

# Improving Endurance Ability through Endurance Training Model-Based Drill Technique

Ridho Bahtra<sup>1,\*</sup>, Aldo Naza Putra<sup>2</sup>, Septri<sup>1</sup>, Windo Wiria Dinata<sup>1</sup>, Yogi Andria<sup>1</sup>, Nugroho Susanto<sup>1</sup>

<sup>1</sup>Department of Health and Recreation, Faculty of Sports Science, Padang State University, Indonesia

<sup>2</sup>Department of Sport Education, Faculty of Sports Science, Padang State University, Indonesia

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**Abstract** Endurance ability is one of the physical conditions that form the foundation of the game of soccer. However, the problem that is often seen is that players don't have good endurance. So, increasing endurance ability through the right training methods is very important. The training model is more varied and can eliminate player boredom during the training process. This study aimed to see the effectiveness of the endurance training model-based drill technique on the endurance ability of soccer players. This type of research is experimental research with a one-group pre-test and post-test design. The population in this study were players of the Student Sports and Education Center (PPLP) in West Sumatra. The sample in this study was soccer players aged U-18 with a total of 30 people. To determine players' endurance ability, the ability of VO<sub>2</sub>Max capacity was measured. The instrument used is the Yo-Yo IR Test. Data analysis in this study used the statistical method of mean difference test (t-test). Before testing the hypothesis, a normality test was carried out using Liliefors. Here are the results of the data analysis:  $t_{count} (8.98) > t_{table} (1.697)$ , so the conclusion from this study is that the endurance training model-based drill technique is effective in increasing the endurance ability of soccer players.

**Keywords** Training Model, Endurance, Drill Technique, Soccer

## 1. Introduction

Soccer is currently developing very rapidly, both in terms of technique, physical, and tactics. This development is in line with the character of today's football, where the game takes place very quickly. Each competing team presses and attacks one after another. In recent years the rhythm of football games is faster. Players can run faster and at high speed, display techniques, and apply tactics better [1]. In modern football players are required to play the ball quickly and with good technique. The character of football like this is the pressure from very fast opponents [2].

In situations like this, players are required to have good technical, and physical skills to avoid pressure from opponents. In modern football, achieving the best results is determined by three main factors: technique, tactics, and physical condition [3]. Physiological, technical, and tactical skills are all important to soccer performance [4]. Soccer is a sport that requires players to have good endurance in accordance with the basic characteristics of soccer itself [5]. To be successful in soccer a player must be in good physical condition, skill, tactical and psychological [6, 7]. Soccer is a sport that involves a lot of physical, technical, and tactical action [8, 9]. Soccer requires its players to train in various physical conditioning components, including speed, strength, jumping, and aerobic ability [10]. As played today, soccer requires good physical condition and proficient technical and tactical skills [11].

The high-tempo game of soccer makes each team that competes to pressure and attack one after another. Movement of moments will always occur throughout a soccer match. The transfer of this moment is called the transition, the transition from defending to attacking and the transition from attacking to defending. During this transition, players perform many actions, both actions without the ball and actions with the ball. Activities such as walking, jogging, and sprinting are part of the game of soccer [12]. During a match a player performs the following actions: 1) 24% walking, 2) 36% jogging, 3) 20% running, 4) 11% sprinting, 5) 7% moving backward, 6) 2% dribbling [13]. These player-performed actions add a lot of in-game mileage. In one soccer game, the players cover a distance of 10-12 km [14, 15, 16, 17]. Match analysis reports reveal that elite soccer players generally cover a distance of 9,5-12 km during a 90-minute, and 40% of the actions players take are high-intensity runs with or without the ball [18].

The long distance makes players need good endurance. Endurance is very important for soccer players [19]. Endurance is the body's ability to overcome fatigue during long activities, accompanied by rapid recovery [20, 21, 22, 23]. One indicator to determine an athlete's endurance is a  $VO_2$  max capacity.  $VO_2$  max is considered one of the main factors to see an athlete's performance and cardiovascular adaptation to training load [24].  $VO_2$  max is the maximum amount of oxygen your body can consume, need, and transport during active physical activity [25]. How much the player's  $VO_2$  Max needs can be known in soccer. The results of research and the latest theories in football explain how big a soccer player's  $VO_2$  max needs. International soccer teams have an average  $VO_2$  max of 55-68 ml/kg/min [26, 27, 28, 29]. With the high need for endurance and  $VO_2$  max in a soccer game, it is necessary for the coach to create and design an exercise model to increase  $VO_2$  max. One of the considerations of the training model that is made is according to the character of soccer itself and training with the ball. It's best to do endurance training with a ball [30, 31, 32]. In training to improve the physical condition of a soccer, it is better to use special exercises such as drill methods, small side games, and soccer position drills [33, 34]. Soccer physical condition training such as endurance, strength, and speed, preferably specific to soccer [35]. Specific training with the ball can improve endurance, and technical and tactical skills [36].

