Journal of Indonesian Physical Education and Sport
P-ISSN 2442-4900 | E-ISSN 2461-1271
Vol. 8, No.2, December 2022, page 46-55

Effect of Training and Recovery Methods on VO2max Athletes of UNSIKA Rowing Club by Controlling the Effect of Leg Length

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Abstract

A well-executed training program using the right training method will result in an athlete's performance if the athlete gets sufficient recovery to recover from post-exercise fatigue. To find out the athlete's performance by knowing the oxygen volume capacity by using the balke test but the leg length of each athlete is suspected of contributing in carrying out the test so researchers want to examine the Effect of Training and Recovery Methods on VO2max of UNSIKA Rowing Club Athletes by Controlling the Effect of Leg Length. quasi-experimental method with a 2 x 2 factorial design. The research variables consisted of: (1) the dependent variable, namely VO2max Athlete Rowing Club UNSIKA (2) independent variables, namely the treatment variable (A1: Cross country method, and A2: Fatlek) and attribute variables (B1: Passive Recovery and B2: Active Recovery) and (3) the covariate variable, in this study was Leg Length. So that the total number of research samples is 80 people. The Balke test is the test instrument used in collecting Vo2max data. as well as a tape measure to measure leg length. Hypothesis testing was carried out using two-way covariate analysis (ANKOVA) with a 2x2 factorial design. The results of the first hypothesis testing showed that the Vo2max results of the UNSIKA rowing club athletes between the athlete group using the cross country method were higher than the athlete group using the fatlek method after controlling for leg length. Thus the cross-country training method used in this study can improve the Vo2max results of UNSIKA rowing club athletes which are better than the fatlek method.

Keywords:vo2max, training method, recovery, leg length, rowing

Introduction

Rowing is a type of sport whose main means are water using boats and paddles. Rowing is a combination of three sports that are developing in Indonesia, namely canoeing, rowing, and traditional boat race. In regional and international terms, these three sports have their own international organization branches, namely the Federation International Socities de Aviron (FISA) for rowing, the International Canoe Federation (ICF) for canoing, and the International Dragon Boat Federation (IDBF) for traditional boat races. . In Indonesia, the three sports have merged into one parent organization, namely the Indonesian Rowing Association (PODSI).(Azizah, 2019).

In rowing, there must be readiness, both internal and external, to compete in the field. Internal readiness in the form of readiness in techniques, tactics, strategies and has the mental and physical readiness to compete in the field. As well as external readiness in the form of infrastructure, coaching, sufficient funds, disciplined trainers, as well as climate and weather(Ilham et al., 2020)

DOI: https://doi.org/10.21009/JIPES.082.02

Rowing sports develops and builds a coaching pattern with many rowing coaches in every urban district. This rowing sport is competed from the student level, university students and to the PORDA level. Championships between international students encouraged the UNSIKA campus to establish the UNSIKA Rowing Club as a forum for the process of developing rowing athletes. The characteristics of the rowing sport are more dominant in the physical condition of strength and endurance, especially in Rowing. So the need for a high vo2max capacity to produce the best performance.

The components of the physical condition needed and how much the level of physical condition is needed and how to improve it through training, there needs to be a thorough understanding of the physical condition(Trishandra & Rois, 2022). VO2Max is the maximum rate a person can take in and consume oxygen from the atmosphere for aerobic respiration and therefore represents aerobic energy expenditure.

VO2max is the maximum volume of oxygen or a level of body ability expressed in liters per minute or milliliters/minute/kg body weight(Nirwandi, 2017). And simply endurance can also be interpreted as the ability to deal with fatigue. However, by definition, it is the ability of the body's organism to overcome fatigue caused by loading in a relatively long time(Azzannul Fitrah, 2019). From this statement it can be concluded that, VO2max is the maximum limit of oxygen in the human body which is caused by loading in a relatively long time.

To train physically (endurance) there are various methods of physical training that can be applied including continuous methods, fartlek, Cross Country, Interval Training.(Togala, 2015). Cross-country training is a form of physical exercise activity that is carried out in the open where there are hills, shrubs, ditches to jump over, sandy soil, grassy soil, soft ground, and so on, which means not in nature where the ground is flat and which is a boring sight(Hadiana & Sartono, 2021)then cross-country training is a variation of exercise that is quite effective in preventing the athlete's saturation level in carrying out the exercise.

