

## Improved performance and physiology following 16 weeks-continuous training and mineral supplement with added Guaraná (Paullina Cupana)

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Published online: December 31, 2023

(Accepted for publication : December 15, 2023)

DOI:10.7752/jpes.2023.12395

### Abstract:

The aims of the study were (1) to analyze the effect of the 16 weeks-continuous training program using 1 mil walking to easy running or jogging and consuming mineral supplement with added guarana (*paullina cupana*) on increasing performance; endurance cardiovascular (VO2Max), leg strength, recovery, (2) to analyze the effect of the 16 weeks continuous training program using 1 mil walking to easy running or jogging and consuming mineral supplement with added guarana (*paullina cupana*) on increasing physiology; reduce blood lactate levels, (3) to analyze a relationship between the effect of giving *paullinia cupana* and 16 weeks continuous training on increasing cardiovascular endurance, leg strength, recovery and reducing blood lactate levels. The samples of this study were 20 pre-elderly who did routine gymnastic activities in Surabaya, East Java, Indonesia. This was a quantitative study using quasi experiment with one group pre-test and post-test experimental design. Pre and post data were done by measuring the endurance cardiovascular using balke test, leg strength using leg strength dynamometer (kg), recovery using heart rate monitor (polar h10) 5 phase in every 1 minute and lactate level using lactic acid (mmol/L). The results: 1) The continuous training group had the results in performance; endurance cardiovascular of 1% greater than control group which was 1% (13,94% vs 14,92% < 0.05), leg strength had significant increase compared to control group by 6% (48,65% vs 54,4% < 0.05), recovery had a significantly greater increase by 15% (98,3% vs 113,6% < 0.05), 2) continuous groups had significant increase in physiology 2% greater than control groups by 2% (4,38% vs 2,19% < 0.05). Conclusion: the results of this study proved that there was a significant effect of the mineral supplement with added ana (*paullina cupana*) on increasing the performance and physiology. Continuous Training and mineral supplement added with guarana (*paullina cupana*) had a relationship to improved performance and physiology sig level < 0.05.

**Keywords:** performance, physiology, continuous training, guarana (*paullina cupana*)

### Introduction

Sport in principle is a process of change for the better, namely to improve physical quality, functional ability of organs, and quality of everyday life (Cassemiro, 2017). According to Angel (2015), exercise is a process in which a person prepares the conditions for his performance to be maximized in achieving fitness. Fitness according to (Wibowo, 2020) is a condition in which a person is in excellent condition, not susceptible to viruses, avoids the risk of injury and does not easily experience fatigue. All physical activity in every activity has a risk of fatigue especially physical activities in the elderly where they are prone to fatigue both during daily activities due to a decrease in the body's metabolic system. Brooks (2015), Falatic (2015), Dantas (2018), in their research suggested to be ready to carry out several activities by avoiding the maximum effects of fatigue, namely by consuming mineral water and getting used to regular physical activity 150 minutes per week such as walking or light exercise such as heating or cleaning the house as well as gardening. According to Fathir, et al., (2021), many individuals perform resistance training as part of their routine conditioning programs to increase muscular strength and/or hypertrophy. Resistance training is often overlooked in its role in musculoskeletal injury prevention and rehabilitation, which means resistance training helps in conditioning and strengthening muscle strength/muscle hypertrophy, especially in the elderly. Improve physical fitness; viewed from the results of increased VO2Max, that a person's body is ready to adapt physiologically by accepting physical loading such as cardiovascular exercise routines, so that it does not quickly experience fatigue which can eventually result in injury (Wibowo, 2021).

In addition, there are other factors that also influence recovery after doing physical activity in terms of pulse which is not easy to get high and falls quickly when cooling down. Srikanthan (2016), Wilson (2017), Mirizo (2020), Lima (2005), Josef (2018), Craighead (2021), Mattei (1998) explain that physiologically giving

*paullina cupana* supplements which can be taken after doing physical activities such as walking, resistance training, function training, sport or gymnastics can significantly reduce blood lactate levels. If it is associated with sports in the elderly, it will include aspects of positive behavior shown by someone while exercising, namely being happy, avoiding viruses or illness by adapting in a social environment, and being able to carry out daily activities without feeling tired after exercising. Discussing physiological factors more deeply, Portella (2013), Seifl (2014), Ratamess (2012), Wilson (2017), Zaton (2015) stated that exercise physiology is different from medical physiology, sports psychology is more focused on the aspects of reducing lactate levels or blood sugar levels after physical activity, while physiology of physiology is more specific on the performance of organs and cells on aspects of restoration of a person to obtain optimal health. As for both, both exercise physiology and physiological physiology have basic objectives, namely: a) Studying how physiological factors affect individual physical performance and individual development (Olaya, 2020).

