005 for physical fitness using VO$_2$Max. This data showed that the three variables had significant differences because the significance value was below 0.05 and the data indirectly influenced by smokers and non-smoker adolescents.

Through this study, we also found that the mean lung vital capacity from smoker adolescent was 3705.5 and could be categorized as moderate. Whereas the mean lung vital capacity from non-smoker adolescent was 4263.4 and could be categorized as very good. Those data mean that lung vital capacity from non-smoker adolescent was better than smoker adolescent. However, there were some outlier data in which two of smoker adolescent were having very good lung vital capacity. This could be due to the frequency of exercise or physical activity that they did, so that they had very good lung vital capacity. Good lifestyle and habits could affect the results of the conducted study even when the sample was smoker adolescents. The lung vital capacity results from smoker and non-smoker adolescents in this study are in

accordance to study conducted by Nauphar & Hafiftry (2015) which show that the duration and frequency of smoking influence to lung vital capacity.

A smoker who like to do exercise could keep his/her performance when doing exercise or even exceed the ability of non-smoker athlete. However, Makawekes et al., (2016) explains that smokers would not be able to keep their performance since their respiratory tract are obstructed by smoke substances so that the absorbed oxygen supply is hampered. This is also in accordance to the theory explained by Bustan (2013) stating that a smoker would undergo swelling in their respiratory tract layer which could limit the air flowing in and out the lungs. Swelling would also result in reduction of inspired air to lungs and reduction of the availability of oxygen supplying muscle cells and lungs. As consequence, they would be easily breathless and fatigue when doing physical activity.

Hemoglobin level for smoker adolescent (Table 1) showed that 13 people had normal value. The same results were also showed in non-smoker adolescent in whom the average value was 14 and categorized as normal. High level values were found in four smoker adolescents and one in non-smoker adolescent. Overall, there was no significant difference between smoker and non-smoker adolescent. The difference was found in hemoglobin level of smoker adolescent which was higher than non-smoker. It could be concluded that smoking

Table 3. Test of Between-Subjects Effects

Tests of Between-Subjects Effects

Source	Dependent variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Powerd
Corrected	Vital Capacity	3.900a	1	3.900	12.212	.001	12.212	.926
	Hemoglobin level	24.180b	1	24.180	5.296	.027	5.296	.611
	Physical Fitness	279.841c	1	279.841	9.109	.005	9.109	.837
Intercept	Vital Capacity	632.741	1	632.741	1981.356	.000	1981.356	1.000
	Hemoglobin level	8188.182	1	8188.182	1793.300	.000	1793.300	1.000
	Physical Fitness	67782.289	1	67782.289	2206.247	.000	2206.247	1.000
Adolescent	Vital Capacity	3.900	1	3.900	12.212	.001	12.212	.926
	Hemoglobin level	24.180	1	24.180	5.296	.027	5.296	.611
	Physical Fitness	279.841	1	279.841	9.109	.005	9.109	.837
Error	Vital Capacity	12.135	38	.319				
	Hemoglobin level	173.508	38	4.566				
	Physical Fitness	1167.470	38	30.723				
Total	Vital Capacity	648.776	40					
	Hemoglobin level	8385.870	40					
	Physical Fitness	69229.600	40					
Corrected Total	Vital Capacity	16.035	39					
	Hemoglobin level	197.688	39					
	Physical Fitness	1447.311	39					

R Squared = .243 (Adjusted R Squared = .223)
a. R Squared = .122 (Adjusted R Squared = .099)
b. R Squared = .193 (Adjusted R Squared = .172)

habit has an influence to hemoglobin level.

Studies conducted by Bakara et al., (2016) and Zukefeli, (2010) show similar results for the association of smoking habits and hemoglobin level. This study is also indirectly supported by the former researches in which smoking habits might reduce the ability of hemoglobin to bind oxygen. Smokers could be categorized into three groups which are light, moderate, and heavy smokers. Light smoker is an individual who smokes 1-10 cigarettes per day (CPD) while moderate smoker is an individual who smokes 11-20 CPD. This is also in accordance to the theory stated by Bustan (2013) that smoking more than 10 CPD could increase hemoglobin level by 3.5%. This data could be a reference to the accumulation of carboxyhemoglobin in blood and effect of reduction of plasma volume.

Smokers with high level of hemoglobin have high level of erythrocytes and high level of blood viscocity which subsequently make heart work heavier by increasing heart rate.

