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APPLYING CONCENTRATED SOLUTION OF *PALM SUGAR* + *5%* NaCl PRIOR TO EXERCISING AND ITS EFFECTS ON AEROBIC ENDURANCE

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----------**ABSTRACT**----------
This study aimed to determine the effect of applying palm sugar+5% NaCl solution prior to exercising on aerobic endurance. The study was conducted to 60 2011/2012 students of Penjaskes-Rek at FKIP of Halu Oleo University. The sample were determined through simple random sampling technique. The study used a true experimental design with randomized pre-test-post-test control group design. The instrument of the research was Multi Stage Test.

The results of the study shown that the application of 80% palm sugar + 5% NaCl solution 30 minutes prior to exercising can significantly improve aerobic endurance both in the first, second, and third attempt, as was indicated by the value of F_{count} *= 5,54 with a probability value of (p) = 0,001 < α 0,05. Likewise, the experimental group consuming a solution of 80% palm sugar 30 minutes prior to exercising experienced a more significant improvement in aerobic endurance than did the experimental group both in the first, second, and third attempt, in which the* F_{count} *= 6,72 with a probability value of (p) = 0,001 < α 0,05. There was no significant difference in the effects of applying 80% palm sugar on the aerobic endurance of the group receiving 80% palm sugar +5% NaCl, both in the first, second, and third attempt, in which* F_{count} *= 1,36 with a probability value of (p) =0,245 > α = 0,05.*

Keywords: *solution of 80% palm sugar + 5% NaCl, prior to exercising, aerobic endurance.*

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I. INTRODUCTION

Nutrition is an important variable that determines a sportsman's performance. Sufficient nutrition in an athlete's body can support the availability of energy needed by muscles and brain to work optimally. Sources of energy can be obtained from a variety of food sources, such as carbohydrate, fat, and protein. The speed at which energy is formed by our body has a great influence on our physical performance. In addition, the amount of energy formed is contingency upon a number of factors, including: the substrate concentrate of the main source of energy and the intensity of the physical activities being performed. According to Wolinsky (1994), optimal food can provide sufficient energy that generates work power and allows for more effective, faster recovery from fatigues, since the nutrient reserve can be reused at a state of homeostatic.

To optimize muscle work and cardiorespiratory system, our body needs vitamins and minerals that regulate and assist the chemical reaction of energy-producing nutritious substances, as co-enzyme and co-factor. In the event when one or more of them suffers deficiency, exercise capacity can be hampered. The need for water-soluble vitamins (B and C) increases when our body needs more energy. Research suggests that moderate-level depletion of iron can decrease exercise performance. The vitamins and minerals that are importantly related to sport activities are such vitamins as A, B, C, D, E and K, and such minerals as Ca, Fe, Na, K, P, Mg, Cu, Zn, Mn, J, Cr, Se and F (Clark, 1996).

Nowadays, many supplementary food and drinks are produced and often consumed by athletes to support their sporting activities and help them achieve top performance. One of alternative source of energy that can also function as energy reserve is palm sugar. Palm sugar contains complex carbohydrate and 368 kilocalories (Depkes, 2012). It also contains important minerals needed to support metabolism process and optimize our muscles, heart, and lungs work.

The contents of nutritional and mineral substances in every 100 gram of palm sugar are shown in the table below.

Table 1: Nutritional contents of every 100 gram of *Palm Sugar*

No	Nutritional Substance	Weight
1	Energy	386kkal
2	Carbohydrate	97,3 gr
3	Protein	0
4	Fat	0
5	Water	1,6 gr
6	Calcium (Ca)	85,mg
7	Iron (Fe)	1,9 mg
8	Magnesium (mg)	29,0 mg
9	Phosphor (P)	22,0 mg
10	Potassium (K)	346,0 mg
11	Natrium (Na)	39,0 mg
12	Zinc (Zn)	0,18 mg
13	Selenium (Se)	1,2 mg
14	Thiamin	0,08 mg
15	Riboflavin	0,7mg
16	Niacin	0,082 mg
17	Pyridoxine	0,026 mg

source: Directorate of Nutrition, Department of Health, RI (in Hatta, 1994)

The other benefit of palm sugar is that it contains low Index Glycemic (IG) and it dissolves gradually in our body fluid over a long time. For these reasons, palm sugar can quickly produce energy (Bandrek & Legiit :2010).

