

# The Effect of Circuit Training on Improving the Physical Condition of Northwest Pantar Football Athletes

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**Abstract** Physical condition is one of the important elements for athletes to develop techniques, tactics, strategies and skills mentally, because good physical condition will affect the athlete's appearance on the field. This study aims to determine whether there is an effect of circuit training on improving the physical condition of soccer athletes at Northwest Pantar football school. The model in this study is a quasi-experimental with a quantitative approach to one group pretest-posttest design. The instruments in this study were the vertical jump test, sit and reach test, 40 meter run test, agility run test, coordination test, endurance test, leg muscle strength test and abdominal muscle test. The population in this study amounted to 20 athletes, and then all populations were used as subjects in this study. Data analysis in this study used a t-test with a significant level of 5%. The results of this study indicate that there is an effect of circuit training on improving physical condition for soccer athletes at SSB PBL. Thus the hypothesis in the study is accepted. The limitations in this study include time, number of SBB, research subjects and training models that are still single.

**Keywords** Circuit Training, Athletes, SSB, Physical Condition

## 1. Introduction

Football is one of the sports that are in great demand by people all over the world including Indonesia. This sport is one of the sports that hypnotize people in the world. Football can provide an interesting spectacle to the world's people, for example, the World Cup, Champions League, European League and so on [1]. This is inseparable from the facilities and infrastructure for football sports in all parts of the world, including Indonesia [2]. Football is an inseparable part of the lives of ordinary people and professional people, for example, professional football players [3,4].

Football is a universal sport, because this sport can be played by all levels of society, not only men or adults, but women and even children in this case of elementary school age can already play this sport [5,6]. Even this sport does not look at ethnicity, religion, race, old, young and gender because in this case, it is a team or team sport [7,8]. A football team does not come from one religion, race, ethnicity, and age group [9]. So that it can be said simply that, football is a very popular sport in the world. Football has changed very rapidly from time to time, both in terms of regulations and the level of competition held in the world. Becoming a professional soccer athlete requires several factors, for example, mastering

techniques, tactics and good conditions. What is familiar from this sport is the number of players who are often known by the team, one of which is a goalkeeper [10]. 10 players in a team are allowed to use all their limbs except for the arms and hands, but a keeper is allowed to use his hands to catch the ball but has limitations, namely in the penalty area or penalty kick area [11,12]. If a goalkeeper catches the ball outside the designated area, then the action is declared a violation and will result in a free kick for the opposing team [13]. All sports certainly have a goal; the goal of football is to get the ball into the opponent's goal as much as possible to win a match [14]. Football is a sport that relies heavily on body combinations, in this case physical components, because good physique will bring an athlete to excel, in addition to good ball handling techniques [15].

The physical condition of an athlete is very influential and even determines every movement made [16]. This is in line with the research results [17] Says that, basic technique, good physical and good mentally health, will affect the career of a professional athlete both at national and international level or achievement at club or country level, because the physical condition of a good soccer athlete will support the athlete in developing techniques and tactics on the field. Physical condition is the ability of an athlete to carry out physical work activities with tiered abilities, because a good athlete's physical condition will last a long time and be intense when participating in competitions on various scales [18]. Physical condition plays a very central role in the function and body system of an athlete, for example, increasing the ability of the circulatory system and heart work, increasing strength, flexibility, stamina and overall biomotor, producing good quality of motion during exercise and organs experiencing rapid recovery after exercise doing exercises [19,20]. Improving the physical condition of an athlete will have an effect on increasing his physical abilities. In general, physical ability has two components, namely physical fitness and movement freshness [21]. Physical fitness is the ability of a person's body to make adjustments to all forms of given training load without causing excessive fatigue. While physical activity is the ability of an athlete to work efficiently that relies on special skills such as dribbling, kicking the ball and passing the ball. Basic techniques in soccer are no less important, because mastery of basic techniques will show the ability and beauty of a soccer player when playing in addition to good physical condition [22,23].

