Green Coconut Water on Pulse Rate Recovery After Physical Activity

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Abstract. This study aims to determine the effect of giving green coconut water on pulse recovery after physical activity. This study involved 20 people, divided into two groups, namely the intervention group and the control group, each consisting of 10 sports science students, in good condition, healthy body without disabilities, and male aged 20-22 years. All research subjects took the Harvard test alternately for 5 minutes and carried it out for 2 days. On the first day the samples did the Harvard test and then had their pulse measured without being given green coconut water, then on the second day the experimental group was given green coconut water 60 minutes before doing the Harvard test. The results of the analysis using the Paired T test with a confidence level ($\alpha = 0.05$) concluded that giving green coconut water before physical activity had a significant effect on pulse recovery.

Keywords: Coconut Water, Pulse Rate, Recovery

1 Introduction

Physical activity consists of activities during work, sleep and during free time. Everyone does physical activity, or it varies from one individual to another depending on the individual's lifestyle and other factors such as gender, age, occupation, etc. Physical activity is highly recommended for all individuals to maintain health, physical activity is also the key to determining energy use and the basis for balanced energy [1]. Different types and amounts of physical activity are necessary for different health outcomes. Physical activity can increase heart rate if you have a high activity load. This is because the body needs oxygen to the muscle tissue so that the heart contracts more quickly and strongly which will increase the pulse frequency.

Sweating profusely during exercise can cause body fluid loss of approximately 1 liter every hour [2]. Sweat contains various electrolytes, such as sodium (Na+), chloride (Cl-), and potassium (K+) and small amounts of amino acids, bicarbonate (HCO3), carbon dioxide (CO2), copper, glucose, hormones, iron, lactic acid, magnesium. (Mg2+), Nitrogen, phosphate (PO42), urea, vitamins and sweat varies from person to person and will also vary from person to person depending on conditions. Along with the water in sweat, we lose several minerals (electrolytes), such as sodium and potassium, which help the body function normally. We can easily replace this loss with the food and fluids consumed after the game. Fluid is the element that an athlete needs to pay most attention to because it will replace body fluids lost through sweating. Drinks that are good as a

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source of fluid are solutions that contain balanced amounts of electrolytes and dextrose, such as ORS solutions and sports drinks [3]. This kind of drink is isotonic so it avoids the symptoms of bloating that an athlete might experience if they drink large amounts of water at once [4]. Reducing the amount of fluid in the body as a result of sweating is one of the factors that causes fatigue and decreased performance. For this reason, people who have done physical activity or exercise usually consume isotonic drinks. Isotonic drinks are liquids that are made to be drunk. where the concentration of water in the intracellular fluid is the same and dissolved substances cannot enter or the concentration is the same as body fluids [5], [6]. Young coconut water is very good to consume because young coconut water can be said to be a natural isotonic drink which has the same level of balance as our blood. Coconut water also has many ingredients that are beneficial for our bodies, one of the ingredients in coconut water is the mineral Potassium or Potassium which is the most abundant so it can restore stamina, both in old coconut water and young coconut water [7], [8].

Coconut water is natural, sterile water and contains high levels of potassium, chlorine and chlorine. In the food industry, coconut water is used as a raw material for making soy sauce and nata de coco [9]. In the Philippines, coconut water is used to make jelly, alcohol, dextran, vinegar and nata de coco. In Indonesia, coconut water is used as a drink (young coconut water) and as an ingredient in making nata de coco [10], [11]. The analysis results show that young coconut water contains 95.5% water, 0.1% protein, less than 0.1% fat, 4.0% carbohydrates and 0.4% ash. Coconut water also contains vitamin C 2.2-3.4 mg/100ml and vitamin B complex consisting of nicotinic acid, pantothenic acid, biotin, folic acid, vitamin B1 and a small amount of pyridoxine [7].