A study by the Philippine Food and Nutrition Research Institute reports that palm sugar contains more macro nutrient than do honey and sugar cane, as well as nitrogen, chloride (Cl), sulfur, and boron that are not found in other sweeteners. Since it does not dissolve in our body fluid quickly, palm sugar can produce energy for longer time (Nur Muhamad, 2012)

So far *palm sugar* has only been used in household industries, mainly as an ingredient of cakes, drink sweeteners, and energy drink such as *gentong mas* (Sikirman, 2012). To date, there has not been any study yet on the benefits of *palm sugar* as supplementary drink that supports sporting activities.

A study by Saiful (2013) on 2010-2011 students of Penjaskes-Rek of FKIP-UHO found that, compared to drinking mineral water, consuming 250 ml drink of 80% *palm sugar* 30 minutes prior to exercising had a more significant effect on the improvement of aerobic endurance.

In this current study, the researcher added 5% of natrium chloride to the drink containing 80% of *palm sugar*. Natrium chloride is one important element to help with muscles relaxation and assist cells to absorb nutrients (Mc. Ardle, 1994).

Considering the aforementioned reasons, this study was set out to determine:

a. The effect of consuming drink with 80% of *palm sugar* prior to exercising on aerobic endurance.
b. The effect of consuming drink with 80% of palm sugar plus 5% of *NaCl* on aerobic endurance.
c. The different effects resulted from consuming drink with 80% of palm sugar and from drinking 80% palm sugar plus 5% NaCl on aerobic endurance.

II. METHOD

This study used an experimental design and employed a *randomized pre-test post-test control group design* (Sugiyono, 2006). The experiment was conducted at the *Sport Centre* of Halu Oleo University of Kendari for 5 months, from May to September 2014.

The population of the study was all year 2011 and 2012 students of Penjaskes-Rek department at FKIP Halu Oleo University, totaling 157. The sampel were 60 students, who were determined through a simple *random sampling* technique.

To measure aerobic endurance, a "*Multi Stage test"* (McKenzie, 1999) instrument was used, that is, having students make a 20-meter two-way run, while synchronizing with certain rhythms.

Regarding the research procedure, the following stages were taken in this study:

1. Preparing research materials and conducting a chemical analysis on the mineral contents of *palm sugar.*
2. Administering a pre-test in the form of *stage test,* to obtain a preliminary data about the aerobic endurance of all samples of the study.
3. Once the data of initial aerobic endurance from the results of pre-test were collected, the samples were split into 3 (three) groups by using a technique of *matched ordinal pairing*. The three groups were:
   - First experimental group, comprising 20 students.
   - Second experimental group, comprising 20 students.
   - Control group, comprising 20 students.

1. Conducting *first*, *second* and *third* replicated experiments to each group, in the following manner:
   a. Each student in the first experimental group was asked to consume 250-ml drink containing 80% *palm sugar* 30 minutes before starting exercise.
   b. Each student in the second experimental group drank 259-ml drink containing 80% of palm sugar plus 5% of NaCl 30 minutes prior to exercising.
   c. Each student in the control group drank 250 ml mineral water.
   d. Thirty minutes after drinking the palm sugar, all students took a *multi stage test* in their own groups, to measure their aerobic endurance.
   e. A period of one month after the first experiment was allowed before replicating it in the second experiment, and another one month before doing it the third time.

III. RESULTS

A. Aerobic Endurance

This study measured the aerobic endurance of the subjects in three groups of treatment, comprising one pre-test group (which consumed mineral water) and three replicated experiments with 80% palm sugar, and pretest group (which consumed mineral water) and three replicated experiments with 80% palm sugar plus 5% natrium chloride (NaCl). The following table presents a description of the aerobic endurance of the students in those three groups.