One of the factors that will determine whether or not an athlete's physical ability increases is an exercise program [24,25]. A good physical exercise program is designed and organized and then carried out in a systematic and patterned manner so that it has a positive or good impact on increasing physical fitness and can increase the required biomotor abilities [26]. Physical strength will always be related to biomotor components, generally consist of five components, namely strength, endurance,

speed, coordination and flexibility. If these biomotor components are in good condition, it is certainly very helpful for a football athlete to develop technical and tactical abilities during a match [27]. Increased physical strength of athletes also affects psychological aspects such as increased motivation, enthusiasm for work, thoroughness, tenacity, self-confidence and caring for athletes in a team [28].

Northwest Pantar Football School is one of hundreds of SSBs in East Nusa Tenggara Province. SSB PBL was founded in 2010, with its main motto "They play, we teach". The age of SSB can be said to be very easy or often termed the age of corn. However, this SSB has produced many quality football athletes and can compete with other SSB football athletes at the regional, provincial and even national levels. SSB PBL is a real form of coaching for young athletes and athletes at an early age, for example ages 9-11, 12-16 and 17-20 years old. These young athletes will become the backbone of the PBL (Northwest Pantar) club or team in participating in various competitions. However, the factor of physical strength is one element that cannot be separated from football athletes.

Based on the researcher's observations and interviews with one of the five trainers at PBL, the athletes were already experiencing fatigue when the match had just entered the 7-10th minute, this indicated that there was a problem with the athlete's insufficient endurance, so coordination was far from perfect, enough because the timing of kicking the ball is still not quite right, always losing in a 1 vs. 1 duel indicates the athlete's strength and speed are still weak when competing, penetration or agility during matches is still lacking. Seeing the various problems that occur, the physical condition component is the main benchmark for the emergence of these problems. The component of good physical condition is absolutely necessary for a soccer athlete to support a quality performance for 2 x 45 minutes.

Based on the results of the initial research, researchers coordinated with local trainers, to train using the circuit training method at the Northwest Pantar Soccer School (SSB). This was done to improve the physical condition and performance of the athletes. As for training using the circuits, the aim is improving the physical condition and performance of the Northwest Pantar Soccer School athletes to become a better physical component. Researchers found that there were 11 physical components of soccer athletes that were still low and needed to be improved through circuit training, the low components were Strength, Endurance, Muscle Endurance, Power, Speed, Flexibility, Balance, Coordination, Agility and Reaction. Then the type of circuit used in improving the 11 physical components of athletes who are still low, namely zig-zag, shuttle run, 100 meter run and 400 meter run to train the physical components of Strength, Endurance, Muscle Endurance, Power, Speed, Flexibility and Balance, then training circuit dribbling, skipping and

throwing and catching the ball to train the Coordination, Agility and Reaction components. One of the efforts to improve the physical condition of soccer athletes at SSB PBL is to practice using the right training model. There are many training models that can help athletes to improve the athlete's physical condition. One of the most complex exercise models is the circuit training model [29]. Circuit training is one of the training models that can improve the overall biomotor of an athlete [30], because the circuit training model is a young and complex training model [31]. The circuit training model is a very precise model that can be used in training in soccer games because it is constrained by a fairly short time [32]. Thus, the circuit training model is one of the best alternatives to overcome the problems experienced by SSB PBL soccer athletes. Through this experiment, researchers want to know the effect of circuit training on improving the physical condition of soccer athletes at SSB Pantar Northwest, East Nusa Tenggara, Indonesia.

## 2. Method

### 2.1. Research Area and Duration

This research was conducted to determine the effect of circuit training for 8 weeks on improving the physical condition of football athletes at the Northwest Pantar football school, in this case the 11 physical components of athletes. The total research schedule as a whole is in a 12-month or 3-month study starting from August 1, 2021 to November 8, 2021. However, researchers do calculations when the subjects are given treatment. The research area took place at the Pantar Barat Laut football school, Alor Regency, East Nusa Tenggara.

### 2.2. Research Design

This study used a Quasi-experiment with a one group pre-test and post-test design. The pre-test relates to the results that are known before the subject is given treatment, while the post-test is the result that is known after the subject is given treatment. This design was chosen because information about the original physical condition of the subjects (pre-test) can be compared with the results of the post-test after the subjects were given treatment.

