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Indra Adi Budiman
Majalengka University
West Java, Indonesia

Comparison of the effects of fartlek exercise and interval training towards the improvement of Vo₂ maximum

Indra Adi Budiman

Abstract

This research is motivated by the writer's observation in the field, that the application of physical education model in Elementary School only emphasizes on physical aspect, so the result of his learning is only a quality improvement in psychomotor aspect and ignore the cognitive, and affective aspects of the student. With the application of a model of learning that combines aspects of cognitive, affective, and psychomotor the writer expect to guide students to be able to develop intact cognitively, affectively, and psikomotorik. The purpose of this study to determine how much influencing the application of self-regulated learning model approach towards the student analytical ability on learning physical education. The research method used in this research is the experimental method. The research design used is Posttest Only Control Design. It also uses questionnaire instruments regarding analytical skills. After being tested with all requirements of data analysis, followed by hypothesis test using t-test, it is proven that the model of physical education learning using Self Regulated Learning approach has a significant influence on students' analytical ability of elementary school. It is thus expected that the Physical Education teachers use the Self Regulated Learning approach model in Physical Education learning.

Keywords: Self Regulated Learning Model, Student' Analytical Ability, Learning Physical Education

Introduction

One sport that is now increasingly popular and in the interest of community sport is soccer. Football is a team sport, which every team consists of eleven players, each player has a different role. Many people do sport of football just for recreational purposes and maintain his fitness, but not the least among the public, especially young people who cultivate the sport is for the purpose of achievement.

Sucipto, (2000: 7) ^[20]. Argues that, "Sport football is just put the ball into the goal as many as possible to his opponent and trying to keep his own net, so it is not goal. Furthermore, according to the rules of football game Law of The Game issued by FIFA (2013) ^[5]. In Rule 7 described that:

"A football game is played in 2 (two) round. The length of time of each half is 45 minutes, with a 15 minute break. In the decisive match in the final instance, in case of the same value, then for the winner is given an additional round time for 2 x 15 minutes with no intermission. If the extra time 2 x 15 minute values are still the same, it will proceed with penalty kicks to determine which team wins. "

In the game of football with the length of time the game 2 x 45 minute course every player should have good physical fitness to be able to play to the maximum. Badriah (2012: 31) ^[3], in her book "Physiology of the sport" explains that "physical fitness is the body's ability to perform various movements without experiencing significant fatigue and recover quickly before the arrival of the task the next day". It is also to support the success of the implementation process of movement skills in the sport of football, such as endurance and stamina. Harsono (1988: 155) ^[9]. Describes the "Durability is a state or condition of the body that is able to work with a long time, without experiencing fatigue which means" stamina described above is higher level of durability of the endurance. Then player should seek to improve the durability to become stamina through certain exercises. Before doing exercise to increase endurance to become stamina athlete must have a level of endurance.

Correspondence
Indra Adi Budiman
Majalengka University
West Java, Indonesia

Therefore aerobic power will only have to increase anaerobic power, and never happens if aerobic power is greater than anaerobic power except on the recovery. Giriwijoyo (2012: 165) [7]. Argues that "it will never happen aerobic capacity is lower than the anaerobic capacity that has been owned at the time". It means that in order to improve aerobic capacity, the load / intensity exercises should overload = supramaximal and the duration which is adequate for aerobic exercise. According Sukadiyanto and Muluk (2011: 83) [21]. says "VO₂max is the ability of the human respiratory organs for breathing oxygen as much as possible during exercise (physical activity)", To make the program endurance exercises the lungs and the heart of determining exercise intensity rather than being based on the maximum heart rate can also be based on a percentage of the VO₂ maximum at anaerobic threshold or someone.

Anaerobic threshold is the transfer of energy through aerobic system support shifted into the anaerobic system. In an effort to increase the VO₂ maximum soccer athletes of Majalengka University students should focus on endurance training which is a model of practice that is used to improve the durability of the lung and heart. The method used is fartlek training and interval training. Fartlek according to its creator should be open in nature where there are hills, thickets, ditches to jump, sandy soil, lawn soil, soft soil and so the question is not in nature where the land is flat and dull landscape. Harsono (1988: 156) [9]. "Interval training is a workout or exercise system that is interspersed with intervals in the form of a period of rest". So in practice is; break - exercise - break - exercise - rest and so on. Interval training is an important way of training to be included in the overall training program. To improve the ability of college football athletes of Majalengka university they need to do exercises that lead to the formation of the physical condition, technique, strategy and mental. During these exercises to improve the physical condition, especially endurance and stamina they use fartlek training methods and interval training.