Fartlek is a Swedish word meaning "quick game". This is a training method that combines continuous training with interval training. Fartlek is a form of road running or trail running in which the runner, varies speed significantly during the run. Physical inactivity is an important public health problem and the seventh most common risk factor for cardiovascular disease globally.(Shingala & Shukla, 2019). Fartlek is an exercise to increase the aerobic capacity of the body, fartlek exercises can be in the form of running/jogging into nature using the capacity of the surrounding environment, running into nature is believed to increase endurance and is fairly cheap and practical.(Firdaus et al., 2022)

One of the important things to consider in doing physical activity is the recovery of working muscles. Recovery is useful for giving the body an opportunity to adapt after physical activity(Zulkarnain D, 2014). So it is necessary for an athlete to make a recovery after doing physical activity. Without good recovery, athletes can get injured. If this happens to the athlete, the athlete's body condition is not ready to undergo the next training or the next match and if it is forced by the athlete, it will not get maximum results and even injury can occur which causes a decrease in the athlete's performance or overtraining.(Hasan Mustafa, 2015). So in carrying out physical activity it is carried out according to the needs and instructions of the coach/teacher, so that athletes can be in good shape before competing.

In the recovery process it is very necessary to speed up recovery, there are 2 types of recovery, namely active recovery and passive recovery. Active recovery is a form of rest, which means the athlete does not sit still, but still does physical activity with very light (20% DNM) to light (50% DNM) intensity, such as jogging and walking, while passive recovery is a form of rest that does not involve physical activity. or done sitting still or resting completely, so passive recovery is a physical activity without any physical activity, such as silence, complete rest (sitting, lying down or sleeping)(Gandhi, 2019). Based on the opinion above, it can be concluded that an athlete needs to carry out the recovery process properly to restore the body's

DOI: https://doi.org/10.21009/JIPES.082.02

condition in carrying out physical activities or matches. The recovery process of passive recovery and active recovery are both useful and beneficial for someone who is carrying out the process of recovering the body's condition.

A well-executed training program using the right training method will result in an athlete's performance if the athlete gets sufficient recovery to recover from post-exercise fatigue. To find out the athlete's performance by knowing the oxygen volume capacity using the balke test but the leg length of each athlete is suspected of contributing in carrying out the test so researchers want to examine the Effect of Training and Recovery Methods on VO2max Athletes of Rowing Club UNSIKA by Controlling the Effect of Leg Length.

Methods

This study used a quasi-experimental method with a 2 x 2 factorial design. The research variables consisted of: (1) the dependent variable, namely VO2max Athletes of the UNSIKA Rowing Club; (2) independent variables, namely treatment variables (A1: Cross country method, and A2: Fatlek) and attribute variables (B1: Passive Recovery and B2: Active Recovery); and (3) the covariate variable, in this study was Leg Length. The target population of this study were all UNSIKA Rowing Club Athletes as many as 210 athletes. The research sample was determined to the UNSIKA Rowing Club athletes through a purposive sampling technique with the assumption that the UNSIKA Rowing Club athletes had free time to carry out research treatments. Determination of the experimental class was carried out by simple random sampling. The number of athletes in the experimental class is 75 athletes each. While the determination of athletes with passive and active recovery for each treatment class was carried out using a leg length test instrument. A total of 20 people (75 x 27%) in the upper group were declared as the group that had Passive Recovery and 20 people (75 x 27%) in the lower group were declared as the group that had Active Recovery. So that the total number of research samples is 80 people. The Balke test is the test instrument used in collecting Vo2max data. as well as a tape measure to measure leg length. Hypothesis testing was carried out using two-way covariate analysis (ANKOVA) with a 2x2 factorial design (Kadir, 2015: 431-437). A total of 20 people (75 x 27%) in the upper group were declared as the group that had Passive Recovery and 20 people (75 x 27%) in the lower group were declared as the group that had Active Recovery. So that the total number of research samples is 80 people. The Balke test is the test instrument used in collecting Vo2max data. as well as a tape measure to measure leg length. Hypothesis testing was carried out using two-way covariate analysis (ANKOVA) with a 2x2 factorial design (Kadir, 2015: 431-437). A total of 20 people (75 x 27%) in the upper group were declared as the group that had Passive Recovery and 20 people (75 x 27%) in the lower group were declared as the group that had Active Recovery. So that the total number of research samples is 80 people. The Balke test is the test instrument used in collecting Vo2max data. as well as a tape measure to measure leg length. Hypothesis testing was carried out using two-way covariate analysis (ANKOVA) with a 2x2 factorial design (Kadir, 2015: 431-437).

