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The Effect of Training Method and Motivation to Increase VO_2Max of Basketball Players

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***Abstract*—VO_2Max is the maximum capacity of a person's body to take in and use oxygen during exercise training. The purpose of this research is to know: (1) the difference in the effects between circuit training and fartlek training on the increase of VO_2Max, (2) the difference in the effect between high and low motivation on the increase VO_2Max, and (3) the interaction between the training method and the motivation on the increase of VO_2Max. The study population in this case was basketball, using extracurricular participants of DIY Province. The instrument used to measure the motivation was a motivation questionnaire and the VO2Max's level was measured by using a multistage fitness test. The results of our research were as follows: (1) there was no significant difference in the influence between circuit training and fartlek training on the increase of VO_2Max, circuit and fartlek training users have the same influences as well on the increase of VO_2Max of basketball extracurricular participants. (2) There was a different influence between levels of high and low motivation on the increase VO_2Max of basketball extracurricular participants. Thosewho has a high motivation level gave a better influence than those who had a low motivation level on the increase of VO_2Max. (3) There was no correlation between high and low motivation on the increase VO_2Max.**

Keywords*— *Training Method, Motivation, VO_2Max, Basketball

I. INTRODUCTION

Basketball calls itself one of the most popular sports in the world [1]. Basketball became so popular because, both players and audiences are amazed by the characteristic of this sport which is dynamic and focused on a team basis [2].

Basketball is an intermittent sport with high intensity. This means that basketball includes both a fast player character and sometimes a slow [3]. During international competition, the players run from 3500 up to 6100 meters, dependent on their position and technique. A high intensity version of this activity is in 1 up to 4 every 20-25 seconds. These periods are interrupted by the low intensity activity, such as: jogging, walking, standing, lay up, and free throw [4].

In basketball, the players are required run, jump, speed up, slow down and turning quickly [5]. The physical component is one of the main components in this training. One of the key purposes of preparing the physical component is to develop an athlete's overall physical fitness, a standard necessary to reach a level of achievement in most sports [1]. A good level of physical fitness is required for basketball, because basketball is highly competitive. A good physical fitness level is capable to encouraging the improved performance of each player and the whole team [6].

The ability to keep a high level of physical activity over a long period of time is called endurance. Endurance is one of the biomotor components and has a very important role in encouraging someone's physical fitness [7]. This general level of endurance becomes the standard in an athlete's performance, especially in the latter part of the competition,in which the athlete struggles to maintain a higher standard [8]. Endurance is divided into two parts, namely, aerobic and anaerobic endurance. Aerobic endurance is endurance which requires oxygen, while anaerobic endurance is the fast, dynamic, and short-duration activities that does not need to take oxygen into the muscles to produce energy [7].

The maximum level of aerobic endurance is similar to maximum oxygen consumption or VO_2Max [9]. VO_2Max is one of the indicators and parameters which marks an athlete's physical fitness level [10]. VO_2Max is the maximum capacity of someone's body to take and use oxygen during training [11]. A high VO_2Max is the main indicator of aerobic capacity and cardiovascular health and someone's overall physical quality [12].

Adolescence is the climax period of the growth and development of a person. Therefore, adolescence is an important period in developing someone's physical quality [6]. When training the basketball extracurricular students, a coach must pay attention to all the aspects of training. Each student has an individual character, physical ability, technical ability, and a differing level of motivation. Therefore, in providing a training program, the coach's role should be central in choosing a fun training method so that it can encourage and motivate the students. It cannot be denied that strong motivation from the team is the key factor in team development [13].

Motivational means is a psychological phenomenon as a result of intention, needs, interest or desire [14]. Motivation has an important role in every activity which is oriented in an achievement either inside a room or laboratory, or even outside the room. Motivation's role in reaching achievement is one of the factors that needs more attention by parents, teachers, coaches, and researchers so that in the future every individual can reach their maximum success [15]. In order to achieve a certain level of success, a person must be ready, not only physically but also mentally. Someone cannot reach a goal unless he/she is motivated to do so [16].

Motivation becomes one of the psychological factors that influences the level and intensity of an athlete's performance [17]. Motivation becomes one of the most important things that should be focused on in order to increase overall endurance. Training for endurance will cause fatigue. However, in this condition, an athlete is demanded to keep going for a certain amount of time. Therefore, it needs motivation, courage, and a big struggle to reach the training's goal. Because endurance training is a boring activity, high willingness and motivation are needed [18].