Seeing the problems seen in the background of the above problems, the authors are interested in doing research on: "Comparative Effects of Fartlek and Interval Training To Increase VO₂ Max".

Literature

According Muhajir cited by Dian Ika (2007: 7), states that "football is a game made with the punt, which has the objective to put the ball into the opponent's goal and defend the wicket in order not conceded a ball".

In playing the ball, each player is allowed to use the whole body except the hands and arms. Only the goalkeeper is allowed to play ball with the feet and hands. Football is a team game, each team consists of eleven players.

Based on the above opinion can be concluded that football is a team game played by two teams, each team consists of eleven players, including goalkeeper. Each team tried to put the ball into the opposing goal in a game that lasts 2 x 45 minutes. A squad was declared the winner when the teams can put the ball into the goal more and conceded fewer balls when compared with his opponent.

Basic Technique Football

To be able to generate an optimal football game, then the player should be able to master the techniques in the game. The basic technique is to play football is the ability to perform movements or doing something completely detached from the game of football. According Sneyers cited by Raharjo (2007:

94) argues: "some basic techniques to learn is to control the ball with the feet, thighs, chest and head, the ball forward without being held, dribbling, kicks while salto, pass short and long, throw the ball, direct and indirect kick, a corner kick short and long, the ball, to give effect to the ball and so forth ". While Fuchs cited by Raharjo (2007: 94) states, "classifies the techniques of playing football skills consisted of kicking, trapping, dribbling, volleying, heading and throw-ins. three basic techniques that must be owned by a player, although there are other techniques ". Meanwhile, according to Usli *et al.* (2008: 39) argues "there are seven basic techniques in football, namely: 1). Passing, 2). Stopping 3). Dribbling, 4). Heading, 5). Throw in, 6). Tackling. 7). Trapping 7). Goalkeeper.

Savin and Sushikov cited by Yunus *et al.* (2009: 11) argues that "the basic engineering skills in the game of football are: (1) kicking skills; (2) the skill to control the ball; (3) depriving ball skills; (4) the skills to throw the ball; and (5) wicket keeping skills ". The same is expressed by Dietrich (2009: 11) that "whoever seeks to be a soccer player good, first of all should be able to kick and headings, also to be mastered skills base to carry dribbling and controlling",

Understanding Exercises

Physical, functional ability and quality of body equipment of a football player who wants to master the motor skills need to be exercised systematically as well as targeted and sustainable. In principle, the exercise is a process of change towards the better.

According Sukadiyanto and Muluk (2011: 5) [21]. Mentions "the exercise of the said practice is an activity to improve the skills (skills) exercise using various equipment in accordance with the objectives and needs of branches of sport". Meanwhile, according to Harsono (1988: 101) [9]. states, "Exercise or training is a systematic process of training or work, which is done repeatedly, by increasing the amount of load or work at every practice."

Based on the description of understanding exercise includes practice, exercise and training as well as supporting the achievement of training objectives is by loading it can be concluded that the main task of the exercise is to explore, assembles and develops the concept of practicing with a combination of practical experience and the approaches, so that the training process can take place precisely, fast, effective and efficient.

It is a key component of the exercise or important things to be considered in determining the dosage and the training load. Moreover component of the exercise as a benchmark and benchmarks crucial to achieve the goals and objectives whether or not a practice that has been developed and implemented.

According Sukadiyanto and Muluk (2011: 25) [21]. states: "an error in determining the components of exercise causes exercise goals will not be achieved as planned resulted in the training process does not result in supercompensation and does not give a positive impact on the state of the body of an athlete." "Supercompensation is the process of changing the functional quality of the equipment body into a better direction, as a result of the influence of external loads the appropriate treatment". As for some kind of exercise components, namely:

1. Intensity: According Sukadiyanto and Muluk (2011: 26) [21]. states that "The intensity is a measure that indicates the quality (quality) of an excitatory or loading".
2. Volume: According Sukadiyanto and Muluk (2011: 28)

[21]. States that "the volume is a measure of the quantity (amount) of an excitatory or loading".