Results

From the results of the balke test and the leg length test for UNSIKA rowing club athletes, data was obtained and analyzed using Ancova (Analysis of covariance) with the aim of regulating the effect by controlling leg length.

DOI: https://doi.org/10.21009/JIPES.082.02

Table 1. Descriptive Statistics

Dependent Variable:VO2max

TRAINING METHOD	RECOVERY	Means	std. Deviation	N
Cross Country	Passive Recovery	48.45	.510	20
	ACTIVE RECOVERY	45.80	1.005	20
	Total	47.12	1,556	40
Fatlek	Passive Recovery	45.85	.933	20
	ACTIVE RECOVERY	47.60	.681	20
	Total	46.72	1,198	40
Total	Passive Recovery	47.15	1,511	40
	ACTIVE RECOVERY	46.70	1,244	40
	Total	46.92	1,394	80

From the results of data analysis for the cross-country training method with Passive Recovery the average value is 48.45 and a standard deviation of 0.510 while the Fatlek training method with Active Recovery has an average value of 45.85 and a standard deviation of 0.933. For the Fatlek training method with Active Recovery the average value is 47.60 and a standard deviation of 0.681

The line alignment test was used to study the effect of linear (Leg Length) on the Long Jump (Y) between 4 groups of Athletes formed by factor A and factor B applied through the following heterogeneous regression model:

Yijk = + (AB) ij + Kov (X) + (AB) ij x + ἐ ijk (Agung, 2006 ;249)μ

With condition: ∑ ij (AB) ij= 0

Statistical hypothesis to be tested:

H0 = (AB) ij x = 0

H1 : Not H0

Table 2 Tests of Between-Subjects Effects

Dependent Variable:VO2max

Source		Type III Sum of Squares	df	MeanSquare	F	Sig.
Model	Corrected	145.340a	7	20,763	182,082	.000
	Intercepts	194,284	1	194,284	1.704E3	.000
	A*B	.146	3	.049	.427	.734
	X	29,473	1	29,473	258,463	.000
	A*B*X	068	3	.023	.199	.897
	Error	8,210	72	.114		
	Total	176310,000	80			
Total	Corrected	153,550	79			

a. R Squared = .947 (Adjusted R Squared = .941)

DOI: https://doi.org/10.21009/JIPES.082.02

H0 : $\tilde{Y} = \beta 0 + \beta i + (0 + i)$ X, every i = 1, 2, 3, 4$\delta\delta$
H1 : Not H0

Based on the analysis results in Table 2, the price of the F test statistic is obtained, namely Fo = 0.199 with db = (3.72), p value = 0.897 > 0.05 or Ho is accepted. Thus the regression coefficients (slope) of the four groups or cells A1B1, A2B1, A1B2, A2B2 are parallel. Thus the ANKOVA model can be applied which can be formed in the following parameter estimate table:

Table 3 Parameter Estimates

Dependent Variable:VO2max

					95% Confidence Intervals	
Parameter	B	std. Error	t	Sig.	LowerBound	Upperbound
Intercepts	33,703	1826	18,457	.000	30,063	37,343
[A=1] * [B=1]	2097	2,937	.714	.477	-3,757	7,952
[A=1] * [B=2]	-.738	2.138	-.345	.731	-5,000	3,524
[A=2] * [B=1]	.112	2091	054	.957	-4,057	4,282
[A=2] * [B=2]	0a	.	.	.	.	.
X	.116	.015	7,617	.000	085	.146
[A=1] * [B=1] * X	-.011	024	-.433	.667	-.059	038
[A=1] * [B=2] * X	.004	.018	.230	.819	-.032	041
[A=2] * [B=1] * X	-.004	.018	-.214	.832	-.039	032
[A=2] * [B=2] * X	0a	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

From Table 3, a regression equation can be formed which shows the intercepts of the four regression lines in each cell factor (group).