In this study, this research was carried out by applying the continuous training method by walking or jogging as far as 1 mile for 16 weeks and consuming minerals by adding guarana (*paullina cupana*) after exercise which is proven to increase cardiovascular endurance, leg muscle strength, recovery pulse and decreased lactate levels in the blood of the elderly also relationship between 16 weeks continuous training and supplement guarana (*paullina cupana*) to improve cardiovascular, strength, recovery dan blood lactate levels in elderly.

### Material & methods

This was quasi-quantitative experimental research because there was a treatment given to the sample (Bogdan, 1998). There were 20 pre-elderly continuous training groups selected to the sample in this study. The continuous training program used 1 mil walking or jogging around 60-75% of HRMax used heart rate monitor (polar H10) following instructor to walking or jogging around Al-Akbar Mosque in Surabaya, East Java, Indonesia. This study aims to determine the extent of the effectiveness and influence of exercise on cardiovascular endurance (VO2Max), strength, recovery pulse rate and reduction in blood lactate levels in the elderly female community in Surabaya.

The sample size used was 20 women aged over 50 years. The entire sample was divided into two groups, each consisting of 10 pre-elderly people. The first group was the group given *Paulinia cupana* extract and the second group was the group given a placebo. The research was conducted over 16 meetings using ½ gram of supplement and 200 ml of water. Previously, a pre-test was carried out on all samples to determine the initial conditions of the research samples. During 16 routine and regular meetings, the pre-elderly group was given *paulinia cupana* (guarana) supplements. Those were given before, during and after breaks from physical exercise. After 16 weeks of meetings, a post-test was carried out on all samples. The results of this research were processed using the SPSS 24 program to determine the effect of *paulinia cupana* (guarana) supplements on pre-elderly. Pre and post data test were done by measuring endurance cardiovascular (VO2Max) using balke test, leg strength using leg dynamometer (kg), recovery using pulse meter and blood lactate levels using lactic acid (mmol/L).

**Table 1.** Characteristics of participants. \*

	Continous Group (n = 10)	Control Group (n= 10)
Age (y)	42.14 0.95	46.50 0.98
Height (cm)	156.71 9.01	158.21 9.20
Weight (kg)	63. 11 8.52	64.81 8.11
Body mass index (kg. m <sup>-2</sup> )	24,52 2.34	23,35 5.11

Participants reported to the laboratory; assessed for endurance cardiovascular test using balke test (VO2Max test), strength with leg strength dynamometer test, recovery with pulse meter (heart rate) and blood lactate levels using lactic acid (mmol/L).

### Statistical Analyses

This research method used quantitative independent T-tests and Anova which the results of the pre-test and post-test were seen to see the increase and differences in the effect of training for 16 weeks for the elderly. Pre and post test data on cardiovascular endurance (CF) were collected using the Balke test instrument, strength test instrument using the leg dynamometer test, recovery by taking resting heart rate data using the H-10 polar instrument, and blood lactate levels in each group. This descriptive data discussed the mean, standard deviation, variance, maximum and minimum values, as well as the percentage increased in cardiovascular endurance (CF) test results, strength, recovery, and blood lactate levels. The treatment in the treatment group was carried out by walking 1 mile or light jogging while the control group received physical activity/daily activities. Both types of groups were analyzed by using the descriptive statistical techniques (Wibowo, 2021) and the Service Solution (SPSS) program specifically for MacBook series 20. To test the normality of data distribution, the Shapiro-Wilks method was used (Rencher, 2002). If the level of significance in the statistical test is greater than 0.05 then the

data is declared to be normally distributed (Rencher, 2002). Levenes variance homogeneity test to determine whether the data collected is homogeneous or no (Rencher, 2002). The results of the study were analyzed and described according to a predetermined hypothesis that would explain the effect of 16 weeks of continuous exercise and *guarana (paullina cupana)* mineral supplementation on increasing cardiovascular endurance, strength, recovery, and blood lactate levels (lactic acid).