While in the process of training methods used to increase the volume of training can be done by exercise: (a) aggravated, (b) prolonged, (c) accelerated, or (d) be reproduced.

Fartlek Training

Harsono (1998: 155) System fartlek workout created by GostaHolemer of Sweden is an endurance training system which means to build, restore or maintain the condition of a person's body. In this exercise the athletes can decide the type, intensity and duration of exercise or depending on the circumstances and the condition of the athlete at the time. Thus, athletes are free to play around at their own pace, free to vary the speed, distance and route path. This exercise will be helpful to avoid boredom in practice.

According Harsono (2001: 10) [10]. Mentions "fartlek run or speedplay is a form of exercise that is running in the open air for as long as 1 to 3 hours.

Further Harsono (1988: 156) [9]. states that: "fartlek usually start with a run slow - slow later in the variation of the sprint - short sprints intensive and run the middle distance with a constant velocity is high enough, then interspersed with jogging and sprint again, and so on. "

Meanwhile, according to Sukadiyanto and Muluk fartlek run is "the activity of running (such as hollow sprints) will be undertaken by means of road, jogging, sprints, and the road constantly.". For example training fartlek with duration of 45 minutes, its implementation began with a jog for 6 minutes as a warm, interspersed scamper 50-60 meters, continue the road one minute and jog 3 minutes, then sprinting again 50-60 meters and so on, so between jogging and roads are interspersed with sprinting.

Based on expert opinions above authors conclude that run fartlek is a system of exercise that is done in the open, starting with a run jogging in the sprint and then proceed to the next street and so on. As seen in Figure 1 below:

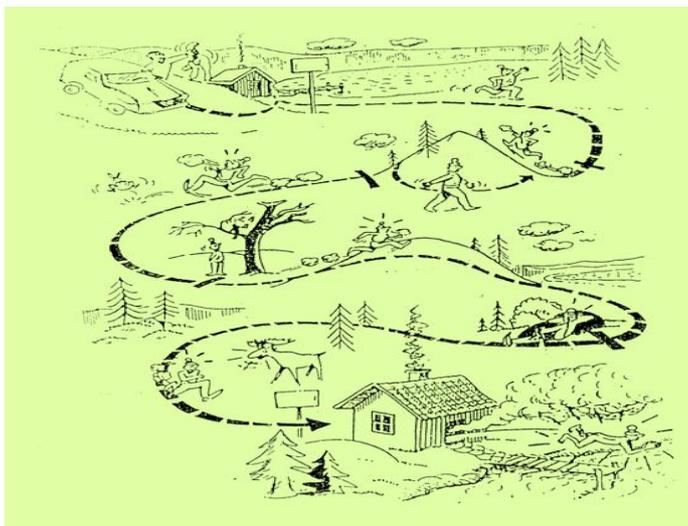


Fig 1: Run Fartlek (Harsono, 2001)

Interval Training

Interval training method is the most appropriate method to improve the physical quality of the athletes. In the method of interval workout prefer giving time interval (intermission) at the time between sets, with the shape of its activities, among others, by running or swimming.

According Mulyono cited by Rahim (2011: 48) mentions "interval training is defined as" an activity that is done repeatedly and each time interspersed with lighter activity ". As the name implies that interval training is a training method interspersed with intervals in the form of a period of rest.

According Sukadiyanto and Muluk (2011: 29) [21]. States "rest time interval is given at the time between series, circuits or between sessions per unit exercise". The difference is that the recovery is given at the time between sets or reps (repetition), while the interval between the series given at the time, circuits or between sessions per unit training. The principle is always giving shorter recovery time (shorter) than the delivery time interval. While EngkosKosasih cited by Indrayana (2012: 5) menyebutkan "Interval training is a certain distance with the number of replications, determined critical distance to go, time and rest, and how much repetition".

