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COMPARISON OF CARDIORESPIRATORY ENDURANCE AND BODY FLEXIBILITY IN ELDERLY BEFORE AND AFTER TALI RASA YOGA TRAINING IN JEGU VILLAGE, TABANAN

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ABSTRACT

Elderly people have a high risk of physical and cognitive impairment. Physical exercise is believed to be a potential solution. One of the recommended physical exercises is yoga. Yoga is a form of physical exercise as well as a culture that has been around for generations. One of the yogas that is part of Balinese culture is Tali Rasa. Several previous studies have described changes that occur in cardiorespiratory endurance and body stiffness after yoga practice. Therefore, researchers are interested in exploring more deeply the influence of Tali Rasa yoga on these two variables as well as preserving and introducing culture to a wider public. The objective of this research is to determine the comparison of cardiorespiratory endurance and body flexibility in the elderly before and after Tali Rasa yoga training in Jegu Village, Tabanan. The research design is a quasi experiment with pre-test and post-test methods. A total of 50 selected elderly people took VO2 max and sit and reach measurements on the first and last days of the study. Followed by the same measurements to find out the comparison of the measurement results. Statistical analysis uses paired t-test. There are differences in the cardiorespiratory endurance and body flexibility in the elderly before and after Tali Rasa yoga training. In cardiorespiratory endurance, changes were found with insignificant results. As well as significant changes in body flexibility.

Keywords : Cardiorespiratory Endurance., Body Flexibility., Elderly., Yoga

INTRODUCTION

Health is a condition that is very valuable for human life and activities. Health is defined as the absence of any disturbances, such as injury, illness and other disorders in a person's body which prevents his daily life from being optimal. Physical exercise is one of the activities that can be carried out to achieve a level of health, where the individual can experience a state of physical fitness. Physical fitness is the body's ability to carry out physical activities without feeling excessively tired so that it is able to carry out other work. Physical fitness can only be achieved if its components in the form of muscle strength, flexibility, endurance, agility, precision and suppleness are formed.[1] Physical fitness has one important component, namely cardiorespiratory endurance because this shows the ability of the heart, blood vessels and lungs to deliver oxygen to the body.[2] Despite all the benefits of physical exercise, almost 40-60% of the world's population does not exercise regularly, with a lower prevalence in men. Society will increasingly age, where by 2050 it is predicted that 20% of the world's population will be elderly. [3] According to the World Health Organization (WHO), the elderly are a group of people who are entering the final stages of their life with an age range from 60 years and over. The elderly will experience a natural process of decreasing body function due to aging which results in the elderly having more risk factors than other groups of people. The elderly have a higher risk of experiencing a decrease in intrinsic capacity, for example physical and cognitive disorders. Therefore, physical exercise is believed **to** be a potential solution despite the development of modern medicine.[4]

One of the recommended and generally known physical exercises is yoga. The term yoga can be interpreted as the union of mind, body, and soul. The yoga that is practiced today comes from an ancient Indian lifestyle that was implemented around 2500-3000 years ago, where the science of yoga has many theories and implementation concepts. However, Sage Patanjali has structured various yoga concepts and theories. Yoga is a physical exercise activity with many movements based on physical fitness training where yoga involves several aspects such as spiritual attitude, diet, yoga asana, breathing exercises, and meditation aimed at achieving the highest consciousness. Yoga is a form of physical exercise and at the same time a culture that has been around for generations.[5] The objective of this study was to determine how the level of cardiorespiratory endurance and body flexibility in the elderly before and after yoga training in the Jegu Village Tabanan. By obtaining significant changes in the results of these two variables, the researcher hopes that in the future yoga tali rasa can be implemented into the physical routine of the elderly so that it can help improve the quality of life, especially in the aspect of cardiorespiratory endurance and body flexibility. In addition, the researcher also hopes that this research can be an illustration or reference for

examining the effect of yoga tali rasa on other aspects of the body. Therefore, this research is not only to explain the benefits of implementing yoga as a physical exercise but also to preserve and introduce it to a wider audience, especially the original yoga from Bali in the form of tali rasa yoga. This is what makes researchers interested in raising the title "Comparison of Cardiorespiratory Endurance and Body Flexibility in the Elderly Before and After Tali Rasa Yoga Training in Jegu Village, Tabanan".