From the problems described above and guided by the existing theory, a form of endurance training based on soccer drill techniques was made. The drill method is a training method that is carried out repeatedly according to the coach's instructions [37]. The drilling method is how the coach teaches movements where athletes are instructed to perform certain movements repeatedly based on instructions given by the coach directly. One way to improve students' abilities [38]. The drill and practice method is carried out seriously with the aim of permanently perfecting their skills [39]. In physical condition training,

the drill method can also be used to increase the physical condition of soccer players. Drill training can be used as a substitute for some physical exercises that are usually done without a ball, and thus provide skill and fitness training simultaneously [40]. Drill training has an effect on improving  $VO_2$  max [41]. The use of the drill method can increase the physical capacity of soccer players [42].

In developing this training, the researcher made modifications to the exercise's intensity, volume, duration, and recovery. These modifications are in accordance with the principles of training and loading of football physical condition training. What innovation can provide in endurance training is the intensity, duration, and frequency of each exercise [43]. The development of this training model has gone through various stages, starting from expert validation, small group, and large group studies. In the small-group and large-group experiments, 86.4% said this training model is suitable for use [44]. The feasibility of this model is an update in endurance training to increase the endurance ability of soccer players. However, it needs to be tested whether the developed exercise model is effective in improving the endurance of soccer players. From the explanation above, the hypothesis in this study is that the endurance training model based-drill is effective in increasing endurance. From the hypothesis proposed, the purpose of this research is to see the effectiveness of the endurance training model based-drill technique in improving the endurance ability of soccer players.

## 2. Methods

This research is quasi-experimental with a one-group pre-test and post-test design. The design was chosen because we wanted to see the effectiveness of the previously developed training model, namely the endurance training model-based drill technique. The first step that was carried out before treatment, was the sample was first given a pre-test. Then the treatment was given using the endurance training model-based drill technique. The study was conducted for 2 months and exercised 3 times a week. The researcher provides a different form of exercise from the exercise model that has been developed (endurance training model based-drill technique). Three different forms of exercise are given each week with the same intensity, duration, sets, and recovery. After all the exercise programs have been given, the next step is to carry out the post-test.

**Table 1.** One Group Pre-test and Post-test Design

Pre-Test	Treatment	Post-Test
T <sub>1</sub>	Endurance Training Model-Based Drill Techniques	T <sub>2</sub>

### 2.1. Subject of the Study

The subjects in this study were 30 male players with an

average age of 16.03 years. In addition, the characteristics of the subjects in this study were an average  $\pm 60,87$  kg in weight and  $\pm 168,77$  cm in height. All players are members of the athlete Sports Education and Training Center in West Sumatera (PPLP). PPLP is a youth player training center that conducts continuous and structured training. Players selected to enter PPLP are the best players selected after strict selection. The distribution of the selected players is 3 goalkeepers, 10 defenders, 10 midfielders, and 7 forwards.

## 2.2. Instruments and Data Analysis Technique

To determine the player's endurance ability by measuring the ability of  $VO_2$ Max capacity. The instrument used is the Yo-Yo IR test [45]. Data that has been collected and compiled, then data processing is carried out using the statistical method of mean difference test (t-test) with the following steps: 1) Data normality test, 2) To see the effectiveness of this training model, the t-test was used.