According Badriah (2011: 47) [2]. explains that "The form of the different exercises will give effect to the different physiology". Basically the only two forms of physical exercises are: aerobic exercise and anaerobic exercise.

Based on the explanation above, in the implementation of interval training should also be able to pay attention to the type and form of exercise because it can affect the increase in VO2max athletes.

As for the rules or menu for interval training exercise program remotely by Rushall and Pyke cited by Sukadiyanto and Muluk (2011: 75) [21]. is can be seen in the following table:

Table 1: Menu distance interval training program

Intensitas	85-90% maximum (DJ. 180 - 200x / minutes
Durasi	2-5 minutes
Recovery	1: 1 to 1: 2 (DJ. 130 - 140x / minutes
Interval	2 - 8 menutes
Repetisi	3 - 12 times

Source: Sukadiyanto and Muluk, physical training (2011)

Itself VO2 Max

According Sukadiyanto and Muluk (2011: 83) [21]. states "VO2max is the ability of the human respiratory organs for breathing oxygen as much as possible during exercise (physical activity)", while according Wiarto (2013: 15) argues "VO2 max is the maximum volume of O2 are processed by the human body at the time of intensive activity". According Sharkley (2011: 74) mentions "aerobic fitness (VO2 max) is defined as the maximum capacity for a breath, distribute, and use oxygen". So VO2max is the maximum volume of O2 are processed by the human body during physical activity. Volume O2 max is a body's ability level expressed in liters per minute or milliliters / min / kg.

If the maximum physical exercise regularly, then the production of lactic acid becomes less at the time of maximum physical exercise. In addition, the physiological response of the body is also changing the time of maximum physical exercise, among other changes in oxygen consumption and CO2 production becomes less.

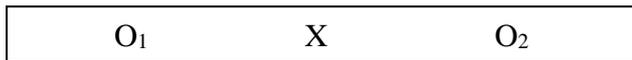
Research Methods

The research method is a way to get the truth of science or solve problems. According Suharsimi Arikunto (2006: 160) states that, "The research method is a method used by researchers to collect data research". This concurs with Badriah (2012: 143) [3]. who explains that, "The research method is a method used in data collection".

The method used in this research is the experimental method. Experiments are always done with the intent to see the effects of a treatment.

Research Design

The design of the study is the design of the Pre-test and Post-test Group. According Suharsimi Arikunto (2006: 85) design Pre-test and Post-test Group are as follows:



The flow of research by the author steps described in Figure 2 as follows:

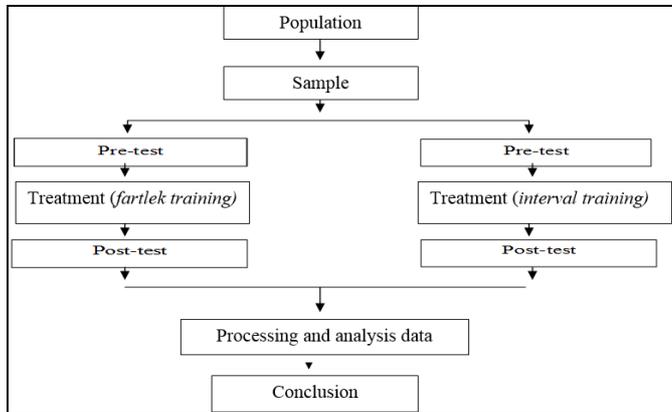


Fig 2: Flow-step research

Technique Analysis Data

Before doing the analysis of data for the purposes of the description of variable or to test the hypothesis we must subject to data processing. Data processing techniques used to transform raw data from measurement results into data that is more subtle so as to provide direction for further assessment. To process the measurement data technical researchers used data analysis using SPSS 20. The processing steps of data in this study are as follows:

1. Finding the lowest value, highest value, average, standard deviation and variance. Here are the steps: open SPSS> on the menu bar select Analyze> then select the descriptive statistics and data inputs, and will descriptive menu appears>pilihoption> then click mean, std deviation, variance, maximum and minimum> then click ok.
2. Test Normalitasdata using SPSS 17 Here are the steps: open SPSS> on the menu bar select Analyze> then select descriptive statistics> select Explore appeared explore menu> click plots> click normaly with test plots> click factor leaves together> click power estimation> click ok Rule SPSS Kolmogorov-Smirnov test, as for the basis of decision making is if sig. or a probability value> 0.05 then said normal data distribution, and if sig. or a probability value of <0.05 then said data distribution is not normal.
3. Test Homogeneity data using SPSS Statistics 17 with Levene's test