Coconut water contains a variety of nutrients, including vitamins, minerals, antioxidants, amino acids, enzymes, growth factors and others [2]. Coconut water is a good source of important minerals, such as magnesium, calcium and potassium. Coconut water also contains various trace elements, such as zinc, selenium, iodine, manganese, boron, molybdenum and others. All the minerals in coconut water are electrolytes so they are easily absorbed by the body. In relation to sports nutrition, it has been reported that coconut water can provide the same hydrating effect as sports drinks containing carbohydrate-electrolytes. Giving drinks or fluids after physical activity or exercise can speed up the body's return to its pre-exercise state, which can be seen from the return of the pulse to the pulse before exercise (recovery pulse) [4], [5]

Based on the descriptions above, it can be said that the effect of young coconut water on pulse recovery after physical activity can have an effect on pulse recovery. This is the background for the author to conduct further research to be able to prove with certainty whether giving green coconut water given before physical activity has an impact on the recovery of pulse rate after physical activity.

2 Method

The research method used is quasi-experimental, with the design being a pretest-posttest control group design, which is a design in research that compares the initial test and the final test [12], [13]. In this study, there were two groups chosen at random, then

given a pretest to find out whether there were any differences between the experimental group and the control group. The method is divided into two groups, namely group A and group B. Each group has a goal to be achieved by the researcher. From these two groups, data and information will be obtained which will be used as material for drawing conclusions [14], [15]. In this study, researchers used 20 male samples who were then divided into two groups, namely the experimental group and the control group.

Data collection techniques are a method used to collect data in a study. Data that will be collected in this research includes; The effect of giving young coconut water on pulse recovery after physical activity in 30 samples. In this research, the data collected is quantitative data. The research instrument used in this research uses the Harvard step up and down test method (Harvard Step Test). After that, the pulse is measured manually, the test participant sits and rests for 1 minute, then counts the recovery pulse in the first minute. The second and third minutes each last for 30 seconds. The recorded results will then be converted into Harvard test assessment norms [16], [17].

On the first day, the Harvard test was carried out on both groups without any intervention, then the results were recorded as initial data. Then on the second day before carrying out the test, samples in the experimental group were first given 250ml/person of green coconut water, while those in the control group were also given 250ml/person of mineral water, each 60 minutes before the Harvard test was carried out. The test sample is required to go up and down the bench at a rhythm of 120x/minute which is regulated by a metronome for a maximum of 5 minutes, but if they are unable to complete the test before that time limit the sample is allowed to stop [18].

3 Results

This research took place for two days located in the sports laboratory on the campus of the Faculty of Sports Science, Makassar State University. The samples used in this research were 20 people, who were divided into two groups, consisting of 10 samples in the intervention group and 10 samples in the control group where on the day First, the samples and controls were given the Harvard test without intervention, then on the second day the samples were given intervention by giving green coconut water, while the control group was only given mineral water, to obtain data on the effect of giving green coconut water on pulse recovery.

Table 1. Effect of giving green coconut water on pulse recovery pulse after physical activity in the experimental group.

PULSE	MEAN (S.B)	*p*
Pulse day-1	88.10 (3.929)	0.006
Pulse day-2	68.65 (18.109)	

Based on Table 1. above, the results show that before and after giving green coconut water, the recovery of the pulse rate after physical activity accelerates, where the recovery of the athlete's pulse rate after physical activity by giving green coconut water obtained a mean value before the intervention of 88.10 times/minute and after the

intervention 68.65 times /minute calculated 60 minutes after the Harvard test. Analysis results using the Paired T test with a confidence level ($\alpha = 0.05$). Based on this test, results were obtained with a value of $P = 0.006$ ($p < 0.05$), so Ho was rejected, H1 was accepted so it can be concluded that there is an effect of giving young coconut water on the recovery of the pulse after physical activity.

Table 2. Comparison of pulse recovery after physical activity in experimental group and control group.

Days	Group	N	Mean	Std Dev	Std error mean
Day-1	Experi-ment	10	88.10	3.929	1.242
	Control	10	75.60	7.058	2.232
Day-2	Experi-ment	10	68.65	18.109	5.000
	Control	10	68.90	21.026	6.649

Based on Table 2 above, it can be concluded that the speed of pulse recovery in the experimental group given green coconut water before taking the Harvard test was better than the control group given regular mineral water before the Harvard test. Where the average pulse value obtained after physical activity on the first day before intervention in the experimental group was 88.10 times/minute and after the intervention given before physical activity on the second day the pulse rate after activity was 68.65 times/minute. Meanwhile, the control group also experienced changes on the first day, the average pulse rate after physical activity was 75.60 times/minute and on the second day they were given mineral water before physical activity, the average pulse rate after physical activity was 68.90. It can be said that adequate body fluids before and after physical activity help speed up recovery, which can be measured, one way, by changing the pulse rate more quickly towards the resting pulse rate.