Table 4. Ankova Regression Model

Cell	Model Constants & Regression Functions		
i	Parameter	Estimation	Regression equation
1	$\tilde{Y} = \beta 0 + \beta 1 + (0 + 1)$ X$\delta\delta$	(33.703 + 2.097) + (0.116 – 0.011) X	$\tilde{Y}$11 = 35,800 + 0.105X
2	$\tilde{Y} = \beta 0 + \beta 2 + (0 + 2)$ X$\delta\delta$	(33.703 – 0.738) + (0.116 + 0.004) X	$\tilde{Y}$12 = 32.965 + 0.120 X
3	$\tilde{Y} = \beta 0 + \beta 3 + (0 + 3)$ X$\delta\delta$	(33.703 + 0.112) + (0.116 – 0.004 X	$\tilde{Y}$21 = 33.815 + 0.112 X
4	$\tilde{Y} = \beta 0 + 0$ Xδ	(33.703 + 0.000) + (0.116 + 0.000) X	$\tilde{Y}$22 = 33.703 + 0.116 X

Two Way Hypothesis Testfor main effects (main effects) A, B, X and interaction effects (interaction effects) AB
The regression model is:
Yijk = + Ai + Bj + (AB) ij + Kov (X) + ἐ ijkμ
The two-way statistical hypothesis to be tested is:

H0 : $\alpha i = 0$, every i
H1 : Not H0

H0 : $\beta j = 0$, every i
H1 : Not H0

H0 : $\alpha\beta ij = 0$, every ij
H1 : Not H0

H0 : Xs = 0, every s
H1 : Not H0

H0 : $\alpha i = \beta j = \alpha\beta jj$ = Xs = 0, every i, j, s
H1 : Not H0

DOI: https://doi.org/10.21009/JIPES.082.02

Table 5 Tests of Between-Subjects Effects

Dependent Variable:VO2max

Source	Type III Sum of Squares	df	MeanSquare	F	Sig.	Partial Eta Squared
Corrected Model	145.272a	4	36,318	329,033	.000	.946
Intercepts	278,248	1	278,248	2.521E3	.000	.971
A	3,528	1	3,528	31,962	.000	.299
B	3,311	1	3,311	29,998	.000	.286
A*B	5030	1	5030	45,574	.000	.378
X	41,222	1	41,222	373,461	.000	.833
Error	8,278	75	.110			
Total	176310,000	80				
Corrected Total	153,550	79				

a. R Squared = .946 (Adjusted R Squared = .943)

From the results of the analysis as summarized in Table 5, a two-party test was carried out with the F test statistic:

Hypothesis 1

H0 : $\alpha i = 0$, every i

H1 : Not H0

F0(A) = 31.962; db = (1, 75) and p-value = 0.000 <0.005 or H0 is rejected. Thus, there is a difference in the average VO2max of UNSIKA Rowing Club Athletes (Y) between athletes trained with the Cross-country training method (A1) and the Fatlek method (A2) after controlling for Leg Length (X). Conclusion: The training method has an effect on the VO2max of UNSIKA Rowing Club Athletes after controlling the Leg Length.

Hypothesis 2

H0 : $\beta j = 0$, every i

H1 : Not H0

F0 (B) = 29,998; db = (1, 75) and p-value = 0.000 <0.005 or H0 is rejected. Thus, there is a difference in the average VO2max of UNSIKA Rowing Club Athletes (Y) between Athletes who are given Passive Recovery (B1) and Active Recovery (B2) after controlling for Leg Length (X). Conclusion: Passive Recovery has an effect on VO2max of UNSIKA Rowing Club Athletes after controlling Leg Length.

Hypothesis 3

H0 : $\alpha\beta ij = 0$, every ij

H1 : Not H0

F0 (AB) 45,574; db = (1, 75) and p-value = 0.000 <0.005 or H0 is rejected. Thus, there is an interaction effect of training and recovery methods (AxB) on the VO2max of UNSIKA Rowing Club Athletes (Y) after controlling the VO2max of UNSIKA Rowing Club Athletes (X). Conclusion: The training method has an effect on the VO2max of UNSIKA Rowing Club Athletes depending on Recovery after controlling Leg Length (X) and vice versa.