Here are the steps: open SPSS> on the menu bar select Analyze> compare means> one-way ANOVA> input data> Options menu> enable selection of the variance homogeneity> OK

This test is calculated using lavene test ($\alpha = 0.05$). With the provision when sig. or the probability value is greater than 0.05 (Sig> 0.05), then the data is homogeneous, whereas if the Sig. or Probilitas value less than 0.05 (Sig. <0.05), then the data is not homogeneous.

4. Hypothesis Testing

Hypothesis test using SPSS 17 using Statistical Parametric Test T, here are the steps:

a. Simple Paired T - Test

Paired-sample T test is the analysis involves two measurements on the same subject to any influence or specific treatment. If a treatment is not given effect, the average difference is zero.

Here's how to make Test Paired Simple T - Test: Open SPSS> Click Analyze> Compare Means> Paired-Samples T Test> Click variables Before and After sequentially so that the two variables are unblocked and press tmbol the arrow > that the couple appeared on the box Paired Variables > Click the Options so that the default rate of 95% and Exclude cases analysis by analysis selected> Click Continue> OK

b. Test Independent Sample T-Test is used to test the significance of the average difference of two groups. This test is used to test the effect of independent variables on the dependent variable.

Here's how to do Independent - Sample T Test: Open SPSS> Click Analyze> Compare Means> Independent-Samples T Test> Enter the variable Y in the Test Variable (s) and the variable X in the box Grouping Variable> Click the Define Group, enter a value of variable X1 and X2 in group 1 and 2> Click continue to return to the dialog box Independent-Sample T Test> Click Options select a trust level of 95% and Exclude cases analysis by analysis selected> Click Continue and OK.

Results and Discussion

Data retrieval is done on each sample group is twice that of data retrieval initial test and final test data for maximum VO2 test. Data preliminary tests taken before the sample is given treatment in the form of fartlek training for groups A and interval training exercises for group B, while the final test is taken after the student is given treatment in the form of training and interval training fartlek intervals.

The data used to analyze the results of this study are the data obtained from the initial tests and the final test VO2 maximum. Data is analyzed by a statistical test to determine the level of difference in the initial test results and final test results. Here are three descriptions of test data obtained during the initial test and final test

Description of the maximum VO2 test result data obtained from the initial tests and the final test can be seen in Table 2.

Table 2: Description Data

Test	n	lowest scores	highest scores	Mean	standard deviation	variance
Fartlek GroupPre test	15	22.5	33.9	28.61	3.8879	15.116
Post test	15	33.6	45.5	41.12	3.0725	9.440
Interval GroupPre Test	15	23.9	32.9	27.89	2.5659	6.584
Post Test	15	36.0	44.2	40.05	2.3947	5.731

In the group of fartlek training initial tests in the data obtained from the total sample of 15 people is as follows scores an average of 28.61 with the lowest score of 22.5 and 33.9 with a highest score of 15 116 standard deviations and variance of 3.8879.

At the end of the test training fartlek group in the data obtained from the total sample of 15 people is as follows scores an average of 41.12 with the lowest score of the highest scores of 33.6 and 45.5 with standard deviations 3.0725 and variance of 9,440.

In the initial test group training interval in the data obtained from the total sample of 15 people is as follows scores an average of 27.89 with the lowest score of 23.9 and 32.9 with a highest score of 2.5659 standard deviations and variances for 6584.

At the end of the test group training interval in the data obtained from the total sample of 15 people is as follows scores an average of 40.05 with the lowest score of 36.0 and 44.2 with a highest score of 2.3947 standard deviations and variance of 5,731.

