www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)
Budapest Institute

The Effect of Exercise and Giving Beetroot Juice (Beta Vulgaris L) on Athletes of Futsal Academy Stock Development in 2021

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Abstract

The purpose of this research isTo determine the effect of exercise and administration of beetroot juice (Beta vulgaris L) onmaximal oxygen volume (VO2max) for futsal athletesStock Development Academy in 2021.The research was conducted using experimental methods. The research design used is One Way Anova. InstrumentBlepp Test as a measuring tool in this study has a validity of 0.915 and a reliability coefficient of 0.868.The subject of this research is futsal athleteacademy STOK Binaguna as many as fifteen people.The data collection technique used in this study was to measure VO2 Max at the beginning and end of the study.The data analysis technique in this study used the t test. From the results of the t-test, it can be seen that the t-count is 1.583 in the exercise treatment group and the administration of beetroot juice, the t-count is 1.890 in the exercise-only treatment group, and the t-count is 2.690 in the treatment group with beet juice only, and t-table for df = 6-2 = 4 which is 2.776. Based on the results of the ANOVA test analysis above, the calculated F value is 0.222 with a significance of 0.804 > 0.05. It was concluded thatexercise and administration of beetroot juice (Beta vulgaris L) had no significant effect on increasingmaximal oxygen volume (VO2max) for futsal athletesAcademy STOK Binaguna 2021.

Keywords
exercise; beetroot juice (beta vulgaris l); maximum oxygen volume (vo2 max)

I. Introduction

Sport is a positive activity that humans do to maintain physical fitness. By exercising, a person gains physical fitness, increases concentration, and is able to excel in his work, so as to increase work productivity. Therefore, at this time we have to start getting used to doing sports or physical activities and making sports a necessity in everyday life(Hariadi, 2009). Currently, there are many sports that can be done to improve fitness, or to excel in their field, it can even become a profession, one of which is Futsal. Physical activity is an inseparable part of the life of living things, ranging from simple to very complex activities. As a living creature, humans need physical activity as an effort to maintain the existence of their lives. Every individual in his life must be doing physical activities both intentionally and unintentionally, because physical activities are carried out with diverse and diverse purposes. (Sulaiman, et al. 2020)

In today's modern futsal game, players are required to always move and control the ball so that the opportunity to create goals is greater. To always move and be able to control the ball for a longer time, good physical conditions are needed, because it is impossible to physically separate from futsal. Futsal is a very tough physical sport, where a player must always move randomly throughout the game. You can imagine how important it is physically if a player has to move continuously with explosive movements in a match.

DOI: *https://doi.org/10.33258/birci.v5i3.6126*

Because the movement is quite large in futsal, one of the main assets in futsal is endurance of the heart and lungs (cardiovascular), which is often referred to as (VO)2Max). VO2A good max must be possessed by every futsal athlete to be able to continue to concentrate and work optimally from the beginning to the end of the match, which of course will have an impact on the team itself. VO2Max is the maximum capacity to breathe oxygen.(Trysandi, 2019)also said that VO2Max is the volume of oxygen required when working hard. The higher the VO2Max, the body's resistance when exercising is also getting higher, which means someone who has a high VO level2Max height will not get tired quickly after doing various activities(Sugiarto, 2012).

VO2Max describes the effectiveness of the body to get oxygen, then send it to the muscles and other cells and use it in energy procurement, while at the same time the body gets rid of metabolic waste that can inhibit physical activity.(Rahmad., 2016). There are two types of cardiorespiratory endurance, namely aerobic and anaerobic. Through the measurement of aerobic cardiorespiratory endurance, namely by measuring the maximum oxygen volume, is one way that can be done to determine a person's physical fitness. To increase VO2Max then needs to do physical exercise that can increase VO endurance2Max. Physical exercise is also the most important part for all sports, especially in futsal.