Table 2

A Summary of the Treatment Group's Characteristics of Aerobic Endurance

Variable	Mean	StDev	Var	Min	Median	Max	Range
PRE-1	45,027	2,787	7,768	40,8	44,9	51,4	10,6
80%-P1	49,02	5,39	29,04	43,3	46,5	63,2	19,9
80%-P2	50,02	5,5	30,21	44,2	47,1	62,5	18,3
80%-P3	50,21	5,47	29,97	43,9	47,1	63	19,1
PRE-2	46,642	4,148	17,208	40,5	45,8	58,2	17,7
80%+5% NaC-P1	50,085	4,817	23,205	43,3	50,2	63	19,7
80%+5%NaCL-P2	51,042	4,437	19,685	44,5	51,9	64,5	20
80%+5%NaCL-P3	50,915	4,454	19,841	45,2	51,2	64,3	19,1

Notes :
PRE-1 = Pre-test 1 with 80% palm sugar
PRE-2 = Pre-test 2 with 80% palm sugar +5%NaCl
P1 = Experiment/replication 1
P2 = Experiment/replication 2
P3 = Experiment/replication 3

2. Hypothesis Testing

The results of testing the difference in the aerobic endurance demonstrated by pre-test group which consumed 80% *palm sugar* and by the pre-test group which drank 80% *palm sugar* + 5% NaCl are shown in the next table.

Table 3

A test on Aerobic Endurance Difference by Pre-test Group with 80% *palm sugar* and a Pre-test Group with 80% *palm sugar*+5% NaCl

Source	DB	Total of Quadrats	Average of Quadrats	F_{count}	P
Group	1	33,9	33,9	2,72	0,106
Galat	50	624,4	12,5		
Total	51	658,3			

Table 3 shows that there was no significant difference between the aerobic endurance possessed by the research subjects in the pre-test group that consumed 80% palm sugar and that which was possessed by the pre-test group with 80% palm sugar + 5% NaCl. This was indicated by the value of F_{count} = 2.72, with a probability of p = 0.106 > out of the value of α = 0.05. A comparison of the aerobic endurance average between the two pre-test groups is presented in the next figure

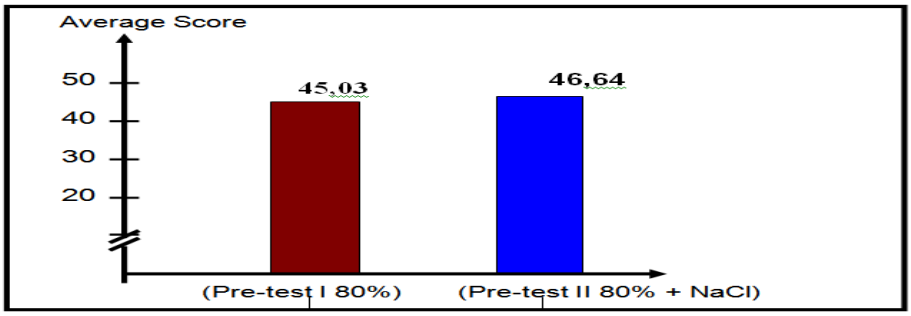

Figure 1
A Histogram of the Average Scores of Pre-test I and Pre-test II

2. Testing the Group which consumed 80% *Palm Sugar* and the Group which consumed 80% *Palm Sugar* + 5% NaCl

The results of variants analysis to determine the overall difference in aerobic endurance between the group receiving 80% palm sugar and those consumed 80% *palm sugar* + 5% NaCl are summarized in the following table:

Table 4
Results of Testing the difference in aerobic endurance between the group consuming 80% *Palm Sugar* and that which consumed 80% *Palm Sugar*+5% NaCl

Source	DB	Total of quadrat	Average of Quadrat	F-count	P
Treatment (Group)	1	33,9	33,9	1,36	0,245
Galat	154	3334,4	24,9		
Total	155	3868,3			

Table 4 shows that there is no significant difference in the aerobic endurance between the group consuming 80% *palm sugar* and those which received 80% palm sugar + 5% NaCl. This is indicated by the value of F_{count} = 1.36, with a probability (p) = 0,245, which is higher than the value of α = 0,05. A comparison of the average of aerobic endurance by both groups is presented in the next figure.

