ORIGINAL ARTICLE

Physical Therapy Journal of Indonesia (*PTJI*) 2023, Volume 4, Number 2: 209-213
E-ISSN : 2722-6034 ; P-ISSN : 2722-0125

Effectiveness of additional Tabata in conventional exercise for cardiorespiratory endurance in football athletes

Ni Nengah Esti Ramantika[1*], Ni Komang Ayu Juni Antari[2], I Made Niko Winaya[2], M. Widnyana[2]

[1]Bachelor of q and Professional Physiotherapy Study Program, Faculty of Medicine, Universitas Udayana, Denpasar, Bali, Indonesia;
[2]Department of Physiotherapy, Faculty Medicine, Universitas Udayana, Denpasar, Bali, Indonesia.

*Corresponding author:
Ni Nengah Esti Ramantika;
Bachelor and Professional Program of Physiotherapy, Faculty of Medicine, Universitas Udayana, Bali, Indonesia;
estiramantika1006@gmail.com

Received: 2023-05-18
Accepted: 2023-07-06
Published: 2023-08-15

ABSTRACT

Background: Tabata exercise is the high-intensity interval training (HIIT) category that includes various motions. Exercise can increase cardiorespiratory endurance. The Cooper Test's VO2 max value can be used to assess a person's cardiorespiratory endurance.

Methods: A simple random sample methodology is employed in the study method, a randomized controlled trial. Two weeks were spent conducting this study. A total of 36 men with male sex who were split into two groups served as the study's samples. Eighteen people total, comprising the conventional exercise with Tabata and conventional exercise only. Pairwise simple t-tests and independent t-tests were employed for data analysis.

Results: Based on the paired simple t-test calculation findings, it was determined that hypothesis was approved in the intervention group because the *P*-value was 0.000 ($P< 0.050$). Still, it was rejected in the control group because the value was 0.083 ($P> 0.050$). The significance between the two groups was 0.000 ($P< 0.050$), according to the findings of computing the post-test data and the difference between the pre-test and the post-test using the independent t-test. The two groups differed significantly from one another.

Conclusion: There were differences in effectiveness between additional Tabata in conventional exercise and conventional exercise only in cardiorespiratory endurance changes.

Keywords: cardiorespiratory endurance, Tabata exercise, VO2max.
Cite This Article: Ramantika, N.N.E., Antari, N.K.A.J., Winaya, I.M.N., Widnyana, M. 2023. Effectiveness of additional Tabata in conventional exercise for cardiorespiratory endurance in football athletes. *Physical Therapy Journal of Indonesia* 4(2): 209-213. DOI: 10.51559/ptji.v4i2.141

INTRODUCTION

One of the famous team sports that people is football. In football, there are two teams, each with eleven players, and the objective is to score as many goals as possible against your opponent's goal while fending off their onslaught.[1] Several factors can affect an athlete's competition on the field, namely tactics, technique, and physical and mental condition.[2]

The most crucial factor is physical fitness, which is the foundation for integrating an athlete's tactical, technical, and mental talents while on the field.[3] One of the essential physical conditions for football athletes is cardiorespiratory endurance because a football match takes 90 minutes, and athletes must move actively on a large field. Athlete's endurance is tested by how strong their cardiorespiratory endurance is to finish the match that long.[4]

The capacity of the heart, blood vessels, and lungs to perform well both at rest and throughout extended periods of moderate to vigorous physical exercise without feeling overly exhausted is known as cardiorespiratory endurance. By having good cardiorespiratory endurance, football athletes only tire easily after the game ends.[5] To measure the cardiorespiratory endurance, the Cooper test can be used, which has a validity of 0.90 and a reliability of 0.94.[6]

Tabata exercise is one of the exercises that can increase cardiorespiratory endurance. This exercise is also considered one of the practical sports and gives results in a short time.[7] Tabata workouts are four minutes long with eight sets, each set practicing for 20 seconds before resting for 10 seconds. Tabata can be done in various ways, including doing the same movements in all sets. Another way to do this is to do two or more activities until you have eight sets. Exercise can be adapted to the needs of athletes.[8]