Futsal is synonymous with physical exercise, due to training in futsal, the body will feel tired. If our bodies are not able to cope with fatigue due to physical activity or exercise, then free radicals will arise in the body. This includes external sources of free radicals that come from outside a person's body. The increase in free radicals in the body of futsal athletes can also affect the athlete's muscle endurance so that they cannot overcome fatigue, or what is termed Strength Endurance, namely the ability of the entire body organism to overcome fatigue when doing activities that demand strength for a long time.(Pito, 2017). Then there will be a deficiency of antioxidants in the body so that it reduces endurance during physical activity, then decreases immunity.

To prevent the emergence of free radicals as a result of physical activity such as exercise such as futsal, the human body needs to consume nutritional intake. Vitamin C acts as an agent for various free radicals. In addition, it also plays a role in minimizing the occurrence of cell and tissue damage caused by oxidative stress(Zulfachri, 2013)So that muscle endurance and VO2Max is more awake and not easy to decline. Exogenous antioxidants produced from plants can reduce free radicals(Apriana & Rahayu, 2016). So, here researchers will provide antioxidants by consuming beetroot juice accompanied by exercise to Futsal athletes. The reason why the beetroot juice given by the researcher is becauseThe pigment contained in red beet fruit isknown betacyaninshas anti-radical effect from high antioxidant activity(Mastuti, 2010).

Then, in beets there are non-nutritive substances in food which are indicated to affect VO .2Max athlete is Nitrate. The presence of nitrate content will play a role in the body's aerobic resistance system by involving nitric oxide (NO) which will increase the efficiency of oxygen use in the energy production mechanism. In addition, nitrate in beetroot has a higher digestibility and can also function to help blood Fasodilation so that blood can flow smoothly, then VO2Max in the athlete's body will increase due to delayed fatigue.

Based on the description above,The sample in this study was the Athletes of the Futsal Academy from Stock Bina Guna. Futsal athletes at the club have endurance problemsVO2the max. VO2The max of the futsal athlete is below the normal average VO2Max a futsal athlete.so it is necessary to provide training that can improveVO2Max, accompanied by the provision of beetroot juice as an antioxidant for athletes.The antioxidant content in beets makes researchers interested and feel the need to do research"Effects of exercise and beetroot juice pemberian*(Beta Vulgaris L*)to the maximal

oxygen volume (VO_2Max) for the athletes of the futsal academy Stock Bina Guna in 2021".

II. Research Method

This research was conducted at the STOK Binaguna futsal academy training ground which is located on Jalan Aluminum Raya, No. 77, Tanjung Mulia downstream, Medan Deli sub-district, Medan City, North Sumatra.This research was conducted from November 2021 to January 2022. In this study, the population was futsal athletes at STOK Binaguna Medan.The sample is a part of the whole as well as the characteristics possessed by a population, (Sugiyono, 2014: 118). From a sample population of twenty-eight people at the STOK Binaguna academy,then do the initial test. After obtaining the data, who met the criteria as a sample of 15 people, then ranked to be divided into three groups using the matching technique (matching by pairing), with the aim of forming a more homogeneous sample.

Table 1. Matching By Pairing

A	**B**	**C**
(1)Diky Afandy	(2)Ilham E. Harahap	(3)Amen Ritonga
(6) Risky H. Siregar	(5) Luwis Manihuruk	(4)Kevin
(7) Iin Kurniawan	(8) Stay away from Efendi	(9) Rizky Akbar
(12) M. Akbar	(11) Daniel Maiza	(10) Akhyar M. Nasution
(13) Hisham	(14) Matthew Hutagalung	(15) Badrul Daffa Sinaga

The research was conducted using experimental methods. The experimental method is a research method used to find the effect of certain treatments (Sugiyono, 2014:12). In this study is to compare the 3 groups, namely: The group was given exercise and given beetroot juice: The group was only given exercise: and the group was only given beetroot juice. The research design used is the one group pre-test-post test design. Before giving treatment, this design conducts a pre-test first to see the effect before being treated and after being given treatment. The form of the design chart is as follows:

Table 2. The one group pre test-post test design

A1	X	A2
Pre-test	Treatment	Post-test

The data collection technique used in this study was to measure VO2 Max at the beginning. After the initial data is obtained, then it is arranged from the highest to the lowest value, then divided into three groups. The division of groups in this study is distinguished from the treatment given by researchers to each group, namely:

Table 3. Research Sample Grouping

Group	Pre-Test	Treatment	Post Test I	Post Test II
A	A1	VO2 Max Workout & Beetroot Juice	A2	A4
B	B1	VO2 Max Workout & No Beet Juice	B2	B4
C	C1	No Exercise VO2 Max & Beetroot Juice	C2	C4

In the case of this study that uses the Blepp Test as a measuring instrument for VO2 Max in the sample, the instrument*bleep test*has a validity of 0.915 and a reliability coefficient of 0.868 (Nurhasan & Hasanudin Cholil, 2007: 76).The data analysis technique in this study used the t test. After the paired sample t-test was performed for each group. Then the next step is the One-way Anova test. The type of Anova used in this study is One-way Anova or one-way Anova, because it only pays attention to one variable, namely the increase in VO2 Max results. After that, it was continued with post hoc LSD analysis to compare each group (significance level $p<0.05$).

III. Result and Discussion

3.1 Pre-test and Post-test experimental group exercise and administration of beetroot juice (A)

Table 4. Description of VO2 Max Statistics in the Exercise and Beet Juice Administration Group (A)

	Pre-test (A)	Post-test I (A)	Post-test II (A)
mean	41.57 ml/kg/min	42.81 ml/kg/min	41.95 ml/kg/min
median	43.30 ml/kg/min	42.40 ml/kg/min	42.40 ml/kg/min
Std. Deviation	2,791 ml/kg/min	2,724 ml/kg/min	2,872 ml/kg/min
Variance	7,794 ml/kg/min	7,425 ml/kg/min	8,250 ml/kg/min
Minimum	37.45 ml/kg/min	39.20 ml/kg/min	37.80 ml/kg/min
Maximum	43.90 ml/kg/min	45.80 ml/kg/min	44.85 ml/kg/min

Based on the statistical descriptive data above, the maximum oxygen volume value (VO2Max) in group A with an average of 41.57ml/kg/min. Minimum value 37.45ml/kg/min, maximum value 43.90ml/kg/min, and a standard deviation of 2.791.

Table 5. Data VO . Statistics Description2Max in Exercise Group (B)

	Pre-test (B)	Post-test I (B)	Post-test II (B)
mean	41.38	42.09	41.34
median	43.30	42.85	42.40
Std. Deviation	3.062	3,215	3,218
Variance	9,377	10,340	10,357
Minimum	36.50	37,10	36,40
Maximum	43.60	45,50	44.85

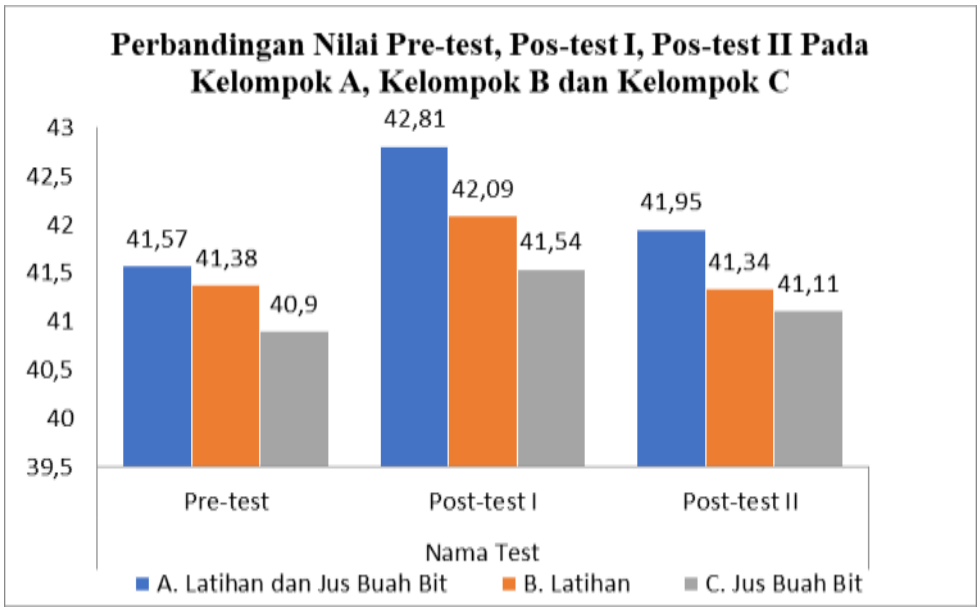
Based on the statistical descriptive data above, the maximum oxygen volume value (VO2Max) in group B with an average of 41.38, a minimum value of 36.50, a maximum value of 43.60 and a standard deviation of 3.062.