Hypothesis 4

H0 : Xs = 0, every s

H1 : Not H0

F0 (X) = 373.461 db = (1, 75) and p-value = 0.000 <0.005 or H0 is rejected. Thus, there is a linear influence of Leg Length covariate (X) on VO2max of UNSIKA Rowing Club Athletes (Y)

Hypothesis 5

In the correct model table 5 row, F0 = 329,033, db = (4, 75) and p-value = 0.000 <0.005 or H0 is rejected, so that the covariate of Leg Length (X), training method (A) and Recovery (B) are simultaneous effect on VO2max Athlete Rowing Club UNSIKA (Y)

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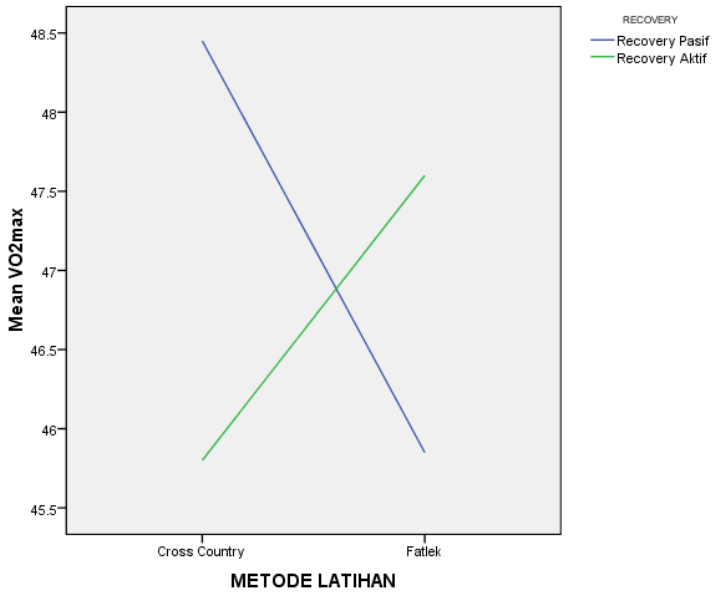

Figure 1 Graph of the interaction between training and recovery methods against the VO2max of the Unsika Rowing Club athlete

One-sided hypothesis testwith t test statistics for main effects (main effects) A, B, X and interaction effects (interaction effects) AB

Regression models:

Y = β0 + β1 (A=1) + β2X + e

Hypothesis 6

Ho :$\beta_1 \leq 0$

H1 :$\beta_1 > 0$

Or

Ho : $10 \leq 20\mu\mu$

H1 : $10 > 20\mu\mu$

Table 6 Parameter Estimates

Dependent Variable:VO2max

					95% Confidence Intervals		
Parameter	B	std. Error	t	Sig.	LowerBound	Upperbound	Partial Eta Squared
Intercepts	30,367	.657	46,188	.000	29,057	31,676	.965
[A=1]	.425	.103	4.113	.000	.219	.631	.180
[A=2]	0a	.	.	.	.	.	.
X	.144	006	25,037	.000	.132	.155	.891

a. This parameter is set to zero because it is redundant.

Based on the analysis results in Table 6, the price of the t test statistic is obtained, namely t count = 4,113 and p-value = 0.000/2 = 0.000 <0.05 or H0 is rejected. Thus, the data supports the hypothesis, meaning that the average VO2max of UNSIKA Rowing Club Athletes (Y) Athletes trained with the Cross-country method (A1) is higher than athletes trained with the Fatlek method (A2) after controlling for Leg Length

(X). Conclusion: the Cross country method (A1) is more effective in increasing the VO2max of UNSIKA Rowing Club Athletes than the Fatlek method (A2) after controlling for Leg Length (X).