This serves as an underlying condition to other organs more intense work such as lungs which pump oxygen more intense and heart which pulse more vigorous. This kind of heart work could later induce heart failure condition. Study by Rosjidi et al (2017) also support this findings by explaining that smoking, drinking alcohol, and consuming not fresh fruits could increase the risk factor of having cardiovascular diseases even leading to death. This phenomenon is having less attention to society particularly in smoker adolescents; because they assume that smoking only induce respiratory tract diseases. However, respiratory tract diseases indirectly serve as the initial disease of other chronic diseases such as hypertension, cancer, and stroke.

The mean value of the personal fitness level from smoker adolescents was 38.52 and could be categorized as moderate. On the other side, non-smoker adolescents had 43.81 which could be categorized as good. The interesting

part of this study was that one of the smoker adolescents had very good fitness level which could happen due to exercise habits so that very good fitness level could be achieved. However, in general fitness level of non-smoker adolescents was better than smoker adolescents. This finding also supported by study by Listyanto (2015) which explain that there is an association between smoking habits and fitness leve l which is measured by MFT (Multistage Fitness Test). In addition, the findings from former studies show that fitness level of non-smoker adolescents are better than smoker adolescents. Same result is also showed by Hanani (2017) who explains that to be fit does not nessecarily need something very expensive. Leisure strolling and walking around neighbourhood could also keep fitness level of individual. Neighbourhood is the place to develop relationship between relatives or friends who might give contributions to our life.

Hospitality activities could develop strong interaction and relationship to: (1) grow sympathy feelings, mutual understanding, mutual respect, and affection, (2) ease access to various information including working and business opportunities, (3) foster mutually agreed values aiming to address common issues or even result in joint business foundation, and (4) redevelop existing memories which are contemplated for social and economical need for individual and more general community.

According to World Health Organization (WHO), health is not always related to diseases, but also as a complex entity consisting of physical, mental, individual, and social components. A healthy person could enjoy life with various activities comfortably. Besides, a healthy person is also expected to keep their endurance both for health and fitness aspects in order to improve immunity level to diseases which haunt everytime a person got tired and eventually their immune level is dropped.

Physical activity of an individual has an association to lifestyle habit, need, and surrounding environment. Physical activity does not have to be expensive and even induce adrenaline to increase heart rate. Simple activities such as walking in park, cleaning house, and revoking the grass are also activities which could burn calories. This should be remembered by the community particularly people who have high acitivity level. They leave for work in the morning and go back to home in the evening, even some of them only have rest time less than 8 hours per day. They do not have much time to do exercise or have some leisure time to entertain themselves. Some of them also get trapped in a bustle activity and have high level of stress. Eventually impingement that could be done according to them is by smoking. Smokers assume that smoking could reduce stress level and saturation in their life.

Fitness level is one of the influence factors for adolescents' health. Adolescents with average age of 19 years old need high/good level of fitness. Good fitness level is expected to improve quality of doing physical activities in academical, practical, or in daily circumstances. Lifestyle and environment are very influential in keeping fitness and health. Someone who does not smoke could be affected although indirectly by having smoker adolescents' friends. This later could be classified as active and passive smokers. Playmates also significantly affect our habits even into health and lifestyle. This is in accordance to Widowati (2015) who explains that character and community habits are affected by obtained economic level. A smoker even only has under average income and uncertain job would still set aside money which in fact could be used to other useful need, yet this person prioritizes to buy cigarettes. This condition indirectly affects someone's character to individual economic level even to health level.

Smoking habits in adolescents even only consume a few of cigarettes still has not good impacts for health particularly for lungs vital capacity, hemoglobin level, and their fitness level. Negative sides from smoking could be feared to reach to the use and abuse of drugs. According to Handayani et al., (2017), Sholihah (2013), Yuliastuti & Anggoro (2017), it could be concluded that community activites such as socialization and promotion about the important of health through physical activitiy, life style, and education about the danger of drugs could significantly increase individual's fitness and reduce the quantity of smoking cigarettes.

Leisure activities in weekend or in holiday, interaction with surrounding social environment, and enjoying morning air are useful simple ways to keep being healthy and fit. Physical activities in form of recreational sport is one of very unite different individuals to socialize, know each other and figure out places that could be used as recreational places. Motivating someone to visit recreational places could also be meant as integrated physical activity.