According to Hasiana, the muscles will contract when doing Tabata exercises. Contraction of these muscles increases metabolism in the muscles, so oxygen consumption rises to meet the increase in metabolism that occurs, which will also increase blood flow. This triggers a maximum increase in cardiac output, so oxygen delivery to the tissues increases maximally. The heart's left ventricle physically thickens due to increased oxygen intake, increasing the heart's power and capacity to pump blood per contraction. Doing the exercise continuously will cause adaptation. Adaptations that occur in the cardiorespiratory system, namely increased lung capacity and heart muscle strength, can be seen from an increase in the endurance value, VO2 max.[9] VO2

max is the body's ability to use oxygen for maximum activity. Where Vo2max is a parameter of cardiorespiratory endurance.[10]

Based on previous research conducted by Palmizal et al. found that football players showed a substantial benefit from Tabata training using the one-group pre-test and post-test research methodology.[4] This encourages the authors to conduct additional research with two groups—the intervention group and the control group. The purpose of this research was to evaluate the effectiveness of additional Tabata exercise in conventional exercises with conventional exercises only in increasing cardiorespiratory endurance.

METHODS

This study used a randomized controlled trial to see the differences in the effectiveness of additional Tabata in conventional exercises compared to traditional exercises only on cardiorespiratory endurance in football athlete Putra Yudha Bangli, Bali, Indonesia. Cardiorespiratory endurance was measured using the Cooper Test. A sample of 36 people calculated using the Pocock formula was selected by simple random sampling and met the inclusion and exclusion criteria. The inclusion criteria for this study were male football athlete Putra Yudha Bangli, aged 15-20 years, with moderate physical activity, namely 600-3000 metabolic equivalent of task (MET) as measured using international physical activity questionnaire (IPAQ) and typical vital signs. Exclusion criteria for this study were subjects undergoing exercise, which could affect cardiorespiratory endurance, and experiencing musculoskeletal complaints as identified through the Nordic Body Map questionnaire. The sample would be excluded when the subject did not follow the research protocols correctly. The study was conducted from April 2023 to May 2023. The independent variables were additional Tabata exercise in conventional exercise and conventional exercise only; the dependent variable was cardiorespiratory endurance; and the control variables were gender, age, body mass index, and physical activity.

This study was conducted in Penglipuran Traditional Village, Kubu, Bangli, Bali. The sample will be explained in advance the research procedure, and then ask the respondent to fill in informed consent who are willing to become the research sample. Responden of 36 people will be randomized into 2 groups, namely the intervention group and the control group. After being grouped, they were given a pre-test using the Cooper Test. The intervention group received both conventional workouts and Tabata activities, performed thrice weekly for two weeks. The Tabata exercises lasted 20 minutes, or 40 sets, each consisting of 20 seconds of movement and 10 seconds of rest. Then, after completing the intervention, a post-test was carried out with the Cooper Test the day after the last intervention was given. The data that has been obtained is tested for normality using the *Shapiro-Wilk Test* and the homogeneity test using *Levene's Test*. Hypothesis testing uses the Paired sample T-test for paired group tests and the Independent T-test for unpaired group tests.

RESULTS

Athletes who played football and were between the ages of 15-20 who live in Penglipuran Village, Bangli, made up the study's sample. The simple random sampling method collected 36 research samples from pieces matching the inclusion and exclusion criteria. To describe the characteristics of the research sample, univariate analysis was used. Age, gender, physical activity, and BMI were among the features of the study's sample.

Based on Table 1, the age range of Putra Yudha Penglipuran athletes, according to the inclusion criteria, is 15-20 years. The number of samples aged 15 years was 6 people (16.7%), 16 years old were 9 people (25%), 17 years old were 5 people (13.9%), and 18 years old were 4 people (11.1%). %), 19 years old, 4 people (11.1%), and 20 years old, 8 people (22.2%).

Table 1 also clearly demonstrates that the sexes in this study were all male, with a total of 36 participants and a percentage of 100%, physical activity in the moderate category on a scale of 600-3000 MET and a total of 36 participants and a rate of 100%, and a BMI in the standard type with a ranking of 18.50-24.99.