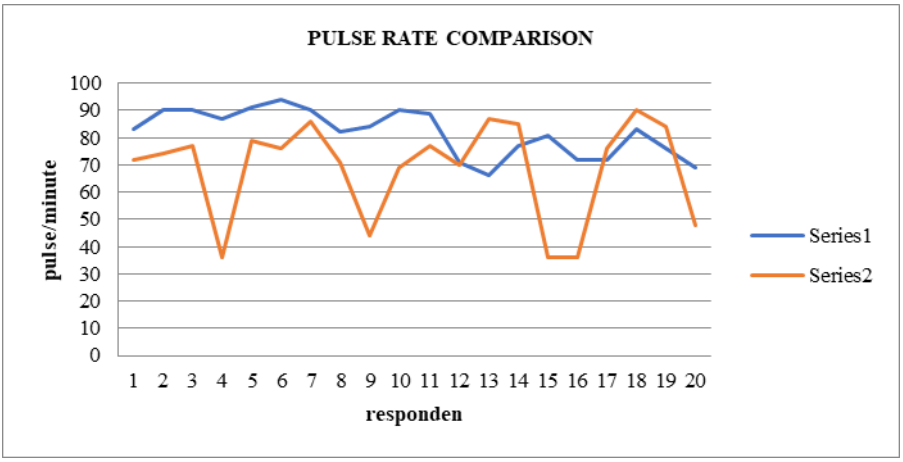

Fig.1. pulse rate comparison diagram experimental group and control group.

Information:
Series 1: control group pulse
Series 2: pulse rate of the experimental group

The diagram in Figure 1 illustrates that the average value of pulse recovery after giving young coconut water on day 2 is better when compared to the pulse rate of the control group. The pulse rate in the experimental group decreased more quickly on average than in the control group.

4 Discussion

This study aims to determine the effect of giving green coconut water on pulse recovery after physical activity. This study involved 20 samples of people who were divided into two groups, namely the intervention group and the control group, each consisting of 10 people. All samples involved had to be ensured that they were in good condition. good, healthy body, not disabled, and male aged 20-22 years. On the first day, all research subjects took the Harvard test without being given treatment, while on the second day new samples were given treatment, the experimental group was given green coconut water and the control group was given the same amount of mineral water, 250 ml each.

Theoretically, young coconut water is very good for consumption because young coconut water can be said to be a natural isotonic drink which has the same level balance as our blood. [19]. Coconut water also has many ingredients that are beneficial for our bodies, one of the ingredients in coconut water is the mineral Potassium or Potassium which is the most abundant so it can restore stamina, both in old coconut water and young coconut water. Consuming mineral K can also reduce hypertension and help speed up the absorption of drugs in the blood [20].

It is known that during exercise, sweating causes body fluid loss. Sweating profusely during exercise can cause loss of body fluids of approximately 1 liter every hour. Sweat contains various electrolytes and other elements which vary from person to person and each individual will also be different depending on conditions, but lack of fluid during exercise not only increases the risk of injury will also cause an increase in body temperature and heart function which will affect the pulse, which will feel faster if palpable.

This research is in line with previous research by Ida Ayu Eka Widiastuti and Putu Aditya Wiguna in 2017. It was concluded that the average speed of pulse recovery by administering young coconut water was quicker to recover the pulse compared to plain water [21]. This is caused by several ingredients in coconut water which speed up recovery after physical activity. Coconut water also contains various trace elements, such as zinc, selenium, iodine, manganese, boron, molybdenum and others.

Coconut water contains 670 mg of potassium per 330 ml. Potassium plays an important role in maintaining blood pressure and heart health. Young coconut water is also rich in electrolytes, chloride, calcium, magnesium, sodium and riboflavin [22]. As a natural isotonic that is rich in minerals and has the same electrolytes as the body's electrolytes, young coconut water is very useful for rehydrating and restoring body stamina. Coconut water also contains protein, fiber, manganese, riboflavin and vitamin C, all of which play an important role in maintaining stamina [23].