Tali Rasa Yoga

Based on a quote from Watu Karu magazine, Edition 01, Tali Rasa is a martial art from Paiketan Paguron Suling Dewata that is different from other martial arts. Tali Rasa emphasizes slow, calm and graceful movements rather than speed and agility. The Tali Rasa and Tai Chi movements are considered to be similar by those who see them. This opinion is valid because it is possible that it comes from the same source. This science removes all elements of movement that rely solely on energy and replaces them with movements full of feeling that continue without interruption. The movements carried out must be practiced calmly and in balance between thoughts, feelings, breathing and natural movements that are integrated.[6] Functional and structural changes are natural processes associated with aging. Changes in physical status which include changes in tissues and organs as well as changes in mood and social activities are part of aging.[7] Regular physical activity can overcome health problems that arise, but many elderly people are not active in carrying out physical activity.[4] Research regarding the effectiveness of yoga in the health of the elderly shows positive results. These positive results show a reduction in certain symptoms, help relieve pain, and improve the well-being of older adults regarding mental health.[8]

Cardiorespiratory Endurance

The cardiorespiratory system is a system in the body which is composed of the cardiovascular system which involves the blood vessel and heart systems and the respiratory system which is the pulmonary system. Cardiorespiratory endurance can be interpreted as the ability of the cardiorespiratory system to send oxygen to active muscles according to workload requirements because cardiorespiratory endurance can influence the level of fatigue experienced by a person. In this case, fatigue is caused by insufficient oxygen requirements to provide energy.[9] VO2 max is a representation of the level of cellular respiration in various metabolic and functional limitations of the cardiorespiratory system as well as a measure of a person's fitness.[10] Cardiorespiratory endurance can be calculated using actual data from VO2 max which is also said to be the main determinant of a person's endurance in exercise and mortality in the general population. Cardiorespiratory endurance can be calculated using VO2 max. VO2 max is the maximum amount of oxygen used by the body and is expressed in liters or milliliters per minute per kg of body weight. Measuring cardiorespiratory endurance through VO2 max can be done using the non-exercise method with the equation VO2 max = 15 x (HR max / HR rest) with HR max using estimated numbers with the equation HR max = 220 – age.[11] In this study, the Cardiac Output results obtained from the equation (systolic - diastolic) / (systolic + diastolic) * heart rate will also be presented.[12]

Body Flexibility

Flexibility is defined as an individual's ability to stretch the body as widely as possible, the axis of which is the strength of joint movement so that when moving, the body can produce a maximum Range of Motion without any feelings of pain or discomfort. This ability is correlated with muscle ability and performance. Muscle elasticity and joint range of motion can be helped by properly trained flexibility abilities.[13] Regarding flexibility, which is one of the elements of body fitness, there are several methods to assess its objectivity. One test that has proven its effectiveness is the sit and reach test. The sit and reach test is a direct test used to measure hamstring and lower back flexibility. This test is carried out using a sit and reach test tool or using your own tool which is made to simulate a proper sit and reach test tool.[14]

MATERIAL AND METHOD

This research is an analytical research method with a longitudinal approach, using primary data sources from the results of measurements of research subjects to determine the comparison of cardiorespiratory endurance and body flexibility in the elderly before and after tali rasa yoga training in Jegu Village, Tabanan. The overall population of this study was all elderly people living in Jegu village, Tabanan. The researcher then took a sample of the elderly who participated in the jegu village elderly group with a total sample size of 75 individuals. The sampling method used was total sampling with samples that had been adjusted to the inclusion and exclusion criteria. The inclusion criteria for this study were elderly people aged 60 years and over who were active in the Jegu village elderly group and were willing to take part in tali rasa yoga training and anthropometric measurements. The exclusion criteria for this study were elderly people who attended the training only to take part in activities passively and actively in the Jegu village elderly group but whose age was still under 60 years. The entire sample that has been reviewed using the inclusion and exclusion criteria is found to be 44 individuals. The data that has been collected will be processed with simple statistical calculations and descriptive analysis will be carried out which aims to describe each research variable using SPSS 25 software. Information on Ethical Clearance Number : 915/UN14.2.2.VII.14/LT/2023 dated 03 April 2023.

RESULT

Based on a research design comparing cardiorespiratory endurance and body flexibility in the

elderly before and after Tali Rasa yoga training in Jegu Village, Tabanan, the population was 75 individuals. The entire sample that met the inclusion criteria was 44 individuals, while 31 other individuals were excluded. The research period was carried out for 100 days, where measurements were carried out on the 1st and 100th days for comparison. During this 100 day period, the elderly have carried out the Tali Rasa exercise which was coached by the Tali Rasa instructor.

Table 1. Gender

Gender	Frequency (n)	Percentage (%)
Male	15	34,1%
Female	29	65,9%
Total	44	100%

The sample distribution based on gender shown in table 1 shows that in all 44 samples there were 15 men (34.1%) and continued with 29 women (65.9%) who dominated the number.