### 2.3. Participants

The overall population in SSB aged 12 to 16 years is 60 athletes with details, 12 years old totaling 6 people, 13 years 5 people, 14 years 7 people, 15 years 15 people and 16 year 27 people. Considering that the circuit-based training program was quite tiring, the researchers chose athletes aged 16 years with a total of 20 of the 27 athletes,

and 7 people were not used because they had just joined SSB for only 4 months, so it was not suitable for inclusion in this study. The 20 subjects in the inclusive study met the criteria, as they had been practicing since grade 6 of elementary school, and their physical condition at the age of 16 was ripe for receiving more than one training method, 20 subjects also had experience competing at the regional and district levels, and had participated in the selection to represent the district in the provincial level competition, and the last characteristic was that all subjects were in grade 2 high school.

### 2.4. Instrument

The instruments used in this study were 7 types of tests, namely: zig-zag, shuttle run, 100 meter run, 400 meter run, dribbling, skipping and catching the ball. Then of the seven tests divided into two parts of the first type of test for the physical components of Strength, Endurance, Muscle Endurance, Power, Speed, Flexibility and Balance using the type of zig-zag test, shuttle run, 100 meter run and 400 meter run, and the second type of test is for the physical components of Coordination, Agility and Reaction using dribbling, skipping and throwing and catching the ball. All subjects are required to carry out the series of tests with the following rules: 1). Run zig-zag 3 times the chance, 2). Shuttle run 2 times the chance, 3). Run 50 meters 2 times a chance, 4). Run 400 meters 2 times a chance, 5). Dribbling the ball, skipping and throwing and catching the ball were given 3 opportunities for the subjects to do this.

### 2.5. Procedures

The subjects followed a series of circuit training sessions three times a week for eight weeks. Then the intensity of circuit training in this study was around 60% - 90%, the time used in this study was 30-60 minutes. Then the researchers used 7 (seven) types of programs used in the study including: zig-zag test, shuttle run, 100 meter run and 400 meter run, skipping, throwing and catching the ball.

### 2.6. Statistical Analysis

The analysis technique in this study used the SPSS version 24.0 application; this application was used to test the research data collected including three types, namely normality, homogeneity and t-test. The normality test was carried out to determine whether all the data in this study contributed normally or not, then a homogeneity test was carried out to ascertain whether the variance in this study was entirely homogeneous or whether there were differences and the last test in this study was the t-test, ascertaining whether the hypothesis in this study can be accepted or rejected.

### 3. Result

This study aims to determine whether the circuit training exercise model has an effect or not on improving the physical condition of SSB PBL athletes. The data in this study included several tests, namely: muscle strength, explosive power, abdominal muscle endurance, balance, flexibility, cardiovascular, coordination, balance, agility and reaction time. Then the data is changed in the form of

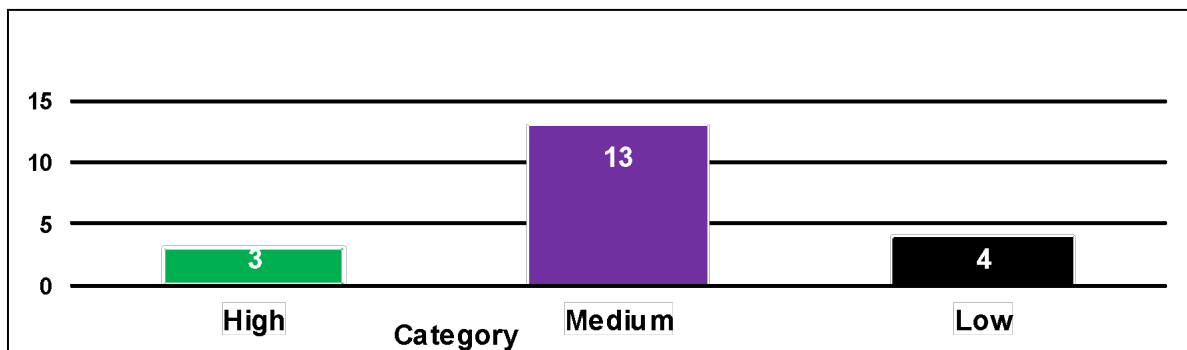
t scores, after that they are added up and the physical condition of the SSB PBL athletes is obtained. The table below is a description of the results of the pretest and posttest data research on the physical condition of SSB PBL athletes.