DOI: https://doi.org/10.21009/JIPES.082.02

Hypothesis 7

Ho :1 λ 0

H1 : :1λ 0

Or

Ho : 01 ≤ 02$\mu\mu$

H1 : 01 > 02$\mu\mu$

Regression models:

Y = :0λ + : 1λ B=1) + 2 λX + e

Table 7 Parameter Estimates

Dependent Variable:VO2max

					95% Confidence Intervals	
Parameter	B	std. Error	t	Sig.	LowerBound	Upperbound
Intercepts	30,459	.665	45,778	.000	29,134	31,784
[B=1]	.396	.105	3,781	.000	.188	.605
[B=2]	0a	.	.	.	.	.
X	.143	006	24,562	.000	.131	.155

a. This parameter is set to zero because it is redundant.

Based on the analysis results in Table 7, the price of the t test statistic is obtained, namely t count = 3,781 and p-value = 0.000/2 = 0.000 <0.05 or H0 is rejected. Thus, the data supports the hypothesis, meaning that the average VO2max of UNSIKA Rowing Club Athletes (Y) Athletes who are given Passive Recovery (B1) is higher than Athletes who are given Active Recovery (B2) after controlling for the effect of Leg Length (X). Conclusion: Passive Recovery (B1) is more effective in increasing the VO2max of UNSIKA Rowing Club Athletes than Active Recovery (B2) after controlling Leg Length (X).

Discussion

The results of testing the first hypothesis showed that the Vo2max results of UNSIKA rowing club athletes between the athlete group using the cross country method were higher than the athlete group using the fatlek method after controlling for leg length. Thus the cross-country training method used in this study can improve the Vo2max results of UNSIKA rowing club athletes which are better than the fatlek method. This finding also answers the research hypothesis that the results of the cross-country training method are better than athletes using the fatlek method after controlling for leg length. And passive recovery is better than active recovery after controlling leg length.

Vo2max is very important for athletes because athletes who have high Vo2max will have high endurance which is an important point in achieving performance. This is in line with the results of research from Widodo and Novitasari regarding the Fitness Profile of Klaten District Futsal Athletes Expressed by Vo2max. The main finding in this study was that the fitness level (VO2Max) of the Klaten Regency futsal athletes was 42.87% at a moderate level, 42.85% at a less and less level, and only 14.28% at a good level. Seeing these findings, it means that the fitness condition of the majority of Klaten Regency futsal athletes is at a moderate level.(Widodo & Novitasari, 2022).

The cross-country method is better than the fatlek method because cross-country training provides a different training atmosphere compared to fatlek training. In the One-year periodization of training loads of Russian and Norwegian elite cross-country skiers cross country aims to provide the highest level of specific physiological capacity, motor ability, and maximum efficiency of the movement system. This allows athletes to reach competitive speeds in major races. In addition to adequate training and optimal methods, the most important

DOI: https://doi.org/10.21009/JIPES.082.02

condition for achieving the highest level of performance in time is the rational distribution of the training load and the effective relationship of their modes during the one-year macro-cycle (i.e. their annual periodization).(Myakinchenko et al., 2021)

Athlete's performance is not only built by the scheduled training in the training program but it takes optimal quality of rest to compensate for the results of tiring training. In line with what was found by(Harahap & K, 2016)that the recovery process of passive recovery and active recovery are both useful and beneficial for someone who is carrying out the process of recovering the body's condition. In this case, passive recovery may be more appropriate for the body's recovery process, because it aims to accelerate physiological regeneration and eliminate lactic acid

Conclusions

Based on the results of research, data analysis, hypothesis testing and discussion of research results on the Effect of Training and Recovery Methods on VO2max Athletes of Rowing Club UNSIKA by Controlling the Effect of Leg Length, the following conclusions are drawn:

First: The training method affects the VO2max of the UNSIKA Rowing Club Athletes after controlling the Leg Length. Second: Passive Recovery affects the VO2max of UNSIKA Rowing Club Athletes after controlling the Leg Length. Third: The training method affects the VO2max of UNSIKA Rowing Club Athletes depending on recovery after controlling the length of the limbs (X) and vice versa. Fourth: there is a linear influence of Leg Length covariate (X) on VO2max of UNSIKA Rowing Club Athletes (Y). Fifth: the covariate Leg Length (X), training method (A) and Recovery (B) simultaneously affect the VO2max of UNSIKA Rowing Club Athletes (Y). Sixth: The Cross-country method (A1) is more effective in increasing the VO2max of UNSIKA Rowing Club Athletes than the Fatlek method (A2) after controlling for Leg Length (X). Seventh:

References

Azizah, N. (2019). EVALUATION OF THE PHYSICAL CONDITIONS OF KAYAK ROWING ATHLETES PUSLATDA JATIM Nur Azizah S1 Sports Science, Health and Recreation Education, Faculty of Sports Science, Surabaya State University Achmad Widodo S1 Sports Science, Health and Recreation Education, Faku. Sports Health, 7(2), 511.