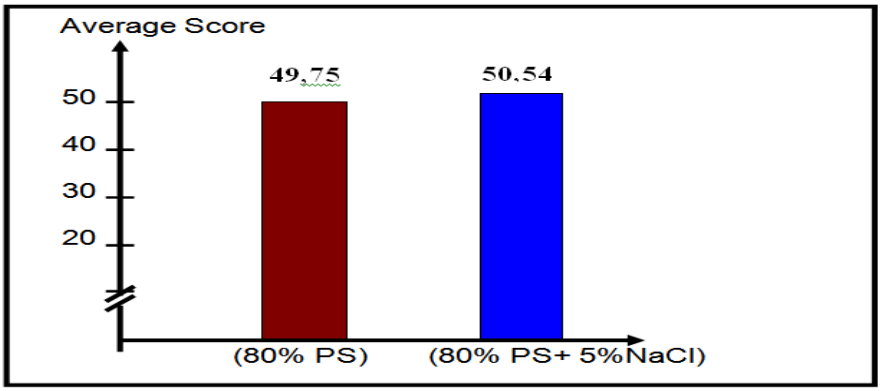

Figure 2

A comparison of aerobic endurance between the group comsuming 80% Palm Sugar and the one taking 80% Palm Sugar + 5%NaCl

3. Testing the Group that Consumed 80% Palm Sugar

Prior to testing the hypothesis of this study, a variants analysis was done to measure the difference of aerobic endurance experienced by all four experimental groups, both those which consumed 80% *palm sugar* and the ones taking 80% *palm sugar* + 5% NaCl . The following table summarizes the results of the variants analysis.

Table 5
Testing the difference of aerobic endurance of the group consuming 80% *Palm Sugar*

Source	DB	Sum of Quadrat	Average of Quadrat	F-count	P
Treatment (Replication)	3	456,2	152,1	6,72	0,001
Galat	100	2424,9	24,2		
Total	103	2881,1			

It can be seen from Table 5 that there is a difference in the aerobic endurance among the four groups that received treatment, which comprise one pre-test group and three replicated experiments (P1, P2, P3) that consumed 80% *palm sugar*, as indicated by the value of F_{count} = 6,72, with a probability (p) = 0,001, that is lower than the value of α = 0,05. Next, a test on the difference of aerobic endurance among the groups receiving treatment was administered to determine which group experienced more significant difference. The results of the difference testing are summarized in the following table.

Table 6.
The results of variants Analysis to determine the difference in aerobic endurance between different treatments to the groups taking 80% *Palm Sugar*

	PRETEST-1	P11	P12	P13
PRETEST-1		F-count= 11,24	F-count= 17,09	F-count= 18,49
		P = 0,002	P = 0,000	P = 0,000
		F-tab= 2,00	F-tab= 2,00	F-tab= 2,00
P11	F-count= 11,24		F-count= 0,450	F-count= 0,63
	P = 0,002		P = 0,508	P = 0,432
	F-tab= 2,00		F-tab= 2,00	F-tab= 2,00
P12	F-count= 17,09	F-count= 0,450		F-count=
	P = 0,000	P = 0,508		P
	F-tab= 2,00	F-tab= 2,00		F-tab= 2,00
P13	F-count= 18,49	F-count= 0,63	F-count= 0,010	
	P = 0,000	P = 0,432	P = 0,904	
	F-tab= 2,00	F-tab= 2,00	F-tab= 2,00	

It is clear from Table 6 that there was a difference in the aerobic endurance between the pre-test group which consumed mineral water and the group taking 80% *palm sugar* in the first, second, and third replicated treatments. This is indicated by the value of F_{count} = 11,24 > F_{table} -2,00, at the probability value of (p) = 0,002 < α = 0,05. With regard to the results of the first, second, and third replicated treatments, there was no significant difference between one and the others, as was indicated by the probability value of (p) = 0,904 > α = 0,05. The difference in the aerobic endurance among the four experimental groups which consumed 80% palm sugar is presented in Table 3 below.

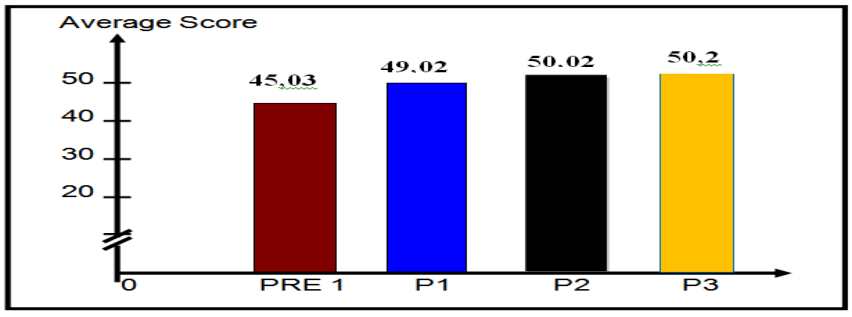

Figure 3

The Average Score of Aerobic Endurance between Pre-test I and Replicated Treatment I, II, and III with 80% Palm Sugar

Figure 3 visually suggests that a teatment with 80% palm suagr can improve the aerobic endurance of the subjects which received 3 (three) replicated experiments, compared to those subjects which only consumed mineral water in the beginning (pretest).