To be acknowledged as having a good level of endurance, you would need to complete a lot of trainings. An optimal training program for an athlete is very important in a team that usually loses as a result of bad performance [19]. A comprehensive training program must contain activities which focus on each vital flexibility component: muscles power, muscular endurance and cardiorespiratory endurance [20].

To maximize a basketball training program, one should consider the development trend in national and international level and their use of a particular training method [21]. Choosing the appropriate training method becomes one of the most important factors in deciding whether training is successful or not. Circuit training and fartlek training are the most appropriate methods to increase VO_2Max of basketball extracurricular participants.

Circuit training is a type of training that contains alternating training posts arranged in a form of a systematic training towards the goal [22]. Circuit training is an efficient training method which can help increase someone's general health [23].

On the other hand, fartlek training is a training method that plays on the fast speed vs slow speed interlude [24]. Fartlek training is often called 'speed changing training or playing speed.'Fartlek training is considered one of the most important training types in developing a player's aerobic and anaerobic capacity [25]. Fartlek training is focused on aerobic and anaerobic energy. Fartlek training is effective in savingtime, especially to exercise. Moreover, fartlek training requires a longer time locomotor which is an important part of living healthily. Fartlek training has a vital impacet, especially for a beginner [26].

II. METHOD

A. Research Method

This research used an experimental method using factorial design 2x2 with the pretest, treatment, and posttest to basketball extracurricular male participants.

B. Research Setting

This research was held from March to May, 2018. The research took place on the basketball field in SMAN 1 Yogyakarta, SMAN 9 Yogyakarta, SMA Budi Mulya 2 Sleman, and SMAN 1 Kasihan Bantul. The training was done over a space of 16 meetings, three times a week. The duration was 90 minutes for each training session, held at 03.30-05.00 PM.

C. Population and Sample

The population in this research was basketball extracurricular students in DIY province. The sample was taken via random sampling. The researcher divided the samples into groups based on their schools. There were 3 regencies with 13 groups. There were 7 schools in the Yogyakarta province, namely, SMAN 1 Yogyakarta, SMAN 3 Yogyakarta, SMAN 4 Yogyakarta, SMAN 9 Yogyakarta, SMA Pangudi Luhur Yogyakarta, MAN 2 Yogyakarta, and SMA BIAS Yogyakarta. There were 3 school for Sleman regency, namely, SMAN 2 Ngaglik Sleman, SMA Budi Mulia 2 Sleman, dan SMA Kolese De Britto Sleman, and 3 schools for Bantul regency, namely, SMAN 1 Kasihan Bantul, SMAN 2 Bantul, and SMAN 3 Bantul.

The sample of population was taken randomly. There were 4 schools chosen to be the sample of our research. These were: SMAN 1 and SMAN 9 Yogyakarta from Yogyakarta. SMA Budi Mulia 2 Sleman from Sleman, and SMA 1 Kasihan Bantul from Bantul. In total, there were 51 students, 11 students from SMAN 1 Yogyakarta, 14 students from SMAN 9 Yogyakarta, 14 students from SMA Budi Mulya 2 Sleman, 12 students from SMAN 1 Kasihan.

Before beginning the experiment, the researcher gave questionnaires to the participants to measure the general motivation level of each student. After gathering this data, the first step of analyzing was identifying the top and bottom groups using the an overall score. After analyzing the students' motivation level, those 51 participants were organized fromhighest to lowest motivation level. Then, the researcher took 27% of the high level motivation students and 27% of low level motivation students. After that, each group was divided into 2 groups more, so there were 4 groups in total. Besed on those groupings, the used sample was 7 students with high motivation trained using circuit training method and 7 students with low motivation trained using the fartlek training method, while the middle motivation students were no longer included in the experiment.

TABLE I. RESEARCH DESIGN PROGRAM

Training metodh (A) / Motivation (B)	Circuit Training (A1)	Fartlek Training (A2)
High Motivation (B1)	A1B1	A2B1
Low Motivation (B2)	A1B2	A2B2

Explanation:
A1B1: Group players with high motivation were given treatment using circuit training method.
A2B1: Group players with high motivation were given treatment using fartlek training method.
A1B2: Group players with low motivation were given treatment using circuit training method.
A2B2: Group players with low motivation were given treatment using fartlek training method.