According to Table 2, the Shapiro-Wilk test findings for the normality test indicated significant pre-and post-test results in the intervention and control groups, with a standard data distribution and a p-value of 0.05. The intervention group's pre-test data had a normality test result of 0.623 ($p > 0.05$), while the post-test data had a normality test result of 0.694 ($p > 0.05$). Pre-test data in the control group had a normality value of 0.734 ($p > 0.05$), while post-test data had a normality result

Table 1. Characteristic of Respondent

Characteristic	N	%
Age (Year)		
15	6	16.7
16	9	25
17	5	13.9
18	4	11.1
19	4	11.1
20	8	22.2
Gender		
Man	36	100
Woman	0	0
Physical Activity		
Low(<600 MET)	0	0
Moderate (600-3000 MET)	36	100
Heavy(>3000 MET)	0	0
BMI		
Underweight (<18.49)	0	0
Normal (18.50-24.99)	36	100
Overweight (25.00-29.99)	0	0
Obesity (>30.00)	0	0

Table 2. Normality test and homogeneity test

	Group	Normality Test Shapiro-Wilk Test	Homogeneity Test Levene's Test
Pre-Test	Intervention	0.623	0.242
	Control	0.734	0.51
Post-Test	Intervention	0.694	0.121
	control	0.92	0.45

Table 3. Paired sample T-Test

	Intervention Group Mean±SD	Control Group Mean±SD
Pre-Test	31.9±3.2	31.9±2.5
Post-Test	36.4±1.9	32.4±1.9
P	0.000	0.083

Table 4. Independent T-Test

	Intervention Group Mean±SD	Control Group Mean±SD	*P*-value
Pre-Test	31.9±3.9	31.9±2.5	0.994
Post-Test	36.4±1.9	32.4±1.9	0.000
Difference	-4.4±1.6	-0.5±1.1	0.000

of 0.92 (p> 0.05).

To test for homogeneity, utilize *Levene's* test. According to Table 2, the pre-test and post-test findings in the intervention and control groups were homogeneous, with a *p-value*> 0.05. The findings of the post-test in the intervention group were 0.121 (p> 0.05), and the results of the pre-test data homogeneity test in the intervention group were 0.242 (p> 0.05) based on the mean. The control group's post-test results were 0.45 (p> 0.05), while the findings of the pre-test data homogeneity test were 0.51 (p> 0.05) based on the mean.

The paired sample T-test was utilized in Table 3 for the mean test of improving cardiorespiratory endurance before and after exercise in the intervention and control groups. A value of p= 0.000 (p< 0.05) was found in the intervention group, indicating that Tabata training successfully boosted cardiorespiratory endurance. The value of p = 0.083 (p> 0.05) in the control group showed that traditional exercise was ineffective in increasing cardiorespiratory endurance.

Based on Table 4, the pre-test data for the intervention and control groups were tested using an independent t-test. The results showed no difference between the pre-test scores for the intervention and control groups, with an average of 31.9 in both groups and a value of p = 0.994 (p> 0.05). The average post-test scores for the intervention and control groups were 36.4 for the intervention group and 32.4 for the control group, respectively. The post-test scores between the two groups differ significantly, as indicated by the p result, which is 0.000 (p 0.05). With an average value of -4.4 in the intervention group and -0.5 in the control group, and a value of p = 0.000 (p< 0.05), the data on the difference between the pre-test and post-test in the intervention and control groups show a significant difference between the two groups.

DISCUSSION

This research was carried out in April 2023 by collecting athletes as research samples at the Penglipuran Traditional Village Field, Bangli, Bali, Indonesia. Athletes who meet the inclusion and exclusion criteria comprise 39 of the 49 Putra Yudha Bangli football players. A population of athletes obtained the inclusion and exclusion requirements, and randomization was carried out to select 36 people for the research sample. After receiving the research sample, the allocation was randomized into two groups using a lottery, which included an 18-person intervention group and an 18-person control group.

According to Rubiani, 16 years is included in the late adolescent category, namely the consolidation period towards the adult period. Usually, late adolescents like socializing with people around them and seeking new experiences.[11] So, not a few 16-year-old teenagers join the football team to fill their free time. Sutarman also stated that teenagers have more free time than other productive age developments.[12]

Males are psychologically more interested in games that require a variety of movements. Football is not just an ordinary game that someone quickly plays. Football requires skill and mental and physical condition, so many men channel their hobbies by playing football.[13] Men and women have different fitness levels. Men have a higher fitness level than women in anatomy and physiology. This sex difference is based on the size and function of the heart and lungs in producing cardiorespiratory fitness.[14] According to Nurmitasari and Zaidah's research, the rate of increase in absolute VO2max values for boys and girls is usually the same until age 12. The VO2 max value for men will continue to increase until age 18, while for women, it will be more constant from 14-18 years.[15] In line with this, Rizqi and Udin stated that the fitness level of girls is far behind that of boys after puberty. Men's fitness is better than women's. Namely, 87.5% of male respondents have good fitness, while 85.7% of women are in the poor category. This causes men to play grueling football.[16]