Table 2. Group Age

Age	Frequency (n)	Percentage (%)
60-70 years	21	47,7%
71-80 years	18	40,9%
81-90 years	5	11,4%
Total	44	100%

Based on table 2, the age range in the sample is shown, namely the age range of 60-70 years dominates with 21 people (47.7%), the age range of 71-80 years with 18 people (40.9%), and finally the age range of 81-90 years as many as 5 people (11.4%).

Table 3. Anthropometry

Characteristics	Mean ± SD	Median
Weight (kg)	57,89 ± 8,76	58,00
Height (cm)	165,11 ± 15,53	163,50
BMI (kg/m^2)	21,53 ± 3,88	21,58

Table 3 shows the weight, height and body mass index of the sample to show the anthropometric characteristics of the Jegu village elderly who are included in the inclusion criteria.

Table 3. Heart Rate

Heart Rate	Mean ± SD	Median
Rest		
Pre-test	82,05 ± 12,22	81,50
Post-test	79,84 ± 12,01	81,50
Max	156,71 ± 4,52	157,20

Table 4 shows the resting heart rate and maximum heart rate of the samples used as components of the dependent variable cardiorespiratory endurance. The HR Max value is written as one because the pre-test and post-test scores have been determined from the start using an equation and have the same value

Table 5. Blood Pressure and Cardiac Output

	Mean ± SD	Median
Sistolic		
Pre-test	130,00 ± 21,56	130,00
Post-test	139,55 ± 20,06	140,00
Diastolic		
Pre-test	77,27 ± 7,27	80,00
Post-test	78,64 ± 5,94	80,00
CO		
Pre-test	20,31 ± 5,34	19,56
Post-test	21,76 ± 6,32	21,92

Based on table 5, there are measurement results regarding blood pressure from the sample which are then calculated to estimate cardiac output as an additional illustration of cardiorespiratory endurance outside of the dependent variable that has been determined.

Table 6. Dependent Variables (Pre-test)

Variable	Mean ± SD	Median
VO2 Max	28,83 ± 3,98	28,95
Sit and Reach	16,43 ± 8,35	15,50

Table 7. Dependent Variables (Post-test)

Variable	Mean ± SD	Median
VO2 Max	29,58 ± 4,26	29,58
Sit and Reach	19,39 ± 7,15	18,00

From the results of measuring cardiorespiratory endurance presented in VO2 max, the pre-test results were (28.83) and post-test (29.58) as well as measurements of body flexibility with the results of pre-test sit and reach measurements (16.43) and post-test. test (19.39) in the average data of measurement results from 44 samples which will then be tested according to the data distribution.

Table 8. Normality Test

Variable	Significancy (p)
VO2 Max Pre-test	0,283
VO2 Max Post-test	0,165
Sit and Reach Pre-test	0,649
Sit and Reach Post-test	0,060

The data distribution normality test uses the Shapiro-Wilk test because the number of samples is ≤50 where the test results show that all data is normally distributed because all significance values are more than 0.05 (p> 0.05).

Table 9. Hypothesis Test

Variable	Significancy (p)	Significancy (2-tailed)
VO2 Max	0,00	0,068
Sit and Reach	0,00	0,011

The normally distributed data was then continued with hypothesis testing using the paired t-test to see whether there were changes and effectiveness of the research results regarding cardiorespiratory endurance and body flexibility. In the first results, the test value for the two variables was obtained with p=0.00, which indicated that there was a change in the results from the pre-test and post-test measurements. Then the 2-tailed significance value for VO2 Max shows p=0.068, where p>0.05 indicates that the results are not significant and for sit and reach, it shows p=0.011, which indicates significant results.

DISCUSSION

Based on the results of data analysis in research entitled "Comparison of Cardiorespiratory Endurance and Body Flexibility in the Elderly Before and After Tali Rasa Yoga Training in Jegu Village, Tabanan", the Tali Rasa yoga training in the elderly in Jegu Village had a potential impact on the results of VO2 max measurements and sit and reach. This is related to research conducted by Haudebourg et al and LaSala et al. In all previous studies listed, the yoga used was conventional yoga. In this research, the author focuses on the implementation of Tali Rasa yoga. The science of Tali Rasa yoga is traditional Balinese yoga which originates from Paiketan Paguron Suling Dewata. Tali Rasa Yoga also has the same components as conventional yoga, which emphasizes regular breathing and slow movements.[6] This research also aims to spark research into Tali Rasa Yoga which has not previously been implemented, as well as to better introduce one of Bali's original cultures to the wider community. In previous research with healthy male subjects aged 20-35 years, yoga was proven to produce better heart parameters and increased dynamic lung function such as vital capacity and expiratory volume compared to regular exercise.[15] Yoga intervention, especially in varying positions, can provide effective benefits in body flexibility because slow movements can stretch the muscles so that they can loosen the muscles, increase flexibility, and allow the body to achieve a more ideal posture.[16]