D. Data Gathering Technique and Instrument

The data gathering technique in this research was done by giving both a pretest and posttest before and after treatment. The used instrument in this research was a motivation questionnaire to measure motivation for basketball extracurricular students and using a multistage fitness test to measure the VO_2Max level of students.

E. Data Analisis Technique

The data analysis technique in this research was using the help of SPSS 20 for windows. Hypothesis test used a variant analysis (ANAVA) two ways on a significant standard 5% or 0,05. Before analyzing the data using ANAVA, the researcher carried out a data normality test using Kolmogrov Smirnov and homogeneity using the aLevene Statistic test with a probability score (p > 0,05).

III. Result and Discussion

A. Data Description

This research was held in 4 schools, namely, SMAN 1 Yogyakarta, SMAN 9 Yogyakarta, SMAN 1 Kasihan Bantul, and SMA Budi Mulia Dua Sleman. The sample number used in this research was 28 students divided into 4 separate groups. The group players with high motivation were treated using the circuit training method (A1B1), whilst an alternative group of players, also with high motivation, were given treatment using the fartlek training method (A2B1). One group of players with low motivation were treatmed using circuit training method (A1B2), and another group of players with low motivation were given treatment using the fartlek training method (A2B2).

The following was presented as descriptive results of the research data, presented in table form (see table 2):

TABLE II. Statistic Descriptive VO_2Max Pretest and Posttest Result

Treatment	Atributive	Statistik	Pretest	Posttest
Circuit Training	High motivation (A1B1)	Total	300.18	336.75
		Means	45.2000	48.1071
		SD	5.32524	4.23265
	Low motivation (A2B2)	Total	285.96	321.12
		Means	40.8514	45.8743
		SD	6.96790	4.46066
Fartlek Training	High motivation (A1B1)	Total	265.61	289.20
		Means	37.9443	41.3143
		SD	2.54887	2.32123
	Low motivation (A2B2)	Total	266.75	296.68
		Means	38.1071	42.3829
		SD	5.51040	4.38006

The result of pretest and posttest in this research were in a form of diagram (see Fig. 1):

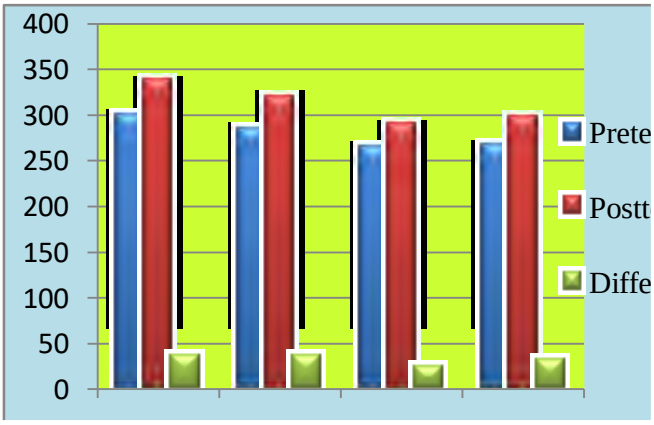

Fig. 1. Pretest and posttest of VO_2Max level diagram.

B. Presequisite Test

In this research, the normality test used the Kolmogrov Smirnov method. A normality test was carried out on each group using the SPSS 20 program with a 5% or 0,05 significance standard. The result of the normality test was in the form of table:(see Table 3):

TABLE III. Normality Test Result.

Data	*p*	Significance	Explanation
Pretest A1B1	0,816	0,05	Normal
Posttest A1B1	0,515		Normal
Pretest A2B1	0,934		Normal
Posttest A2B1	1.000		Normal
Pretest A1B2	0,552		Normal
Posttest A1B2	0,953		Normal
Pretest A2B2	0,944		Normal
Posttest A2B2	0,925		Normal

Moreover, the homogeneity test in this research used the Levene Staristic method with a 5% or 0,05 significance standard. The result of the homogeneity test was also in the form of a table (see Table 4):

TABLE IV. Homogenity Test Result

Test of Homogeneity of Variances					
	Levene Statistic	f1	df2	Sig.	Explanation
Pretest	2.347	3	24	.098	Homogen
Posttest	1.698	3	24	.194	Homogen

C. Hypothesis Test Result

The different influence between circuit training and fartlek training on the increase VO_2Max of basketball extracurricular participants.