## 3. Results

After carrying out the entire process in this study, data have been obtained which will be described in detail. The results of the pre-test with a sample of 30 people, the maximum is 53,20, the minimum is 39,76, the mean is 47,62, and the standard deviation (SD) is 2,90. Furthermore, the results of the post-test with a sample of 30 people, the maximum is 55,22, the minimum is 41,10, the

mean is 51,31, and the standard deviation (SD) is 3,22. Data on differences in pre-test and post-test results can be seen in the following table 2:

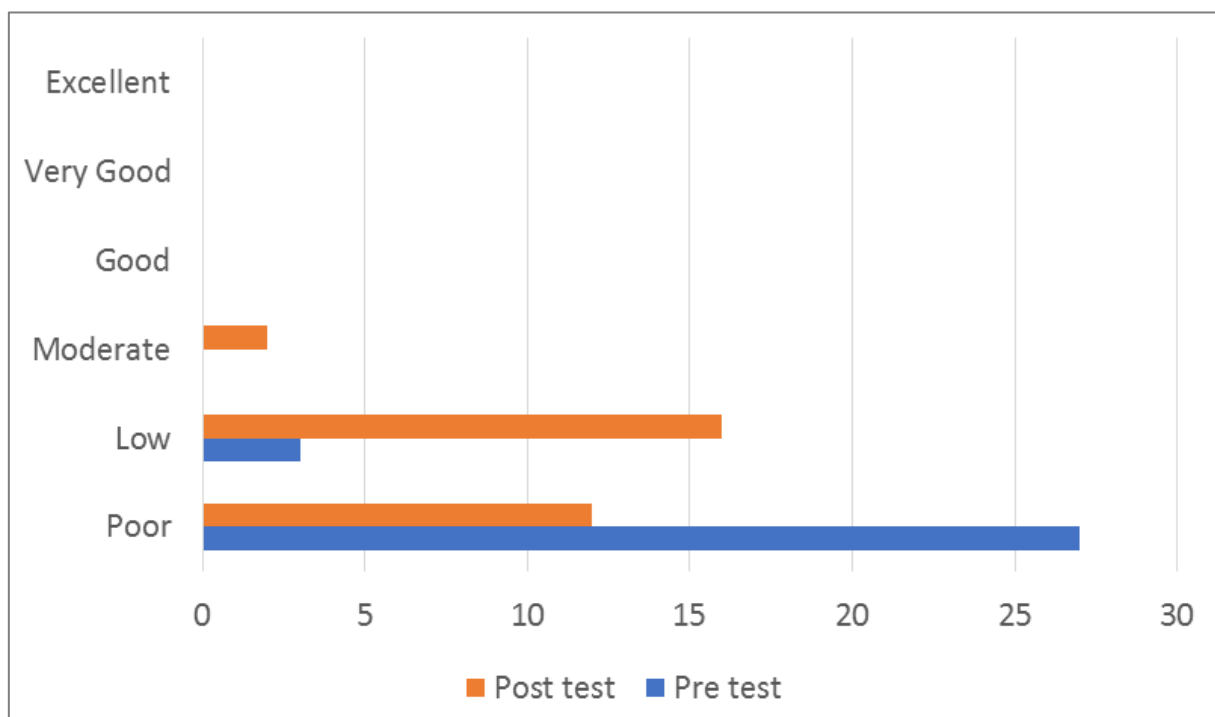
**Table 2.** Differences in the Results of the endurance ability test in the pre-test and post-test groups

Group	Max	Min	Mean	SD
Pre-test	53,20	39,76	47,62	2,90
Post-test	55,22	41,10	51,31	3,22

From the results of the pre-test and post-endurance test data, it can be seen that not all players have good  $VO_2$  max. In the pre-test of 30 samples, 27 people had  $VO_2$  max in the poor category and 3 people were in a low category. While in the post-test, 12 people were in the poor category, 16 people were in the low category, and 2 people were in the moderate category. For more complete data, it can be seen in table 3 and figure 1 below:

**Table 3.** Classification of endurance ability pre-test and post-test group

Rating	$VO_2$ Max	Pre-test	Post-test
Poor	< 51,52	27	12
Low	51,52 - 54,54	3	16
Moderate	54,88 - 57,90	0	2
Good	58,24 - 59,25	0	0
Very Good	59,58 - 61,6	0	0
Excellent	> 61,6	0	0



**Figure 1.** Histogram of  $VO_2$ Max capacity of players

**Table 4.** Summary of Data Normality Test Results

Data	N	Lo	L <sub>tabel</sub>	Ket
Pre-test group	30	0,1307	0,1610	Normal
Post-test group	30	0,1131	0,1610	Normal

**Table 5.** Summary of Effectiveness Test Results

Group	Mean	SD	t <sub>hitung</sub>	$\alpha$	t <sub>tabel</sub>	Test Results
Pre-test	47,62	2,90	8,98	0,05	1,697	Significant
Post-test	51,40	3,20				

Before the effectiveness test is carried out, the analysis requirements test is carried out first, namely the data normality test. In table 4 above you can see the results of the data normality test.