4. Testing the Group which consumed 80% *Palm Sugar* + 5% NaCl

The results of variants analysis that determines the difference in the aerobic endurance of the group which received 80% *palm sugar* + 5% NaCl are summarized in Table 7.

Table 7
The results of testing the aerobic endurance of the group consuming 80% *Palm Sugar*+5% NaCl

Source	DB	Sum of Quadrat	Average of Quadrat	F-count	P
Treatment (Replication)	3	332,1	110,7	5,54	0,001
Galat	100	1998,5	20,0		
Total	103	2330,6			

Table 7 indicates that there was a difference in the aerobic endurance of the subjects in the groups that received treatments, which comprises one pre-test group and one group receiving three replicated treatments (P1, P2, P3) with 80% *palm sugar* + 5% NaCl. This was shown by the value of F_{count} with a probably of p = 0,001 < α = 0,05. A test on the difference of aerobic endurance between the four groups was then conducted to determine the extent to which each of the treatment affected significantly. The results of this test is presented in Table 6 below.

Table 8
The results of Varian Analysis which determines the aerobic endurance difference between the groups consuming 80% *Palm Sugar* + 5% NaCl

	PRETES-2	P21	P22	P23
PRETEST-2		F-count= 7,62	F-count= 13,64	F-count= 12,81
		P = 0,008	P = 0,001	P = 0,001
		F-tab= 2,00	F-tab= 2,00	F-tab= 2,00
P21	F-count= 7,62		F-count= 0,56	F-count= 0,42
	P = 0,008		P = 0,459	P = 0,521
	F-tab= 2,00		F-tab= 2,00	F-tab= 2,00
P22	F-count= 13,64	F-count= 0,56		F-count= 0,01
	P = 0,001	P = 0,459		P = 0,918
	F-tab= 2,00	F-tab= 2,00		F-tab= 2,00
P23	F-count= 12,81	F-count= 0,42	F-count= 0,001	
	P = 0,001	P = 0,521	P = 0,918	
	F-tab= 2,00	F-tab= 2,00	F-tab= 2,00	

As is obvious from Table 8, there was a difference in the aerobic endurance between the pre-test group (which consumed mineral water) and the experimental group which took 80% *palm sugar* + 5% NaCl in the first, second, and third replicated treatment. This is indicated by the value of F_{count} = 7,62 , which is higher than the value of F_{tabel}= 2,00, at a probability value of (p) =0,008, that is lower than α = 0,05. The results of the first, second, and third replicated treatment, however, showed no significant differences between one and the others, since the probability valus was (p) =0,45, which is higher that the value of α = 0,05. The difference of the average score of the aerobic endurance between the four experimental groups that consumed 80% palm sugar is shown in Table 4.

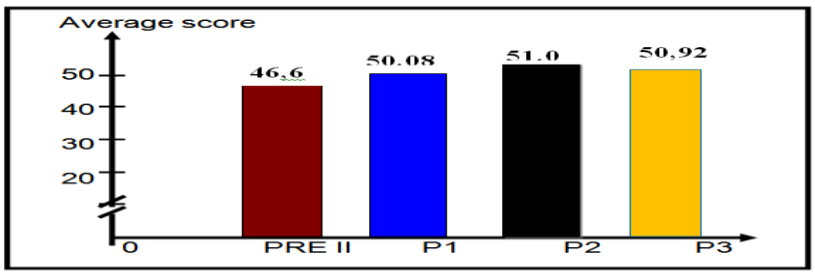

Figure 4

The average score of the aerobic endurance of the Pre-test I group and the group receiving three replicated experiments with 80% Palm Sugar + 5% NaCl

Figure 4 indicates that the experiments with 80% *plam sugar* + 5% NaCl can improve the aerobic endurance of the subjects in this study who received three replicated tretaments, a result not demonstrated by the group that drank mineral water at the beginning of the experiment (pre-test).