Based on the analysis result, we found a score of *sig* = 0,700 > 0,05 which meant H_0 was accepted and H_a was not accepted. Therefore, it could be concluded that there was no significant difference in the influence between circuit training and fartlek training on the increase of VO_2Max of basketball extracurricular participants. Therefore, our first

hypothesis showed that both circuit training and fartlek training gave a good influence.

The different influence between high and low motivation categories on the increase VO_2Max of basketball extracurricular participants.

Based on the analysis result, we found a score of *sig* = 0,002 < 0,05, which meant H_0 was not accepted whilst H_a was accepted. Therefore, it could be concluded that there was a significant difference in the influence between high and low motivation categories on the increase of VO_2Max in our basketball extracurricular participants.Our, second hypothesis then showed that the high motivation category gave a better influence than that of the low motivation category upon the increase of VO_2Max in basketball extracurricular participants.

The interaction between both training method and motivation on the increase VO_2Max of basketball extracurricular participants.

Based on the ANAVA test analysis result above, it showed a score of *sig* = 0,280 > 0,05, which meant H_0 was accepted and H_a was not accepted. Therefore, weconcluded there was no significant difference ininfluence between the interaction of both training method and motivation upon the increase of VO_2Max in basketball extracurricular participants. Finally, the third hypothesis showed there was no significant difference in influence between the interaction of training method and motivation upon the increase of VO_2Max in basketball extracurricular participants.

D. Discusion

There was no significant different influence between circuit training and fartlek training on the increase VO_2Max of basketball extracurricular participants.

Circuit training is one of the methods which has a number of varying posts. Each post, involves a different training form which has been defined before. On each post, an athlete must carry out a training task. Circuit training must be arranged according to muscle groups in turns. If the training aims to increase cardiorespiratory endurance, running elements should be included in the training. Circuit training is a training method which is very efficient time-wise and can therefore contribute inincreasing someone's overall health [23].

There were 8 posts within the circuit training of this research. These were: Stationary run, jumping jack, shuttle run, skipping, zig-zag run, mountain climber, straddle run, and T-drill run. Posts were arranged systematically to increase cardiorespiratory endurance on our basketball extracurricular participants. At each post, participants train for a total duration of 1 minute per training movements. These trainings should be repeated for 2 to 3 sets. A rest between each set should take place within 2 minutes. The training load in circuit training increases during each training session. Through circuit training, it is expected that participants can do more movements in each post, so that they can consume more oxygen, ascan the VO_2Max.

Meanwhile, fartlek training is a method that uses speed in a fast period by adding a slow period of run within [24]. Fartlek training is a combination of jogging, walking, and sprinting. Fartlek training is a method that focuses on both aerobic and anaerobic energy. Fartlek training is effective in saving time, especially for training purposes. Moreover, fartlek training requires more time for locomotor movements, which is one of the important prerequisites to healthy living. Fartlek training has an effect on overall health [26].

One example of fartlek training had a 45 minutes duration and begins by jogging for 6 minutes as a warm up. Then, fast running for 50 up to 60 meters, continued by walking for 1 minute, and jogging again for 3 minutes. After that, it is fast running for 50 to 60 meters [18]. The fartlek training method in this research focused on fast speed play which combined jogging, sprinting, and walking. The training was started by jogging for 4-7 minutes, then, sprinting for 25 meters, and walking for 1 minutes. Then the participants completed jogging again for 2-4 minutes, and ended by sprinting for 25 meters. Fartlek training in this research was repeated for 2-3 sets. The participants were given a rest time of 2 minutes per set. Like the training load in circuit training, the load here also increased over each session.

Fartlek training itself is very important in increasing VO_2Max. It has been proven that there is a significant increase upon VO_2Max, breathing duration, and artery beatafter completing fartlek training, showing that the method has a positive influence on a body's physiology parameter. Through fartlek training, it was expected the participants would be able to consume more oxygen and thus increase VO_2Max [26].