Research conducted by Prabowo and Yuliastrid showed that physical activity and VO2 max had a weak relationship and had a positive direction, meaning that the higher the physical activity of football athletes, the better their VO2 max.[17] In line with this research, the results of Febriyanti et al. show someone who has dominant physical activity has poor cardiorespiratory endurance. This is because the more active a person is, the better his cardiorespiratory endurance.[18] To prove the effectiveness of the Tabata exercise, the researchers used the middle, namely samples with moderate physical activity.

Research conducted by Mahfud et al. found that the average BMI of Technocrat University Football UKM athletes was in the normal category. Normal BMI allows a football athlete to move agilely and firmly compared to someone with

excess or less BMI.[19] Aqmain and Irsyada stated that BMI and VO2 max had a negative relationship, namely an inverse relationship. If BMI increases, VO2 max will decrease, and vice versa.[20]

These findings are consistent with the findings of Palmizal et al. The test results indicate a considerable impact of the Tabata workout on the VO2 max ability of football athletes since the t value is more significant than the t table.[4] Meanwhile, Kusuma said that based on average calculations, the results of increasing VO2 max after Tabata training would be more significant in groups with medium and less initial VO2 max. People with an initial VO2 max are moderate and less when given high-intensity training. The stress generated is higher when compared to people who are trained.[21] The ability of the heart, lungs, and blood vessel systems to perform properly while engaging in daily activities for an extended length of time without feeling overly exhausted is known as cardiorespiratory endurance.[22] VO2 max can indicate a person's cardiorespiratory endurance fitness level. Cooper test is a type of test that can be used to measure cardiorespiratory endurance.[23]

Tabata exercise is one exercise that can increase cardiorespiratory endurance.[24] One of the studies that support this statement is research conducted by Maulana that Tabata training can increase cardiorespiratory endurance because Tabata training is a high-intensity training consisting of eight sessions of 20 seconds of exercise followed by 10 seconds of rest. This study was carried out 12 times, which was carried out continuously and continuously could increase the VO2max of the students of the Metro Ketawang Football Club Ngawi football school.[25]

Emberts et al.'s study on "Exercise Intensity Expenditure of a Tabata Workout" found that a 20-minute Tabata training that uses many body parts can boost cardiorespiratory endurance by raising Vo2 max. As opposed to Whyte et al., who claimed that high-intensity exercise performed three times per week for two weeks could enhance VO2 max by 7%.[26] Meanwhile, according to Egger and Kosasih's theory in the journal Tanzila et al. Improving the cardiorespiratory fitness index can be achieved with the minimum duration that must be done in aerobic activity, which is 15-20 minutes, and you should practice at least 3 times a week to get good results because a person's cardiorespiratory endurance will start to fall after 48 hours if you don't do exercise.[27]

In this study, four movements were used in the Tabata exercise, namely jumping rope, jumping jacks, high knees, and cross-body toe touch, carried out for 20 minutes or 48 sets, each set consisting of 20 seconds workout and followed by 10 seconds of rest. Tabata exercises consisting of jumping rope, jumping jacks, and high knees are dominated by jerking movements followed by hand swings that involve the muscles. With this jumping, movement can move the knees, hips, core, trunk, back, shoulders, and arms muscles.[28] In line with this, the research conducted by Adyaksa in jumping movements focused on the powers of the extremities, which can cause changes in respiration that help the mechanical load on the diaphragm during the breathing process. Movement of the arm straight up can trigger performance on the respiratory muscles, especially the trapezius muscles, which will increase a person's lung functional capacity effect.[29]

According to the findings of the previous study, Tabata exercise can enhance VO2 max and physiologically thicken the myocardial left ventricle of the heart, which boosts the heart's strength and ability to pump blood during each contraction and lowers the number of pulses per minute.[7]