The analysis results show that young coconut water contains 95.5% water, 0.1% protein, less than 0.1% fat, 4.0% carbohydrates and 0.4% ash. Young coconut water also contains vitamin C 2.2 – 3.4 mg/100 and vitamin B complex consisting of nicotinic acid, pantothenic acid, biotin, folic acid, vitamin B1 and a small amount of pyridoxine. Coconut water not only contains water, but also contains nutrients. 30 ml of coconut water contains 61 mg of potassium, 5.45 mg of sodium and 1.3 mg of sugar. Coconut is also a source of manganese, and contains 60% of the mineral as the ideal daily recommended amount. Coconut is rich in protein and calories but coconut has a type of protein that helps to build muscle.

All the minerals in coconut water are electrolytes so they are easily absorbed by the body. In relation to sports nutrition, it has been reported that coconut water can provide the same hydrating effect as sports drinks containing carbohydrate-electrolytes. The simple carbohydrate content in the form of fructose and glucose in coconut water will quickly replace lost energy. Compared to isotonic drinks currently circulating on the market, coconut water is a natural isotonic drink, not made from synthetic chemicals. The potassium component in coconut water is higher than sodium, and corresponds to the electrolytes in our body. These potassium ions help heart muscle contractions [24]. Therefore, the World Health Organization (WHO) recommends consuming drinks high in potassium, to reduce the risk of hypertension and stroke [25], [26].

So not only does it prevent dehydration, additional electrolytes, especially potassium, which are very high from coconut water, will control blood pressure that was previously high to normal. Coconut water is an electrolyte fluid that is good for the body. Its function is the same as infusion fluid. As a rehydration drink, coconut water has a better rehydration index compared to sports drinks and stamina enhancing drinks. A higher rehydration index indicates that young coconut water is more effective and faster in correcting dehydration. So consuming green coconut water before and after physical activity will maintain the working rhythm of the heart muscle so that it continues to work optimally without causing the heart muscle's work to increase which causes blood pressure to rise.

5 Conclusion

Based on data analysis and discussion, it was concluded that there was a significant effect of giving green coconut water on pulse recovery after physical activity in the experimental group. Green coconut water maintains the body's hydration condition during physical activity so that the heart's work does not experience a significant spike, which can be measured by the activity pulse returning more quickly to the resting pulse.

References

1. A. Arimbi, H. Haeril, and W. M. Wahid, “Senam Diabetes terhadap Kadar Glukosa Darah Penderita Diabetes Melitus Tipe-2,” *Jurnal Korsa*, vol. 1, no. 1, pp. 11–15, 2022.

2. I. A. E. Widiastuti and P. A. Wiguna, "Perbandingan Efek Pemberian Air Kelapa Muda dan Air Putih terhadap Kecepatan Pemulihan Denyut Nadi Pada Pemain Futsal Fk Unram," *Jurnal Kedokteran*, vol. 2, no. 2, 2013.
3. S. Ibrahim, "Potensi Air Kelapa Muda dalam Meningkatkan Kadar Kalium" *Indonesian Journal of Nursing and Health Sciences*, vol. 1, no. 1, pp. 9–14, 2020.
4. M. Hatta, H. Susanto, and M. Z. Rahfilludin, "Perbandingan Pemberian Air Kelapa Muda (Cocos Nucifera L) dengan Isotonik Terhadap Denyut Nadi dan VO2maks Atlet Remaja," *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)*, vol. 4, no. 2, pp. 71–81, 2016.
5. G. Prasetiyo, N. Lubis, and E. C. Junaedi, "Kandungan Kalium dan Natrium dalam Air Kelapa dari Tiga Varietas Sebagai Minuman Isotonik Alami: Review: Potassium and Sodium Content in Coconut Water from Three Varieties as Natural Isotonic Drinks," *Jurnal Sains Dan Kesehatan*, vol. 3, no. 4, pp. 593–600, 2021.
6. I. P. Nugraha and D. A. Kusuma, "Efek Pemberian Isotonik Water dan Air Kelapa terhadap Kadar Asam Laktat dalam Darah Setelah Melakukan Aktivitas dengan Intensitas Tinggi," *Jurnal Prestasi Olahraga*, vol. 2, no. 4, 2019.
7. D. Vita, "Kelapa Muda Pelepas Dahaga Sejuta Khasiat" *Surabaya: Stomata*, 2016.
8. A. C. Medeiros and V. de F. L. de Paiva, "Therapeutic use of Coconut Water," *Journal of Surgical and Clinical Research*, vol. 3, no. 2, pp. 83–91, 2012.
9. G. Thankappan and P. Anitha, "Effect of Sources of Coconut Water and Acidulants on Physics Chemical Properties of Nata-de-coco," *J Trop Agric*, vol. 56, no. 2, 2019.
10. G. Gayathry, "Production of Nata de coco-a Natural Dietary Fiber Product from Mature Coconut Water Using Gluconacetobacter Xylinum (sju-1)," *International Journal of Food and Fermentation Technology*, vol. 5, no. 2, pp. 231–235, 2015.
11. J. Zhang *et al.*, "Dynamic Profile of The Microbiota During Coconut Water Pre-Fermentation for Nata De Coco Production" *LWT-Food Science and Technology*, vol. 81, pp. 87–93, 2017.
12. S. Arikunto, "Prosedur Penelitian Suatu Praktek Pendekatan Praktik," *Jakarta: Rineka Cipta*, 2019.
13. A. A. Hidayat, *Metode Penelitian Kesehatan Paradigma Kuantitatif*. Health Books Publishing, 2015.
14. V. H. Kristanto, *Metodologi Penelitian Pedoman Penulisan Karya Tulis Ilmiah:(KTI)*. Deepublish, 2018.
15. P. Sugiyono, "Metodologi Penelitian Kuantitatif Kualitatif dan R&D," *Alpabeta, Bandung*, pp. 62–70, 2011.
16. A. Fenanlampir and M. M. Faruq, *Tes dan Pengukuran dalam Olahraga*. Penerbit Andi, 2015.
17. A. Narlan and D. T. Juniar, *Pengukuran dan Evaluasi Olahraga (Prosedur Pelaksanaan Tes dan Pengukuran dalam Olahraga Pendidikan dan Prestasi)*. Deepublish, 2020.