Focus on cardiorespiratory endurance, previous research shows that increasing age will affect the level of cardio-pulmonary endurance, where there will be a decrease in physiological function over time. However, each individual can carry out physical exercise which can increase their level of cardiorespiratory endurance.[17] One physical exercise that can be done is yoga. Previous studies have shown that practicing yoga results in increased thoracic cavity expansion and the ability to hold your breath. This change occurs because yoga requires us to take deep breaths very slowly and hold our breath continuously after inspiration and expansion.[18] The effect of yoga on cardiorespiratory has also been studied previously, with research stating that each inhalation and exhalation during yoga becomes longer and fuller, resulting in maximum and smooth lung ventilation capacity. Increasing lung capacity will increase oxygen transport into the muscles. The body will then adapt so that cardiovascular and respiratory performance will be more efficient. Implementing hatha yoga for 12 weeks in 832 individuals showed significant increases in muscle strength and cardiorespiratory endurance.[19] However, this study did not obtain results that were in accordance with previous research because it could be influenced by several factors such as the previous activity conditions of the elderly who had already experienced an increase in their cardiorespiratory endurance, making it difficult to achieve changes and condition of the muscles in their body.[20] Apart from that, there is also non-compliance among some elderly people in following the proper training schedule.

Regarding the aspect of body flexibility, in previous research it was said that in the elderly, the level of flexibility can experience a functional decline because the loss of elasticity of the connective tissue surrounding the muscles undergoes a shortening process so that one of the body functions that is affected is the back.[21] One of the studies conducted by LaSala et al shows that yoga, which is a form of static stretching exercise, will influence muscle stretching, the results of which can improve the joint range of motion of the elderly.[16] In previous studies, sauna yoga training in adults can provide changes to the practitioner's physical condition in the aspects of flexibility, strength and balance. The changes that occur can be influenced by several things, including duration of exercise, consistency of exercise, intensity of exercise, and focus on range of movement.[22] In line with this research, significant measurement results were obtained in body flexibility research which is in accordance with previous research where flexibility increased after being given yoga therapy.[21] in research regarding tai-chi on body flexibility, it has an impact on improving the biomechanical function of the pelvic spine by providing efficient lumbopelvic rhythm for the range of motion of the lumbar joints. where tai-chi itself is said to have the same movements and sources of knowledge as tali rasa yoga.[23] In this research, there was an obstacle in the form of implementing the Tali Rasa training 15 times, where the duration aspect of the training was still not met.

There are several limitations in this research, including, the technique for measuring VO2 max and body flexibility only uses one method so it is still not specific in representing comprehensive measurement results. The research subjects were limited to elderly people in Jegu Village so the sample size was still limited. The calculated implementation time is still quite short so that 100 days of training cannot be achieved properly. As well as factors in the physical activity of research subjects outside the time of data collection.

CONCLUSIONS AND SUGGESTIONS

Based on the results of research comparing the average values of cardiorespiratory endurance and body flexibility in the elderly before and after Tali Rasa yoga training in Jegu Village, Tabanan, it was concluded that there were differences in cardiorespiratory endurance and body flexibility in the elderly before and after Tali Rasa yoga training. In cardiorespiratory endurance, changes were found in the form of an increase in VO2 max, but the results were not significant. In terms of body flexibility, there were significant changes in the results of sit and reach measurements.

Based on the results of research comparing cardiorespiratory endurance and body flexibility in the elderly before and after Tali Rasa yoga training in Jegu Village, Tabanan, suggestions that can be given are that further research can be carried out regarding the effect of Tali Rasa yoga training on cardiorespiratory endurance and body flexibility using different measurement methods and different research subjects so that more comprehensive results can be obtained to support the relationship. Then it is hoped that research can also be carried out regarding the influence of Tali Rasa yoga on body fitness components outside of these two variables.