According to this research, Hasiana said that doing Tabata exercises can increase blood flow, transporting oxygen and nutrients needed by contracting muscles. When doing Tabata exercises, a contraction occurs in the skeletal muscles, which causes the blood vessels to get pinched, causing blood to squeeze out of the intramuscular blood vessels. A mild rise in arterial blood pressure, an increase in the need for oxygen and nutrients, and an increase in muscle metabolism are all brought on by the contraction of skeletal muscles, and repeated Tabata practice results in increased blood flow. In healthy people, this will trigger a maximum increase in cardiac output, so oxygen delivery to the tissues increases to the maximum. As a result of the higher VO2 max, the left ventricle thickens physiologically, which boosts the heart's pumping efficiency and strength while lowering the heart rate. This causes an increase in cardiorespiratory endurance.[9]

According to Nuzularachmania and Indarto, the Tabata exercise, which is dominated by high-intensity jumping movements, will be quite draining and cause greater use of oxygen. The body will respond to this with the heart beating faster to pump oxygen-filled blood. If oxygen needs to increase, the heart will work harder and increase its pumping power. After regular exercise, the maximum oxygen consumption (VO2 max) will slowly grow.[30]

CONCLUSION

Based on the research and discussion above, adding Tabata exercises effectively increases cardiorespiratory endurance. There are significant differences between additional Tabata on conventional exercise and conventional exercise only in increasing cardiorespiratory endurance.

ETHICAL CLEARANCE

This study was approved by the Research Ethics Commission of the Faculty of Medicine, Udayana University. Ethical clearance with letter number 1099/UN14.2.2.VII.14/LT/2023 and protocol number 2023.01.0283.

CONFLICT OF INTEREST

This study has no conflicts of interest.

FUNDING

This study received no grants from any institution.

AUTHOR CONTRIBUTIONS

NNER is preparing study designs, collecting data, processing data, and writing manuscripts. NKAJA, IMNW, and MW are directing data collection and revising the manuscripts.

REFERENCE

1. Santoso SB, Junaidi S. Hubungan antara kekuatan otot tungkai dan keseimbangan dengan hasil passing bawah sepakbola pada