As for the parameters used in this study, the researcher used the 2012 EA Sports BCSP Fitness Testing theory. Then the results in Table 1 are shown in the diagram.

**Table 1.** The results of the pretest of the physical condition of the PBL SBB athletes

Interval	Category	Absolute	%
> 53.61	high	3	15
45.67-53.61	moderate	13	65
< 45.67	low	4	20
Total		20	100

Source: (EA Sports BCSP Fitness Testing 2012)

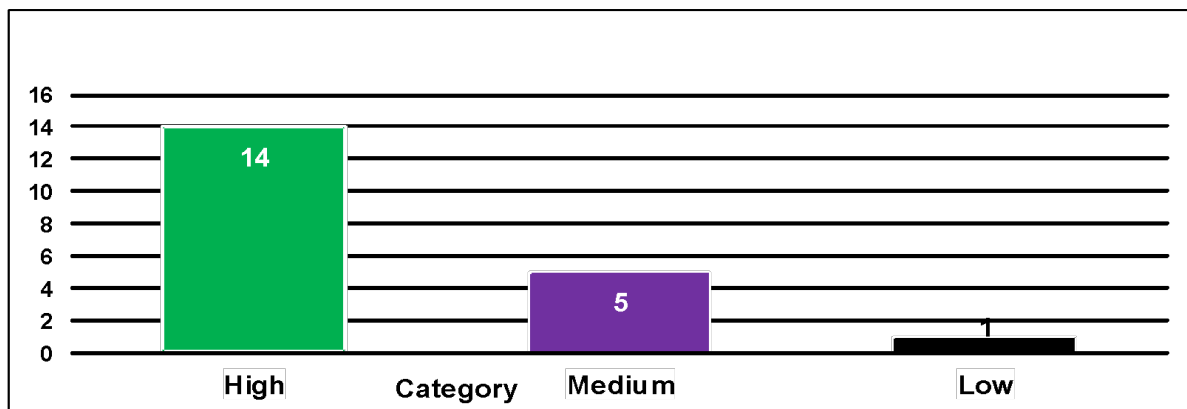


**Figure 1.** Diagram of the results of the pretest physical condition of the PBL SBB athletes

**Table 2.** The results of the posttest physical condition of SSB PBL athletes

Interval	Category	Absolute	%
> 46.48-54.05	high	14	70
54.05	moderate	5	25
< 45.48	low	1	5
Total		20	100

Source: (EA Sports BCSP Fitness Testing 2012)



**Figure 2.** Diagram of the results of the posttest physical condition of the PBL SSB athletes

Based on the table and figure above, it can be seen that the results of the pretest physical condition of the PBL SSB athletes are as follows: 3 athletes (15%) in the high category, 4 athletes, (20%) in the medium category and 13 athletes (65%) in the moderate category.

After describing the results of the pretest, below are the results of the posttest of the physical condition of the PBL SSB athletes. The minimum score is 40.78, the maximum value is 57.51, the average value is 50.53, the median value is 51.79, the mode value is 40-78 and the standard deviation of 4.05. Furthermore, the results of the research are described and then classified based on being categorized in the form of a table as table 2.

Then the results in Table 2 are shown in the diagram. Based on the table and figure above, it can be seen that the posttest results of the physical condition of the PBL SSB athletes are as follows: 70% (14 athletes) are in the high category, 25% (5 athletes) are in the medium category and 5% (1 athlete) are in the low category. Then the results of the pretest and posttest were tested in three stages, namely normality, homogeneity and t-test. The three tests can be described as follows:

#### a. Normality Test

The criteria used to determine whether a data is normal or not is if  $X^2$  count  $< X^2$  then the data is declared normal. The results of the normality test can be seen in Table 3.

Based on the results in Table 3 above, it is known that

the pretest and posttest data in this study contribute normally.