## Results

The results of a 16-week study by providing treatment to consume *guarana (paullina cupana)* mineral supplements in increasing cardiovascular endurance, strength, pulse recovery and blood lactate (lactic acid) levels are as follows;

Table 1. Description of Performance (Group Continuous)

Variable	N	Pre Test	Post Test	Difference
Endurance Cardiovascular (Balke Test)	10	Mean = 14,92	Mean = 13, 94	Mean = 0,98
Strength (leg strength dynamometer)	10	Mean = 59,7	Mean = 59,95	Mean = 0,25
Heart rate recovery (pulse meter)	10	Mean = 113,6	Mean = 98,3	Mean = 5,3

Table 2. Description of Physiology; Blood Lactat Levels Data/ Lactic Acid (mmol/L)

Group	N	Pre Test	Post Test	Difference
Continous (K1)	10	Mean = 4,38	Mean = 2,19	Mean = 2,19

The probability of error in this research was 0.05. The descriptive that was presented in this discussion included determining the mean and standard deviation of data from the attached variables, namely cardiovascular endurance, leg muscle strength, recovery and blood lactate levels for each group.

From the results (Table 1) of the performance variable data in the continuous group after being given 16-week treatment for 16 sessions, it showed an increase of 1% Endurance Cardiovascular, 1 % Leg strength, 5% recovery and 2% reduce blood lactate levels (lactic acid). It can be concluded that the recovery of the continuous training experienced a significant increase > endurance cardiovascular and strength and was better to reduce blood lactate levels in control group. The following can be explained in the graph below:

Figure 1. Endurance Cardiovascular (VO2Max)

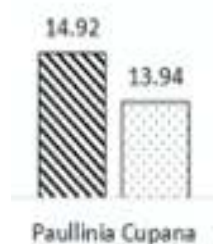


Figure 2. Strength (Leg Strength)

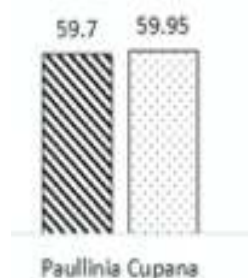


Figure 3. Recovery (Heart rate recovery)

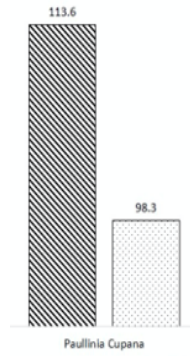
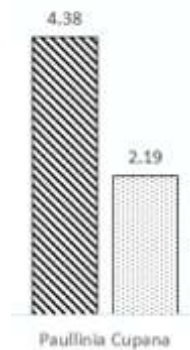


Figure 4. Blood lactat levels (lactic acid)



Based on the results of the analysis in table 1 and table 2 above, the data can be interpreted as follows:

- Given the 16 sessions continuous training and mineral supplement added *guarana (paullina cupana)* there was significant difference in performance; endurance cardiovascular, leg strength and with a significance  $< 0.05$ .
- Given the 16 sessions continuous training and mineral supplement added *guarana (paullina cupana)* there was significant difference in physiology; blood lactate level (lactic acid) with a significance  $< 0.05$ .
- There is have relationship between physical activity and mineral supplement to improve in performance and physiology a significance  $< 0.05$ .

## Discussions

The relationship between 16 sessions of physical activity (1 mil walking or jogging) and consuming mineral added *guarana (paullina cupana)* have improved endurance cardiovascular, leg strength, heart rate recovery and reduce blood lactate levels in elderly especially woman. There were adaptation with endurance training (60-75% of HRMax) as a training method that uses low intensity continuous training using walking or easy jogging. Exercise in physical activity is generally separated into two aspects of metabolism, namely aerobic and anaerobic (Bompa, 2015). These exercises certainly aim to improve aspects of physical condition, especially cardiovascular endurance, prevent osteoporosis and menopause and slow down fatigue in daily activities. Time limits and strict competition schedules carried out by the elderly must be enforceable, safe, effective and efficient (Doma, 2014).

In addition, exercise with the aim of increasing aerobic energy is recommended at an intensity of 150 minutes per week with a moderate intensity of 40% to 60%. In fact, this training protocol has been scientifically proven to improve the physical condition of endurance and cardiovascular strength in the elderly (Dantas, 2018). There are two types of physical activity or sports that elderly people can do, namely moderate activity and vigorous activity. For moderate activity, it is recommended to do it for 150 minutes per week, for example 30 minutes a day and 5 times a week. In designing a sustainable program using 1 mile walking or leisurely jogging and adding supplements (*paullina cupana*), there must be something that is safe and effective in its implementation, such as for people (elderly) who are overweight, obese, and have not exercised for a long time and the history of the previous injuries and people who have a history of diseases such as high blood lactate (Daniel, 2021). According to the World Health Organization (WHO), a person is advised to exercise at least 150 minutes per week and add weight training twice per week to maintain body health. Elderly is the final stage of

someone who is experiencing a specific phase. In this phase, a person experiences aging or decline in intelligence and even physical decline. The elderly people who experience physical complications usually have limited daily physical activity (Rina Febriani, Zaitul et al., 2019).