atlet usia 14 tahun di ssb kediri putra. *J SPRINTER*. 2020;1(1):38-42.
2. Maliki O, Hadi H, Royana IF. Analisis kondisi fisik pemain sepakbola klub persepu upgris tahun 2016. *Jendela Olahraga*. 2017;2(2):1-8.
3. Sulasmono R. Analisis deskriptif kondisi fisik pemain sepak bola ssb tunas jaya sidoarjo. *J Kesehat olahraga*. 2016;4(3):62-72.
4. Palmizal A, Munar H, Pasaribu AMN. Pengaruh latihan tabata terhadap kemampuan vo2max atlet sepakbola ps.tungkal ulu u-21. *J Coach Educ Sport*. 2020;1(1):25-34.
5. Syahda IA, Damayanti I, Imanudin I. Hubungan kapasitas vital paru-paru dengan daya tahan cardiorespiratory pada cabang olahraga sepak bola. *J Terap Ilmu Keolahragaan*. 2016;1(1):24.
6. Dianita I. Pengaruh permainan air terhadap kebugaran jasmani pada anak usia dini. *univ pendidik indones. Jurnal Kesehatan Perintis (Perintis's Heal Journal)*. 2020;7(1):32-40.
7. Herlan H, Komarudin K. Pengaruh metode latihan high-intensity interval training (tabata) terhadap peningkatan vo2max pelari jarak jauh. *J Kepelatihan Olahraga*. 2020;12(1):11-17.
8. Wibowo FA. Efektivitas tabata workout dan senam aerobik terhadap penurunan presen lemak tubuh pada pelajar overweight. *UNNES Repos*. 2019;7(1):29-32.
9. Hasiana ST. Pengaruh rope jumping dan latihan tabata terhadap fungsi paru dan indeks kebugaran tubuh. *Respirologi Indones*. 2021;4(1)10-15.
10. Yonas, S. A. R. and Nurhayati F. Perbandingan kemampuan daya tahan jantung dan paru-paru antara siswa kelas xi pada pembelajaran pendidikan jasmani pagi hari dengan siang hari di sman 1 kediri. 2014;2(3):306-312.
11. Rubiani A. Tahapan perkembangan remaja. medicine reviews 2017;(2011):9-32.
12. Sutarman W. Ruang kota sebagai wadah aktivitas remaja dalam mengisi waktu luang di kota denpasar. *SPACE*. 2015;2(2):254-266.
13. Akabar A. Meningkatkan hasil belajar teknik passing kaki bagian dalam pada permainan sepakbola melalui metode bermain berpasangan pada siswa kelas vii smp negeri 14 bengkulu tengah. *Educ Sport*. 2020;2020(2):52-55.
14. Oktriani S, Kusmaedi N, Ronald H, Setiawan A. Perbedaan jenis kelamin , usia , dan body mass index (bmi) hubungannya dengan kebugaran jasmani lanjut usia. *J Terap Ilmu Keolahragaan*. 2020;5(1):28-40.
15. Nurmitasari G, Zaidah L. Faktor-faktor yang mempengaruhi nilai vo2max pada remaja dengan metode narrative review. *Naskah Publ*. 2020;2(1):1-15.
16. Rizqi H, Udin I. Hubungan asupan karbohidrat dan status gizi dengan tingkat kebugaran jasmani pada atlet basket remaja siswa sekolah menengah pertama. *Media Gizi Indones*. 2018;11(2):182.
17. Prabowo LHG, Yuliastrid D. Hubungan aktivitas fisik dengan vo2 max pada tim futsal putra selama pandemi covid 19. *J Kesehat Olahraga*. 2022;10(04):25-30.
18. Febriyanti NK, Adiputra IN, Sutadarma IWG. Hubungan indeks massa tubuh dan aktivitas fisik pada mahasiswa fakultas kedokteran universitas udayana. *Erepo Unud*. 2017;831:1-14.
19. Mahfud I, Gumantan A, Fahrizqi BE. Analisis imt (indeks massa tubuh) atlet ukm sepakbola univetsitas teknokrat indonesia. *Sport Athl Teach Recreat Interdiscip Anal*. 2020;3(1):9-13.
20. Aqmain FN, Irsyada M. Hubungan indeks massa tubuh terhadap vo2 max atlet kota pasuruan. *J Olahraga Prestasi*. 2018;5(2):53-58.
21. Kusuma IDMAW. Perbedaan tingkat vo2max awal memiliki dampak yang berbeda terhadap hasil latihan tabata. *J Sport*. 2019;5(2):327-341.
22. Herry S. Tingkat daya tahan kardiorespirasi peserta ekstrakulikuler bulutangkis putra di smp negeri 2 banguntapan yogyakarta. *Lumbung Pustaka UNY*. 2020;7(1):32-40.
23. Wulandari PA, Purnawati S. Perbandingan daya tahan kardiorespirasi mahasiswa program studi pendidikan dokter fakultas kedokteran universitas udayana angkatan 2013 dengan mahasiswa d1 bea cukai sekolah tinggi akutansi negara denpasar angkatan 2013. *E-Jurnal Med Udayana*. 2014;3(2):1-10.
24. Wijaya AM, Syafii I. Pengaruh latihan tabata terhadap peningkatan vo2 max pada academy abyasa u-16 kab. nganjuk. *J Prestasi Olahraga*. 2018;1(1):1-7.
25. Maulana AA. Kontribusi kekuatan otot tungkai, panjang tungkai dan keseimbangan terhadap kemampuan menendang bola pada permainan sepakbola murid SD Negeri Sungguminasa IV Kabupaten Gowa. *Univ Negeri Makassar*. 2019;1(1):1-7
26. Emberts T, Porcari J, Doberstein S. Exercise intensity and energy expenditure of a tabata workout. *J Sport Sci Med*. 2013;12(3):612-613.
27. Tanzila, R.A. and Chairan LSAP. Pengaruh latihan aerobik terhadap kebugaran kardiorespirasi pada siswa smp di palembang. *J Online Univ Muhammadiyah Surabaya*. 2018;6(2):12-13.
28. Suciyati H, Zaidah L. Perbedaan pengaruh latihan skipping rope dan latihan shuttle run terhadap kelincahan pemain futsal siswa smp muhammadiyah 2 gamping. *J Unisa*. 2018;6(2):12-13.
29. Adyaksa AF, Ambarwati E, Supatmo Y, Marijo. The effect of jump rope training on oxidative stress and pulmonary function among medical student. *Diponegoro Med J*. 2020;9(4):12-13.
30. Nuzularachmania F, Indarto P. Pengaruh tabata workout untuk menjaga kebugaran tubuh pada masa pandemi covid-19. *J Porkes*. 2022;5(1):35-44.