IV. DISCUSSION

Based on the results of the statistical analysis of the aerobic endurance prior to treatment (pre-test) that was given to the experimental group (that consumed 80%of *palm sugar* solution), it was found that there was no significant difference, as indicated by the value of F_{count} with a probability p = 0,106, which is higher than the value of α = 0,05. Similarly, the second experimental group which took a solution of *80% palm sugar* plus *5%* NaCl did not show a significant difference, as can be implied from the value of F_{count} with a probability p = 0,245, which was higher than the value of α = 0,05. Based on the results of these testings, it can be claimed that prior to the treatments, all the three groups (i.e., the experimental groups with 80% *palm sugar* 80%, the one with *palm sugar* 80% + 5 NaCl, and the control group) showed a similar degree of aerobic endurance. Therefore, since the results of the experiments indicated a difference in aerobic endurance, it is conclusive to say that the difference was the result of the given treatments.

The experiments conducted in this study were replicated three times, with a time interval of one month between each experiment. The purpose of doing these was to avoid the effect of exercise or endurance test.

The testing on the control group (which consumed mineral water) and the first experimental group (to which a solution of 80% *palm sugar* was applied in the first, second, and third experiment) showed a significantly different result. This was indicated by the value of F_{count} which is higher that the value of F_{table}, and the probability value (p) which is lower than the value of α = 0,05. The same case occured to the experimental group which received a solution of 80% *palm sugar* plus 5% Natrium Cloride (NaCL), demonstrating a significant difference between the first, second, and third treatment, and the pre-test group, in which the value of F_{count} was higher that the value of F_{table} with a probability value (p) = 0,001, which was lower than α = 0,05. Therefore, this result indicated that applying a solution of 80% palm sugar 80%, with or without adding 5% NaCl, can have a siginificant effect on the improvement of aerobic endurance.

In the first, second, and third replicated experiments with a solution of 80% *palm sugar* 80% , there was no significant difference between one and the others, as was indicated by the value of probability (p) which was higher than α = 0,05. Likewise, the group receiving a solution of *80% palm sugar* + 5% *NaCl* in the first, second, and third replicated experiments shown no significant difference since its probabiltiy value (p) was higher α = 0,05.

The difference between the experimental group receiving 80% *palm sugar* and the one with 80% *palm sugar* +5% NaCl has evidently not shown any differences in the aerobic endurance either in the first, second, or third replicated experiment, given that the value of F_{count} with the probability (p) value of 0,245 was higher than the value of α = 0,05.

Based on these results, the first hypothesis of this study, that is, applying a solution of both 80% palm sugar and 80% palm sugar +5% NaCl 30 minutes prior to exercising can have an effect on aerobic endurance, seems to be accepted. In contrast, the second hypothesis, which states that consuming 80% palm sugar 80% + 5% NaCl can have a better effect than only 80% *palm sugar*, is rejected. Nevertheless, descriptively speaking, the aerobic endurance resulted from consuming 80% palm sugar 80% plus 5% NaCl is a bit better after the first, second, and third treatment pertama, with an average of aerobic endurance = 50,89, in comparison to the experimental group that received 80% *palm sugar*, with an average of aerobic endurance = 49,28.

The improvement of aerobic endurance that was demonstrated through this experiment has been made possible by the fact that palm sugar contains 386 kilo calories, as well as 97,3 kilocalories of complex carbohydrate in every 100 gram of palm sugar. This amount can generate a reserve of energy during an exercise. This is in line with Litwak's (2003) view that the primary sources of energy for various level and types of physical activities can be generated from carbohydrate which mainly functions to maintain our body's functional activates. Two types of carbohydrate have been known: simple and complex carbohydrates. Glucose is one type of simple carbohydrates that can be directly used as a source of energy by our body's cells, and when the amount of glucose exceeds, it will be converted into a reserve of glycogen in our liver and muscles.