#### b. Homogeneity Test

The criteria used to determine whether a test is homogeneous or not is if  $p > 0.05$  and  $F_{hit} < F_{table}$ , then the test is declared homogeneous. Homogeneous test results can be seen in Table 4.

Based on the results in Table 4 above, it is known that the variances above are homogeneous.

#### c. T-Test

T-test was carried out to determine whether circuit training had an effect on improving the physical condition of SSB PBL athletes. The results of the t test can be seen in Table 5.

Based on the results of the t-test, the t value is calculated (6.956)  $>$  t table (1.729), and the p value is  $<$  0.05. Thus,  $H_0$  is accepted, so the hypothesis in this study states that there is an effect of circuit training on improving the physical condition of SSB PBL athletes.

Based on the results of the t-test which is described in Table 6 above, it can be concluded that the 10 components trained using circuit training exercises have an effect on increasing the 10 components in SSB PBL athletes. Thus, circuit training exercises have an effect on improving the physical condition of SSB PBL athletes.

**Table 3.** Normality Test Results for SSB PBL Athletes

	Variable	$X^2$ hits	$X^2$ table	P	Sig 5%	description
Pre-test	Strength	3,711	8,350	0,570	0,04	Normal
	Endurance	2,8319	9,488	0,230	0,03	Normal
	Muscle Endurance	2,311	8,331	0,410	0,05	Normal
	Power	3,110	9,201	0,360	0,02	Normal
	Speed	2,017	9,001	0,601	0,01	Normal
	Flexibility	2,614	8,250	0,350	0,02	Normal
	Balance	1,019	4,470	0,720	0,03	Normal
	Coordination	2,341	8,521	0,660	0,02	Normal
	Agility	2,004	7,340	0,420	0,01	Normal
	Reaction	2,702	10,50	0,530	0,02	Normal
Post-test	Strength	8,100	19,10	0,430	0,03	Normal
	Endurance	9,200	16,20	0,211	0,04	Normal
	Muscle Endurance	8,400	18,10	0,310	0,02	Normal
	Power	8,800	15,11	0,200	0,05	Normal
	Speed	9,600	19,30	0,520	0,01	Normal
	Flexibility	7,900	16,10	0,310	0,04	Normal
	Balance	6,300	13,60	0,101	0,01	Normal
	Coordination	9,400	19,20	0,417	0,03	Normal
	Agility	7,300	18,70	0,312	0,05	Normal
	Reaction	8,200	17,50	0,219	0,03	Normal

**Table 4.** Results of Homogeneity Test for SSB PBL Athletes

Test	Df	F table	F hit	P	Sig 5%	Description
Physical Condition	1.18	4.41	0.249	0.620	0.05	Homogeneous

**Table 5.** T-test results of SSB PBL

Pretest-Posttest	Df	t table	t hit	P	description
Physical Condition	19	1,729	6,956	0.000	There is an Influence

**Table 6.** Test results of 10 components in the physical condition of SSB PBL athletes

	Variable	X <sup>2</sup> hits	X <sup>2</sup> table	P	description
Pre-test	Strength	3,711	8,350	0,570	There is an Effect
	Endurance	2,8319	9,488	0,230	There is an Effect
	Muscle Endurance	2,311	8,331	0,410	There is an Effect
	Power	3,110	9,201	0,360	There is an Effect
	Speed	2,017	9,001	0,601	There is an Effect
	Flexibility	2,614	8,250	0,350	There is an Effect
	Balance	1,019	4,470	0,720	There is an Effect
	Coordination	2,341	8,521	0,660	There is an Effect
	Agility	2,004	7,340	0,420	There is an Effect
	Reaction	2,702	10,50	0,530	There is an Effect
Post-test	Strength	8,100	19,10	0,430	There is an Effect
	Endurance	9,200	16,20	0,211	There is an Effect
	Muscle Endurance	8,400	18,10	0,310	There is an Effect
	Power	8,800	15,11	0,200	There is an Effect
	Speed	9,600	19,30	0,520	There is an Effect
	Flexibility	7,900	16,10	0,310	There is an Effect
	Balance	6,300	13,60	0,101	There is an Effect
	Coordination	9,400	19,20	0,417	There is an Effect
	Agility	7,300	18,70	0,312	There is an Effect
	Reaction	8,200	17,50	0,219	There is an Effect