Based on the results of the analysis requirements test, all data meet the criteria for effectiveness testing. The results of the effectiveness test of the endurance training model based-drill technique are in table 5.

Based on table 5, it can be seen that  $t_{count} (8,98) > t_{table} (1,697)$ . These results indicate that the training model developed is effective in increasing the endurance ability of soccer players.

## 4. Discussion

Statistical tests reveal that  $t_{count} (8,98) > t_{table} (1,697)$ , which indicates that drill-based endurance training is effective in increasing endurance. From these results, it can be concluded that this training model is suitable for use in endurance training. The feasibility of using this model cannot be separated from the improvisations made by researchers in developing this model. In developing this model, the researchers improvised and modified the variables or training loading. Even so, all the improvisations are in accordance with the principles of football's physical condition training.

In the process of the training given to the samples, endurance training based-drills techniques were carried out 3 times a week. Implementation of exercises in accordance with the principles of exercise to increase endurance. The loading given in the training process is the intensity given 75-85%, with 3 sets and 2 minutes of recovery per set. The variations of the drilling technique developed are given in 3 variations in each training session. Three different variations in each encounter help eliminate boredom and increase player motivation in training. Player motivation in undergoing endurance training is very important to keep fighting in training. Appropriate training loads and varied forms of training make a significant increase in the player's endurance ability.

Based on the statistical data that has been described, it is revealed that technique-based drill-based endurance

training can improve endurance abilities. This is in line with the results of previous research which explained the advantages of drill training in improving endurance. Soccer drills can improve endurance ability [40, 42]. Improving the endurance ability of soccer players can be improved with specific drills [46]. Soccer drills can also be used to improve players' technical and tactical skills and to be able to maintain their physical condition of players [41, 47, 48].

One indicator of increasing endurance is by measuring the player's  $VO_2$  max.  $VO_2$  max is the body's capacity to consume oxygen maximally during activity or exercise [30].  $VO_2$  max will improve during intense training, mainly aerobic training. Many theories and research results reveal the  $VO_2$  max needs of soccer players. International football teams'  $VO_2$  max requirements range from 55 to 68 ml/kg/min [27, 29, 30]. In football, a  $VO_2$  max of 65-70 ml/kg/minute can be obtained by players. What affects is age, activity, and playing position.  $VO_2$  max 60-62 ml/kg/min is a pretty good thing, especially for players 16-17 years [14].

The demand for  $VO_2$  max in soccer is so high that it requires coaches to create forms of exercise that can increase endurance. In the game of soccer, the training model that is made is very good if it is specific and uses the ball. Training to improve endurance is ideally done with ball exercises [20, 30]. Small-side games, technical drills, and playing position drills can be used to improve the physical condition of soccer players [33, 35]. High-intensity small side games can increase aerobic endurance [49, 50]. Training methods to improve physical conditions in soccer must be specific [51].

Improves player qualities such as increased mileage and engagement with the ball due to increased endurance [52, 53]. Endurance training increases  $VO_2$  max and increases positive enzymatic and metabolic adaptations that increase fatigue resistance [54]. In addition, the advantages of endurance training with the ball are 1) improving endurance and technical skills, 2) eliminating boredom, 3) the trainer can easily control the exercise, and 4) increasing motivation [2]. 1) increased motivation, 2) improved athletic efficiency training, 3) improved tactical awareness, 4) improved technical ability, 5) Optimized training time,

and 6) prevent injury [42].

One of the interesting things about soccer is that it always creates something new like endurance training with the ball. Endurance training with the ball provides coaches with multiple benefits, not only increasing endurance but also improving players' technical and tactical skills. Therefore, soccer coaches, especially physical trainers, are advised to provide endurance training using the ball, such as drills in soccer techniques. Coaches can also develop or modify new forms of training so that many new methods will be used later. With so many new methods, it will enrich the coaches' references in training physical conditions, especially endurance.

## 5. Conclusion

The findings in this study reveal that the drill technique-based endurance training model is effective in increasing the endurance ability of soccer players. The increase in player performance is caused by various forms of training, thus increasing player motivation in undergoing training. Besides that, improvisation on training variables (intensity, duration, sets, and recovery) makes the training load match the training to increase endurance.

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