18. E. Sepdanius, M. S. Rifki, and A. Komaini, “Tes dan Pengukuran Olahraga,” 2019.
19. A. Roza, N. Nalaratih, and Y. Febrianita, “Effectiveness of Coconut Water Against Blood Pressure Reduction for Hypertension Patients,” *Collaborative Medical Journal (CMJ)*, vol. 3, no. 2, pp. 82–90, 2020.
20. S. T. Zulaikhah, “Health Benefits of Tender Coconut Water (TCW),” *Int J Pharm Sci Res*, vol. 10, no. 2, pp. 474–480, 2019.
21. I. A. E. Widiastuti, P. A. Wiguna, and G. W. Buanayuda, “Efek Pemberian Jus Tomat terhadap Kecepatan Pemulihan Denyut Nadi pada Mahasiswa Medical Sports Club Fakultas Kedokteran Universitas Mataram,” *Jurnal Kedokteran*, vol. 6, no. 3, p. 24, 2017.
22. G. Prasetiyo, N. Lubis, and E. C. Junaedi, “Kandungan Kalium dan Natrium dalam Air Kelapa dari Tiga Varietas Sebagai Minuman Isotonik Alami: Review: Potassium and Sodium Content in Coconut Water from Three Varieties as Natural Isotonic Drinks,” *Jurnal Sains Dan Kesehatan*, vol. 3, no. 4, pp. 593–600, 2021.
23. S. Fadlilah *et al.*, “Benefits of Young Coconut Water, Watermelon, and Papaya for Blood Pressure Among Hypertension,” *International Medical Journal*, vol. 28, no. 2, pp. 202–207, 2021.
24. R. Syafriani, E. Y. Sukandar, T. Apriantono, and J. I. Sigit, “The Effect of Coconut Water (Cocos nucifera L.) and an Isotonic Drink on The Change of Heart Rate Frequency in The Rats Induced Hypertension” *Procedia Chem*, vol. 13, pp. 177–180, 2014.
25. A. Roza, N. Nalaratih, and Y. Febrianita, “Effectiveness of Coconut Water Against Blood Pressure Reduction for Hypertension Patients,” *Collaborative Medical Journal (CMJ)*, vol. 3, no. 2, pp. 82–90, 2020.
26. S. Fadlilah *et al.*, “Benefits of Young Coconut Water, Watermelon, and Papaya for Blood Pressure Among Hypertension,” *International Medical Journal*, vol. 28, no. 2, pp. 202–207, 2021.