REFERENCES

1. Rohmah L, Muhammad HN. Tingkat Kebugaran Jasmani dan Aktivitas Fisik Siswa Sekolah. J Univ Negeri Surabaya. 2021;09(01):511–9.
2. Delfa K, Raga. Perbandingan Daya Tahan Kardiorespirasi Antara Mahasiswa Perokok Dan Mahasiswa Tidak Perokok. J Pendidik Olahraga dan Kesehat. 2020;8(1):798–803.
3. de Carvalho Souza Vieira M, Boing L, Leitão AE, Vieira G, Coutinho de Azevedo Guimarães A. Effect of physical exercise on the cardiorespiratory fitness of men—A systematic review and meta-analysis. Maturitas [Internet]. 2018;115:23–30. Available from: https://doi.org/10.1016/j.maturitas.2018.06.006
4. Valenzuela PL, Castillo-García A, Morales JS, Izquierdo M, Serra-Rexach JA, Santos-Lozano A, et al. Physical exercise in the oldest old. Compr Physiol. 2019;9(4):1281–304.
5. Nair A, Palkar A, Honkalas P. Effect of Yoga and Pranayama on Chest Expansion and Breath Holding Time in Chefs Exposed to Cooking Fumes. 2020;8(3):3499–503.
6. Nantra IK. Ringkasan Umum Yoga Tali Rasa Rahasyam. 2014. p. 51.
7. Choudhary A, Pathak A, Manickam P, Purohit M, Rajasekhar TD, Dhoble P, et al. Effect of yoga versus light exercise to improve well-being and promote healthy aging among older adults in Central India: A study protocol for a randomized controlled trial. Geriatr. 2019;4(4).
8. Rahima, Kustiningsih E. Adaptasi faal tubuh terhadap latihan hatha yoga pada lansia penderita hipertensi. J Ilm Univ Batanghari Jambi. 2017;17(2):169–77.
9. Lundby C, Montero D, Joyner M. Biology of VO2max: looking under the physiology lamp. Acta Physiol. 2017;220(2):218–28.
10. Gabriella N, William, Rumiati F. Gambaran Tingkat Aktivitas Fisik dan Kebugaran Kardiorespirasi (Vo2Max) Pada Karyawan PT Arwana Nuansa Keramik. J Med Udayana [Internet]. 2023;12(1):10–1. Available from: http://ojs.unud.ac.id/index.php/eum
11. Lee I, Kim S, Kang H. Non-exercise based estimation of cardiorespiratory fitness mediates associations between comorbidities and health-related quality of life in older Korean adults with diabetes. Int J Environ Res Public Health. 2020;17(4).
12. Vignati C, Cattadori G. Measuring cardiac output during cardiopulmonary exercise testing. Ann Am Thorac Soc. 2017;14(July):S48–52.
13. Aras D, Arsyad A, Hasbiah N. Hubungan Antara Fleksibilitas Dan Kekuatan Otot. J MKMI. 2017;13:380–5.
14. Miyamoto N, Hirata K, Kimura N, Miyamoto-Mikami E. Contributions of Hamstring Stiffness to Straight-Leg-Raise and Sit-and-Reach Test Scores. Int J Sports Med. 2018;39(2):110–4.
15. Pelinski da Silveria M, Starck E, Rossi RC. 2. Physical exercise as a tool to help the immune system against COVID‐19 an integrative review of the current literature.pdf. 2020.
16. Kaminoff L, Matthews A, Ellis S. Yoga anatomy. 2007. 1–233 p.
17. Hikmawan MD. Tinjauan Struktur Anatomi Thoraks. 2017;53(9):1689–99.
18. Haudebourg AF, Perier F, Tuffet S, De Prost N, Razazi K, Dessap AM, et al. Respiratory mechanics of COVID-19- versus Non-COVID-19-associated acute respiratory distress syndrome. Am J Respir Crit Care Med. 2020;202(2):287–90.
19. Amaro-Gahete FJ, De-La-O A, Jurado-Fasoli L, Dote-Montero M, Gutiérrez Á, Ruiz JR, et al. Changes in physical fitness after 12 weeks of structured concurrent exercise training, high intensity interval training, or whole-body electromyostimulation training in sedentary middle-aged adults: A randomized controlled trial. Front Physiol. 2019;10(APR).
20. Poole DC, Jones AM. Measurement of the maximum oxygen uptake Vo2max: Vo2peak is no longer acceptable. J Appl Physiol. 2017;122(4):997–1002.

21. Colomadu RM. Pengaruh yoga terhadap fleksibilitas punggung lanjut usia di sanggar senam rm 7 colomadu. 2018;
22. Shin S. Meta-analysis of the effect of yoga practice on physical fitness in the elderly. Int J Environ Res Public Health. 2021;18(21).
23. Pulcheria M, Muliarta I. Fleksibilitas Mahasiswa Universitas Udayana Yang Berlatih Tai Chi Lebih Baik Daripada Yang Tidak Berlatih Tai Chi. E-Jurnal Med Udayana. 2016;5(6):1–6.