Physical activity is usually carried out with movements that cause work on skeletal muscles to expend energy. Physical activities such as walking, sweeping, washing clothes and gardening which can be done every day at home range from moderate to heavy activities which can help maintain health and avoid disease. Insufficient physical activity can cause disease, one of which is non-communicable disease, hypertension (high blood pressure) (Hasanudin et al., 2018). A person who is less active can experience an increase in heart rate and become a burden on the heart so that heating is harder and results in an increase in blood pressure (Ministry of Health of the Republic of Indonesia, 2015). Physical activity that is carried out regularly and regularly can control the heart in the body. In general, someone who does regular and regular physical activity has low blood pressure. Compared to those who rarely do physical activity, their blood pressure is higher. This is because someone who is seen doing activities tends to have stronger and more flexible muscle, joint and organ function. Physical activity by doing light movements or aerobic exercise which is beneficial for a person's body, such as maintaining cardio-respiratory function.

Aerobic exercises that a person can do include walking, brisk walking, running, cycling and swimming (Fathir, 2021). Physical activity that is often carried out routinely and regularly can make the heart stronger, its smooth muscles can accommodate more volume and the construction or beats are stronger and more regular, besides that the blood vessels become more elastic and there is relaxation and vasodilation, resulting in a decrease in fat and can increase construction. muscles in the walls of blood vessels. It can be said that the main factor in blood pressure is physical activity. Insufficient physical activity can increase the risk of hypertension, which can lead to weight gain. Someone who is less physically active tends to have a higher heart rate so that the heart muscle works harder and the heart has to pump and the pressure on the arteries is greater (Fox, 1946). Meanwhile, the sequence of exercises must be based on the concentric and eccentric properties of muscle groups, for example dynamic exercises (walking or jogging) can be continued with lower body movements and reduce blood lactate (Craighead, 2021). According to a literature review, as many as 16 sessions of exercises can be done, but there is not too many results if only one time a weeks to maintain the programs (Costa, 2021). WHO advises everyone to do a minimum of physical activity like a walking or gardening 150 minutes in a week.

In this study, the variables studied were the increase in endurance cardiovascular, leg strength, recovery and reduce blood lactate levels. Fundamentally, every elderly is recommended have a good habit in daily activity to do physical activity/ training routine as walking, jogging, gardening, and others also consuming mineral added *guarana (paullina cupana)* post training sessions. The results of the study obtained good results and had a significant effect on heart rate recovery.

## Conclusions

Based on the results of trials on samples from the elderly community in Surabaya, it was concluded that there was a significant effect of 16-week continuous training and mineral supplement adding *guarana (paullina cupana)* in increasing the endurance cardiovascular, strength, recovery, and blood lactate levels (lactic acid). The results obtained in continuous group have an increase with the highest percentage compared to other variables, which was 5%, that leg recovery > Cardiovascular Endurance > Leg strength.

Based on the results of trials on samples from the elderly community in Surabaya, it was concluded that there was a significant effect 16-week continuous training and mineral supplement adding *guarana (paullina cupana)* in increasing the endurance cardiovascular, strength, recovery, and blood lactate levels (lactic acid). The results obtained in continuous group had an increase with the highest percentage compared to physiology variables, which is 2%, this was evidenced by the average pre-test result which was 4.38 and post-test was 2.19.

The relationship of continuous training; 1 mil walking or jogging in low intensity 60 to medium intensity 75% of HrMax also consuming mineral supplement added *guarana (paullina cupana)* post training have effectively to improves cardiovascular endurance, leg strength, recovery and reduce blood lactate levels in elderly especially woman. Regular physical activity also influenced the pre-elderly metabolic conditions. However, the effect of using *Paulinia cupana* on elderly people with lactic acid and low blood glucose was still unknown. All samples in this study had high lactic acid and blood glucose. In the future, further research can be carried out on the effect on elderly people who have low lactic acid and blood glucose. The next research about *Paulinia cupana* extract improves metabolism or only reduces lactic acid and blood glucose levels in pre-elderly people.

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