Based on those explanations, both training methods have their own individual strengths and weaknesses. Therefore, it could be concluded that circuit and fartlek training have a similarity in their ability to increase VO_2Max. Therefore, circuit and fartlek training users have the same influences as well on the increase of VO_2Max in basketball extracurricular participants.

There was different influence between high and low motivation categories on the increase VO_2Max of basketball extracurricular participants.

Motivation is an intensity and way to beat a person's struggle. An example refers to what an individual is looking for, closing to, or interested in within a certain situation. While intensity refers to how much struggle an individual has overcome in a situation [27]. It is called a psychological phenomenon as a result of someone's faith, needs, interest, or willingness [14].

Motivation plays an important role in every activity which is oriented around reachinga goal inside or outside the room. Motivation is a factor that should be considered by parents, teachers, coaches, and researchers in the future to get the maximum success [15]. Life that is related to someone's health and behavior and it is certainly related to sport. This statement is compatible with the principle of motivation. Extrinsic motivation aims to prevent disease and increase health. While, intrinsic factor motivation aims to promote happiness and manage stress. The students who participate in this sport would be active physically and would be encouraged towards maximum retention, motivation, autonomy feeling, self - convidence, and good team work [14].

Basketball is an intermittent sport with high intensity. This means basketball has a fast playing character but can sometimes be slow [3]. A basketball player is expected to run, jump, run fast, run slow, and turn well [5]. Therefore, in basketball, the players are required to have a good level of physical fitness.

The maximum consumption level of oxygen is one indicators which marks an athlete's overall health. Someone who has high VO_2Max will perform better in activities. Moreover, they will have a higher VO_2Max capacity to recover their physical condition faster than those who have a low VO_2Max capacity. Therefore, an athlete's ability to do an activity will be greater and able to remain consistent for a long duration [10].

People have different motivation levels. Some of them are high and others are low. Those who have high motivation levels will be able to train heavily. Those who have low motivation level will most likely be too lazy to train. Endurance training produces fatigue. In this condition, the player is demanded to work with intensity for a certain amount of time. Therefore, this person needs motivation, courage, and struggle to reach the goal. Because endurance training is aboring activity, a high motivation is needed [18].

Based on these explanations, it could be concluded that someone who has a high motivation level would have a better influence than someone who has a low motivation level upon the increase of VO_2Max in basketball extracurricular participants.

There was no interaction between both training method and motivation on the increase VO_2Max of basketball extracurricular participants.

The used training method in this research was both circuit and fartlek training. Circuit training is an efficient training method which can increase someone's overall health [23]. Meanwhile, fartlek training is considered one of the most important training methods, that is useful in developing a player's aerobic and anaerobic capacity. Fartlek training is focused on aerobic and anaerobic energy. Fartlek training is effective in saving time to complete exercise. Moreover, fartlek training requires a longer time locomotor which is an important part to live healthy. Fartlek training has an effect for vital especially for beginner [26].

On the other hand, motivation has an important role in every activity which is oriented in an achievement either inside room, laboratory, or even outside the room. Motivation has a key role in reaching an achievement is one of the factors that needs attention by parents, teachers, coaches, and researchers so that in the future every individual can reach the maximum success [15]. However, based on research, there was no interaction between both training method and motivation on the increase of VO_2Max in basketball extracurricular participants. Each training method has alternative roles in increasing VO_2Max as does motivation.

IV. Conclusion

Based on our research and analysis results, it could be concluded that there was no significant different influence between circuit training and fartlek training on the increase of VO_2Max in basketball extracurricular participants. Therefore, circuit and fartlek training users have the same influences upon the increase of VO_2Max in basketball extracurricular participants. On the other hand, there was different influences between high and low motivation categories upon the increase of VO_2Max in basketball extracurricular participants. It could be claimed that someone who has a high motivation level gave better influence than someone who has a low motivation level on the increase of VO_2Max of basketball extracurricular participants. Related to the method and motivation interaction, there was no interaction between both training method and motivation upon the increase of VO_2Max in basketball extracurricular participants. Therefore, there was no significant interaction between both training method (circuit and fartlek training) and motivation (high and low) upon the increase of VO_2Max in basketball extracurricular participants.

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