Table 6. Data VO. Statistics Description2Max in the Beetroot Juice Giving Group ©.

Statistics

	Pre-test ©	Post-test I ©	Post-test II ©
mean	40,90	41.54	41.11
median	42.40	42.50	41.80
Std. Deviation	3,556	3,100	3.116
Variance	12,650	9,613	9,713
Minimum	35.00	36,40	36.05
Maximum	43.60	44.20	43.60

Based on the statistical descriptive data above, the maximum oxygen volume value (VO2Max) in group C with an average of 40.90, a minimum value of 35.00, a maximum value of 43.60 and a standard deviation of 3.556.



Prior to data analysis, a prerequisite test for data analysis will be carried out which includes normality test and homogeneity test. The results of the analysis prerequisite test are:

Table 7. Normality Test Results

Data	Shapiro-Wilk (sig)	Sig.	Information
Pre-test (A)	0.156	>0.05	Normal
Post-test I (A)	0.686	>0.05	Normal
Post-test II (A)	0.688	>0.05	Normal
Pre-test (B)	0.076	>0.05	Normal
Post-test I (B)	0.716	>0.05	Normal
Post-test II (B)	0.699	>0.05	Normal
Pre-test (C)	0.129	>0.05	Normal
Post-test I (C)	0.242	>0.05	Normal
Post-test II (C)	0.214	>0.05	Normal

Based on the table above, it can be seen that all data (Pre-test, post-test I and post-test II) have a p value (Sig.) of more than 0.05 (p> 0.05), so the data is normally distributed. Homogeneity test aims to test the similarity of the sample that is uniform or not the variance of the sample taken from the population. The homogeneity rule if Sig > 0.05, then the test is declared homogeneous. The results of the homogeneity test in this study can be seen in the following table:

Table 8. Homogeneity Test

Group		Levene Statistics	df1	df2	Sig	Information
VO2Max	Pre test	0.058	2	12	0.944	Homogeneous
	Post-test I	0.027	2	12	0.973	Homogeneous
	Post-test II	0.020	2	12	0.981	Homogeneous

From the table above, it can be seen the value of Sig. p > 0.05 so that the data is homogeneous. Because the data is homogeneous, the data analysis can be continued. This study uses experimental research methods, research data analysis using t-test, carried out by comparing the results of the pre-test / post-test between the three treatment groups in this study, so that the effect can be seen. If the t value is smaller than t table then Ha is rejected, and if the value of t count is greater than t table then Ha is accepted. The results of the t test are as follows:

The conclusion of the study is stated to be significant if the value of t count > t table and the value of sig. Less than 0.05 (sig. < 0.05). Based on the analysis obtained the following data:

Table 9. Pre-test and Post-test Results of Exercise Group and Giving beetroot juice

Group A		Average ± SD	mean different	t-count	*Sig.*	Note:
VO2 Max	Pre test	41.57±2.724	1,240	1,583	0.189	Not significant
	Post-test I	42.81 ± 2.791				

From the results of the t-test, it can be seen that the t-count is 1.583 and the t-table for df = 6-2 = 4 is 2.776 with a significant p value of 0.189. Because the t-count < t-table (1.583 < 2.776) and the significant value 0.189 > 0.05, this result shows that there is no significant difference between the pre-test data and post-test I data. Thus, the alternative hypothesis (Ha) rejected, which means there is no significant difference in maximal oxygen volume (VO2max) on futsal athletes before and after being given training andbeetroot juice (Beta vulgaris L).