Here, the role of media is needed to promote and inform that there are many important things to do compare to smoking. Because we know that smoking would only be done in tired condition of daily activites, so that later physical activity could motivate someone to shift to more positive things.

Conclusion

Adolescents who have smoking habits influence their lungs vital capacities in which those are lower than non-smoker adolescents. Hemoglobin level in smoker adolescents is higher than non-smoker adolescents which also influences smoker adolescents's fitness level. Adolescents are expected to keep their physical fitness by doing physical and positive activity. Furthermore, smoker adolescents are expected to reduce number of cigarettes they smoke daily and endeavored to stop smoking.

References

Bakara, P. M., Moningka, M., & Lintong, F., 2016. Analisis Kapasitas Vitas Paru Pada Perokok dan Bukan Perokok Sebelum Aktivitas Fisik dan Setelah Melakukan Aktivitas Fisik. *Jurnal Kedokteran Klinik*, 1(1), pp. 36–41.

Bustan, M.N., 2013. Perokok vs Pengolahraga; Manfaat Olahraga Bagi Perokok dan Resiko Rokok Bagi Pengolahraga. *Jurnal Administrasi Dan Kebijakan Kesehatan Indonesia*, 2(3), pp. 48–53.

Fadli, M., & Sutysna, H., 2017. Gambaran Nilai Kapasitas Vital Paru dan Tingkat Kebugaran pada Mahasiswa Perokok dan Bukan Perokok. *Jurnal Kesehatan Andalas*, 2(3), pp. 153–158.

Hanani, E.S., 2017. The Study on Value of Recreational Sports Activity of Urban Communities. *Jurnal Kesehatan Masyarakat*, 12(2), pp. 96–101.

Handayani, O. W. K., MacDonald, D., McCuaig, L.,

Rahayu, T., Budiono, I., Windraswara, R., … Siyam, N., 2017. Subtitution Program in Indonesia and Australia as Health Promotion Model at Schools. *Jurnal Kesehatan Masyarakat*, 12(2), pp. 96–101.

Listyanto, A., 2015. Hubungan Kebiasaan Merokok Dengan Tingkat Kebugaran Jasmani; Studi Pasa Siswa Kelas XI SMA Negeri 1 Pacet Mojokerto. *Jurnal Pendidikan Olahraga Dan Kesehatan*, 3(1), pp. 208–210.

Makawekes, M.T., Kalangi, S.J.R., & Pasiak, T.F., 2016. Perbandingan Kadar Hemoglobin Pada Pria Perokok dan Bukan Perokok. *Jurnal E-Biomedik (eBm)*, 4(1), pp. 121–127.

Nauphar, D., & Hafiftry, Y., 2015. Pengaruh Merokok Terhadap Kapasitas Vital Paru Mahasiswa Fakultas Hukum Universitas Swadaya Gunung Jati Cirebon. *Jurnal Kedokteran Dan Kesehatan*, 2(4), pp. 24–27.

Rosjidi, C.H., Isro'in, L., & Wahyuni, N.S., 2017. Differences in Risk Factor of Cardiovascular Disease Risk on Rural and Urban Population. *Jurnal Kesehatan Masyarakat*, 13(1), pp. 69–76.

Sholihah, Q., 2013. Efektifitas Program P4GN terhadap Pencegahan Penyalahgunaan NAPZA. *Jurnal Kesehatan Masyarakat*, 9(1), pp. 153–159.

Wiarto., 2013. *Fisiologi dan Olahraga*. Yogyakarta: Graha Ilmu.

Widowati, A., 2015. Modal Sosial Budaya dan Kondisi Lingkungan Sehat Dalam Pembinaan Prestasi Olahraga Pelajar. *Jurnal Kesehatan Masyarakat*, 10(2), pp. 218–226.

Yuliastuti, C., & Anggoro, S.D., 2017. The Overview of The Elderly Lifestyle Profile in Surabaya. *Jurnal Kesehatan Masyarakat*, 12(2), pp. 96–108.

Zukefeli, A.A., 2010. *Hubungan Merokok Dengan Kadar Hemoglobin Darah Pada Warga Dengan Jenis Kelamin Laki-laki Berusia 18-40 Tahun Yang Tinggal di Bandar Putra Bertam, Kepala Batas, Pulau Pinang, Malaysia*. USU, Medan.