Azzannul Fitrah, YK (2019). Physical Conditions of High School Volleyball Players. Patriots Journal.

Firdaus, W., Nurhayati, M., & Football, KW (2022). FARTLEK EXERCISE IN IMPROVING PHYSICAL FITNESS. 317–321.

Gandhi, YMA (2019). The Difference between Active Recovery and Passive Recovery in Night Futsal Sports Against Lactic Acid Levels in Semarang Indonesia Futsal Association Players.

Hadiana, O., & Sartono. (2021). Improving Physical Fitness Through Cross Country Exercise Karate UKM Students During the Covid 19 Pandemic Improvement Of Physical Fitness Through Cross Country Exercise Karate Student Activity Unit During Covid 19 Pandemic. Physical Activity Journal, 3(1).

Harahap, IM, & K, FR (2016). Effect of Active Recovery (Jogging) on Reducing Lactic Acid Levels in Blood After Anaerobic Exercise (Interval Training). Journal of Sports Health, 5(2), 43–50.

Hasan Mustofa, FRK (2015). Knowledge Analysis of the Trainers of the Bumi Wali Tuban Handball Club on Recovery. Journal of Sports Health, Vol 7 No 2 (July 2019 Issue), 150–155. https://ejournal.unesa.ac.id/index.php/jurnal-kesehatan-olahraga/article/view/30276

DOI: https://doi.org/10.21009/JIPES.082.02

Ilham, M., Rifki, MS, Health, J., & Recreation, D. (2020). Effect of Weight Training on Increasing Arm Muscle Hypertrophy of Rowing Athletes. Stamina, 3(6), 379–397.

Myakinchenko, EB, Kriuchkov, AS, Adodin, NV, Dikunets, MA, & Shestakov, MP (2021). One-year Periodization of Training Loads of Russian and Norwegian Elite Cross-country Skiers. Journal of Human Sport and Exercise. https://doi.org/10.14198/jhse.2021.163.18

Nirwandi. (2017). Bima Junior Football School. PENJAKORA Journal, 4(2), 19–20. https://ejournal.undiksha.ac.id/index.php/PENJAKORA/article/view/13362/8395

Shingala, M., & Shukla, Y. (2019). Effectiveness of Fartlek Training on Cardiorespiratory Fitness and Muscular Endurance in Young Adults: A Randomized Control Trial. Indian Journal of Physiotherapy and Occupational Therapy - An International Journal. https://doi.org/10.5958/0973-5674.2019.00051.0

Togala, Z. (2015). The effect of learning approaches and thinking styles on learning outcomes of electronics skills after controlling for prior knowledge. JTP - Journal of Educational Technology, 17(2), 129–140.

Trishandra, J., & Rois, M. (2022). The Influence of Circuit Training Exercises on the Physical Conditions of Athletes in Football at PS Debai Club, Sungai Full City. Muara Sports Journal, 4(2), 11–18. https://doi.org/10.52060/jmo.v4i2.816

Widodo, A., & Novitasari, Y. (2022). Riyadhoh: Sports Education Journal Available Online: https://ojs.uniska-bjm.ac.id/index.php/riyadhohjurnal WITH VO2MAX Fitness Profile of Futsal Athletes in Klaten Regrency Declared with VO2MAX UPT Journal Publication and Management Islamic University Ka. 5, 107–112.

Zulkarnain D. (2014). Differences in the Effects of Cryotherapy and Passive Recovery on Pain and Serum Creatine Kinase Levels in Student Futsal Athletes. University of Indonesia.

DOI: https://doi.org/10.21009/JIPES.082.02