1. Normality Test

Normality test calculation results of this research data obtained through calculations using SPSS 17 with the Kolmogorov-Smirnov test equipment. The basis for decision making is if sig. or a probability value > 0.05 then said normal data distribution, and if sig. or a probability value < 0.05 then said data distribution is not normal. Here is a normality test results from research data have been obtained from the results of the pre test and post test. Data normality test results are:

Table 3: Normality Test Results

No	Research data	Df	Test results Kolmogorov - smirnov	Conclusion
			Sig.	
1	K_fartlek Fre Test Data	15	0.200	Normal
	Post Tes Data	15	0.200	Normal
2	K_Interval Fre Test Data	15	0.097	Normal
	Post Test Data tes	15	0.200	Normal

Based on the above table, it can be seen that in a significant column (Sig) initial test result data and the final test fartlek group is 0.200 or probability value > 0.05 means normal data distribution. And in a significant column (Sig.) Data from the Pre test and post test data interval training group was 0.097 and 0.200 or probability value > 0.05 means the normal distribution of data.

2. Test Homogeneity

Homogeneity test conducted with a view to determine the

level of homogeneous variance of each group of tests. This test is required as a condition for comparing data between the test group, namely the initial test data and test data end. This test is calculated using lavene test ($\alpha = 0.05$). With the provision when sig. or the probability value is greater than 0.05 (Sig > 0.05), then the data is homogeneous, whereas if the Sig. or Probilitas value less than 0.05 (Sig. < 0.05), then the data is not homogeneous. The result of the homogeneity test can be seen in Table 4.

Table 4: Homogeneity Test Results

No	Research data	Sig. or Probability		Conclusion
		Based on the average value	Based on median values	
1	K_fartlek Fre Test & Post Test Data	0.178	0.229	Homogeneous
2	K_Interval Fre Test & Post Test Data	0.682	0.703	Homogeneous

By looking at the table above, it can be concluded that the data obtained are Homogeneous. Because research data above normal and homogeneous, then the statistical test used is a parametric statistical test by using Paired Sample t Test.

Hypothesis Testing

1. Allegedly there is significant from doing fartlek training to increase maximal VO2.

Obtained t calculate equal to 11,175 and the value of t table (0025; 14) was 2,145.

- 0,025 is obtained a significant level of 5%: $2 = 2.5\%$ (0.025), in the two as do two-sided test.
- 14 is the degrees of freedom (df) is $n - 1 = 15 - 1 = 14$.

Because the value of t is greater than t table (11,175 > 2,145), then Ho is rejected HI accepted meaning, with the word that there are significant differences between the free test and post test. Fartlek training means a significant influence on the increase in the maximum VO2.

2. Presumably there is significant from doing interval training to increase maximal VO2.

Obtained at 20 753 t and t table (0025; 14) was 2,145.

- 0,025 is obtained a significant level of 5%: $2 = 2.5\%$ (0.025), in the two as do two-sided test.
- 14 is the degrees of freedom (df) is $n - 1 = 15 - 1 = 14$.

Because the value of t is greater than t table (20 753 > 2145), then Ho is rejected HI accepted meaning, with the word that there are significant differences between the free test and post test. Interval training means a significant influence on the increase in the maximum VO2.

3. Allegedly comparisons significant effect of doing fartlek and interval training to increase VO2 training.

Obtained t count of -3731 and the value of t table (0025; 28) is 2,048.

- 0,025 is obtained a significant level of 5%: $2 = 2.5\%$ (0.025), in the two as do two-sided test.
- 28 is the degrees of freedom (df) is $n - 1 = 30 - 2 = 28$.

Because the value of t is greater than t table (-3731 < 2.048), then Ho is rejected HI accepted meaning, in other words that there is a difference between the results of the test group fartlek training to the test results training interval group.

Based on the average increase in VO2 maximum. From each group, the average increase is best fartlek group training with an average increase of 12:51 compared to an increase in the interval group training at 12:16. But either way fartlek and interval training are equally significant impact on the increase in the maximum VO2.

Conclusion

Based on the results of calculation and data processing maximal VO₂ result after being given treatment fartlek training and interval training, can be summed up as follows:

1. Fartlek training have a significant influence on the increase of the maximum VO₂.
2. Interval training has a significant influence on the increase in the maximum VO₂.
3. There are significant differences of fartlek training with interval training in giving effect to the increase in the maximum VO₂.

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