## 4. Discussion

Physical condition is always related to the ability of an athlete. Physical condition is one of the most important factors for an athlete to participate in various training programs offered by a coach [33]. Good practice will have a good impact on an athlete to achieve the expected achievements and goals in a club. Talking about physical condition means talking about physical fitness. It is no longer a foreign thing, physical fitness of an athlete is very important to achieve maximum performance [34].

Physical condition is one of the important factors needed to improve the performance of an athlete [35]. Physical condition can be said as the basic foundation or

benchmark of athlete's achievement. Physical condition is a unified whole that cannot be separated, because an effort to improve physical condition will be in line with the development of all the components needed in physical activity, but this must be trained systematically and with extra focus [36]. Physical conditions generally have 10 components, namely: strength, endurance, explosive power, flexibility, balance, speed, coordination, accuracy, reaction and agility [37].

Physical condition is the main factor for an athlete, especially a football athlete, and this factor must be passed by a football athlete before getting to know or train about technique, tactics and mentality. With this, a technique is needed [38]. Seeing that this factor is very

important, it is necessary to use effective and efficient training techniques and models to improve the physical condition of soccer athletes, and one of the training models used in this study is circuit training [39].

Based on the results of the t-test in this study, the t-count (6.956) > t-table (1.729) and the P value <0.05. Based on the results of this study, the hypothesis is accepted, so the hypothesis in this study states that there is an effect of circuit training on improving the physical condition of the PBL SSB soccer athletes. Based on these results, circuit training is one of the most effective exercises to improve the physical condition of soccer athletes. Circuit training exercises contain forms of exercise such as strength, speed, endurance, explosive power, coordination and reaction. Exercises carried out by a football athlete continuously or repeatedly, automatically have an effect on good physical condition [40]. However, during the exercise process, it is necessary to pay attention to the intensity and frequency of exercise, because these two things will also affect the results obtained during training using circuit training.

A football athlete who has a good quality of physical condition is not obtained instantly, but must practice repeatedly. So that the physical condition in this case and the components of the physical condition support football athletes when doing exercises or when participating in matches. Repeated exercise through circuit training will have a very large impact on football athletes, for example, endurance and coordination of these two factors have improved very well, this can be seen from the ability of physical conditions, especially endurance and better coordination [41].

This study still has limitations in several aspects, namely: the research location is single, the research time is quite short, the subjects and samples used are still small, they do not control the nutrition of each athlete and the training model still focuses on one exercise model. The hope of the researcher is that there will be writers who can continue this paper in a wider direction and involve many soccer places or schools, using a large number of subjects and samples, using an exercise model that is more than one training model and the duration of the research is long. Another hope from the researchers is that this research can be useful in the field of sports, especially in the world of sports coaching as an alternative exercise for athletes.

## 5. Conclusions

Improving the physical condition of football athletes who are still in the young category is something that is not easy and cannot be done instantly. To get the quality of the physical components of quality athletes, a long training process is needed and the right training methods are needed in the training process to improve the physical condition of athletes, especially athletes at the Northwest Pantar football school, Alor Regency, East Nusa Tenggara,

Indonesia. The results of this study can indicate that there is a significant effect on the physical condition of the athletes at the Northwest Pantar Football School after the athletes have practiced the seven (7) types of circuit training used in this study. The results of this study prove that the circuit-based training model has a positive impact on the physical condition of soccer athletes. The research results also answer the initial hypothesis in this study, and it is proven that there is an effect of circuit-based training on the 10 components of soccer athletes. Future researchers are expected to be able to continue this research by involving more components needed and a variety of training models. Researchers realize that, in a scientific study, nothing is 100% perfect. So this study has limitations among the subjects that are used only from one soccer school, the coaches involved are still minimal in experience because they are only training the sub-district level environment and the tools used are still 60% using modifications but do not reduce the value in this study.

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