Table 10. T-Test of Pre-test and Post-test Results of the Exercise Group

Group B		Average ± SD	mean different	t-count	*Sig.*	Note:
VO2 Max	Pre test	41.38 ± 3.062	0.710	1,890	0.132	Not significant
	Post-test I	42.09±3.215				

From the results of the t-test, it can be seen that the t-count is 1.890 and the t-table for df = 6-2 = 4 is 2.776 with a significance value of 0.132. Because the value of t-count < t-table (1.890 < 2.776) and significant 0.132 > 0.05, this result shows that there is no significant difference. Thus, the alternative hypothesis (Ha) is rejected, which means there is no significant difference between the maximal oxygen volume (VO.)2max) on futsal athletes before and after being given trainingVO_2Max.

Table 11. t-test results of pre-test and post-test of the beetroot juice administration group.

Group C		Average ± SD	mean different	t-count	*Sig.*	Note:
VO2 Max	Pre test	40.90±3.556	0.640	2,690	0.055	Not significant
	Post-test I	41.54±3,100				

From the results of the t-test, it can be seen that the t-count is 2.690 and the t-table for df = 6-2 = 4 is 2.776 with a significant p value of 0.055. Because the value of t-count < t-table (2.690 < 2.776) and a significant value of 0.055 > 0.05, this result shows that there is no significant difference. Thus, the alternative hypothesis (Ha) is rejected, which means that there is no significant difference in the maximal oxygen volume (VO.)2max) to futsal athletes before and after being givenbeetroot juice (Beta vulgaris L). This means that the administration of beetroot juice (Beta vulgaris L) has no significant effect onmaximal oxygen volume (VO2max) for futsal athletesAcademy STOK Binaguna 2021.

In the discussion above, it has been explained about the data from the Comparison of Pre-test and Post-test Group C, after that in this discussion will be explained about the results of the Anova test analysis on VO2 Max before (pre-test) and after intervention (post-test I), and the increase in VO2 Max before and after the intervention between the three groups which will be presented in Table 12 below:

Table 12. VO2 Max Data Increase in pre-test and post-test I

No	Name	Group	Pre test	Post-test I	Difference
1	Diky Afandy	A	43.90	45,80	1.9
2	Risky H. Siregar		43.30	45,20	1.9
3	Iin Kurniawan		43.30	41.45	-1.85
4	M. Akbar		39,90	42.40	2.5
5	Hisham		37.45	39,20	1.75
6	Ilham E. Harahap	B	43.60	45,50	1.9
7	Luwis Manihuruk		43.30	42.85	-0.45
8	Effendy		43.30	43.90	0.6
9	Danil Maiza		40,20	41.10	0.9
10	Matthew Hutagalung		36.50	37,10	0.6
11	Amen Ritonga	C	43.60	44.20	0.6
12	Kevin		43.30	43.90	0.2
13	Rizky Akbar		42.40	42.85	0.1
14	Akhyar M. Nasution		40,20	41.10	0.9
15	Badrul Daffa Sinaga		35.00	36,40	1.4

After knowing the data on the increase in VO2 max in each group, the next step is to carry out the One-way ANOVA test as follows:

Table 13. One way ANOVA Test Analysis Table Post-test Data I

Data Post test I		**Average ± SD**	**F-count**	***Sig.***	**Note:**
VO2 Max	Group A	42.81 ± 2.724	0.222	0.804	Not significant
	Group B	42.09±3.215			
	Group C	41.54±3,100			

Based on the results of the ANOVA test analysis above, it is obtained that the calculated F value is 0.222 with a significance of 0.804 > 0.05, then Ho is accepted and Ha is rejected, meaning that there is no effect. a significant increase in VO_2Max among the three groups of futsal athletesAacademy STOCK Binaguna in 2021.