In addition to supporting human body's biological activities, the nutrient and mineral contents of *palm sugar* function to control and clean our digestive tract, from the stomach to throat, since palm sugar also contains Reboflovin that functions to expedite metabolism and optimize cell function, to maintain great stamina that can help with the formation of red blood cells; generates antibody, along with enzymes generates energy needed by human body; along with vitamin A repairs the mucous membranes of the digestive tract; and inhibits cell damage during the process of energy production (Jef Gunnent, 2004). Other mineral contained in *palm sugar* is *thiamin;* which functions as co-enzyme in the process of energy metabolism; strengthens nerve and muscle system; assists our body in creating and using protein. *Palm sugar* contains more macro nutrient than does sugar cane, as well as other minerals not contained in other sweeteners, such as nitrogen, chloride (CI), sulfur, and boron (*http://www.asiamaya.com/nutrients/ gula jawa.htm).*

The other advantage of *palm sugar* is that it dissolves in our body gradually, so that it can generate energy for a relatively longer period, one thing that helps athlete improve their stamina during a physical activity. (http://id.wikipedia.org/wiki/Gulaaren)

The natrium (Na) contained in *palm sugar* functions as nerve transmitter, assists in muscle contractions, maintains osmotic blood pressure, serves as a buffer (in the form of Nakarbonat), and maintains muscle cell irritability. The inorganic component of extra cell fluid and the protein contained in palm sugar have an important role to improve the system of muscle performance and the work of cardio-respiration, as well as to increase body stamina and endurance. The vitamins contained in *palm sugar* are also vital to human body, especially because our body cannot produce vitamin, so that vitamin intake from the outside is greatly needed (Nur Muhammad, 2012).

It is evidently a good idea to consume a solution of *palm sugar* half-an-hour prior to doing exercises, considering that *palm sugar* has a low index of glicemic, making it need a long time to convert glucose into energy. The convertion of *palm sugar* into glukosa normally takes about 3-5 minutes, whereas from glukoce into energy also takes about 3 – 5 menit or more. Consuming such drink 30 minutes before starting a physical activity will not cause our stomach to work hard when doing the activity, since by then the food intake has been converted into ATP and stored in muscle cells, so that it will not cause any psychologically harmful effect on the body.

This research has added 5% of natrium chloride (NaCl) into the 80% palm sugar solution, with a view to further improve aerobic endurance, given that natrium chloride functions to assist our muscle work by helping our nerves to relax and by improving the performance of inter-cell electrical signal transmission. It also helps with the absorption of nutrition by our body cells. However, this study has demonstrated that there was no significant difference in aerobic endurance between the group with additional 5% NaCl and the first experimental group with only 80% *palm sugar*. This was because the drink consumed by the first experimental group actually contains NaCl as well, albeit in a very small amount. According to McArdle (1994), our body only needs a very small amount of NaCl, that is, 200-250 mg per day, and if this amount exceeds, the working system of our lung will be negatively affected, as a result of an increase of pressure in our vascular. For this reason, natrium chloride should only be added to a solution of palm sugar in a small amount, or approximately 5%.

V. CONCLUSION

It can be concluded from this study that:

1. Overall there is no significant difference in the aerobic endurance resulted from consuming either 80% palm sugar or 80% palm sugar + 5% NaCl. In other words, the improvement of aerobic endurance resulted from these two different mixtures of concentrated solution is relatively the same.
2. There is a significant difference betwen the aerobic endurance experienced by the pretest group which consumed mineral water and that which was shown by the experiemntal group taking 80% palm sugar, both in the first, second, and third treatment. Consuming 80% palm sugar can evidently improve the aerobic endurance of the subjects in this study.
3. There is a significant difference betwen the aerobic endurance experienced by the pretest group which consumed mineral water and that which was demonstrated by the experimental group drinking 80% palm sugar + 5% NaCl in the first, second, and third replicated treatment. A treatment which involved the consumption of 80% palm sugar + 5% NaCl seemed to be effective in improving the aerobic endurance of the subjects of this study.

VI. SUGGESTIONS

Based on the findings of this study, the following suggestions are offered:

1. Given that consuming a solution of 80% *palm sugar* 30 minutes prior to exercising had evidently a significant effect on aerobic endurance, it is suggested that athletes, coach, and anyone who may concern consider the results of this study in order to improve their aerobic and to be able to perform physical activities in a longer-than-usual period.
2. This study has found that a concentrated solution with 80% *palm sugar* and the one with 80% *palm sugar* + 5% NaCl can evidently improve aerobic endurance. Regarding this finding, it is suggested that athletes, coach, dan anyone who may concern with sporting activities consume a solution of 80 *palm sugar* 80 or 80% *palm sugar +5% NaCl* as much as 250 ml before they start doing any physical activities or exercises, in order to improve their aerobic and cardio-respiratory endurance.

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