Table 14. One way ANOVA Test Analysis Table Post-test II . Data

Post test data II		**Average ± SD**	**F-count**	***Sig.***	**Note:**
VO2 Max	Group A	41.95±2.872	0.100	0.906	Not significant
	Group B	41.34±3.218			
	Group C	41.11±3.116			

Based on the results of the ANOVA test analysis above, the calculated F value is 0.100 with a significance of 0.906 > 0.05, then Ho is accepted and Ha is rejected, meaning there is no difference.a significant increase in VO2 Max between the three groups of futsal athletesAcademy STOCK Binaguna 2021. This means training and giving beetroot juice*(Beta Vulgaris L*)does not have a significant effect on increasing the maximum oxygen volume (VO2 Max) in futsal athletesAcademy STOCK Binaguna 2021. To find out whether or not there were significant differences between groups, the Post Hoc Tests were carried out in the following table:

Table 15. Summary of LSD Test Results based on Comparison of Increase in VO2 Max between Group A, Group B and Group C

(I) Group	(J) Group	Mean Difference (IJ)	Std. Error	Sig.
Group A	Group B	,72000	1.91064	0.713
	Group C	1.27000	1.91064	0.519
Group B	Group A	-,72000	1.91064	0.713
	Group C	,55000	1.91064	0.778
Group C	Group A	-1.27000	1.91064	0.519
	Group B	-.55000	1.91064	0.778

If the value of sig < 0.05 then there is a significant difference between groups. Or by looking at the value in the Mean Difference, if there is an asterisk (*) then there is a significant difference. Based on the table above, through the LSD Post Hoc Test, it is known that the differences between groups are summarized as follows: Exercise Group and Beet Juice Giving – Exercise Group: Not Significant

There was no significant effect in group A (which was given exercise and giving beetroot juice).*(Beta Vulgaris L*)) with Group B (which was given exercise but not given beetroot juice) with p 0.713 > 0.05 to increaseVO2Max sample.

3.2 Exercise and beetroot juice giving group beet juice giving group: not significant

There was no significant difference between group A (which was given exercise and the administration of Bit fruit juice).*(Beta Vulgaris L*)) with group C (which was not given exercise but was given beetroot juice) with p 0.519 > 0.05 for an increase inVO2Max sample.

3.3 Exercise Group Beet Juice Giving Group: Not Significant

Which means there is no significant difference betweenGroup B (which was given exercise but not given beetroot juice) with group C (which was not given exercise but was given beetroot juice) with p 0.778 > 0.05 for an increase inVO2Max sample. To determine the impact of retention on the decrease in VO2 Max from Post-test I to Post-test II in each group, paired sample test t-test was used.

Table 16. Paired Sample test Retention Impact of Decreased VO2Max post-test data I to Post-test II in Group A, Group B and Group C.

Data		Average ± SD	mean different	t-count	*Sig.*	Note:
Group A	Post-test I	42.81 ± 2.724	-0.860	-3.723	0.020	Significant Decrease
	Post-test II	41.95±2.872				
Group B	Post-test I	42.09±3.215	-0.750	-7.234	0.002	Significant Decrease
	Post-test II	41.34±3.218				
Group C	Post-test I	41.54±3,100	-0.430	-2,974	0.041	Significant Decrease
	Post-test II	41.11±3.116				

Based on the results of the t-test above, it is known that the overall significance value of the data in each group shows a significant valueα> 0.05. From these data shows that the impact of retention causes a significant decrease in VO2Max futsal athletes in each group.

IV. Conclusion

Based on the results of the research and discussion above, several conclusions can be drawn, namely:

1. There is no significant effect on maximal oxygen volume (VO2max) after being given training andbeetroot juice (Beta vulgaris L) for futsal athletesAcademy STOK Binaguna 2021.
2. There is no significant effect on maximal oxygen volume (VO2max) after being given training to futsal athletesAcademy STOK Binaguna 2021.
3. There is no significant effect on maximal oxygen volume (VO2max) after givenBeetroot juice (Beta Vulgaris L) for futsal athletesAcademy STOK Binaguna 2021.
4. There is no significant effect on increasing VO2Max in the three research groups. However, when viewed from the average value of the increase in VO2Max, it was concluded that the sample in group A (exercise and beetroot juice) experienceincrease in VO2Max is better than group B (exercise), and group C (juice).
5. The impact of retention in this study on futsal athletesAcademy STOCK Binaguna 2021in each group is to cause a decrease in maximal oxygen volume (VO2Max).

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