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Dominant Physical Factor Determinant to Play Football

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***Abstract*— There is an important physical condition for football's athlete. It determine the athlete performance on field. This research goal is to identify the dominant physical factor determinant to play football. The sampling technique used was purposive sampling. The subjects of this reserach were 125 football players in two university in Surakarta City. This research use confirmatory factor analysis. Statistical software (SPSS 22) were used to process the data using *Kaiser Meyer Olkin and Bartlett's Test.* The result of this study indicated that agility (0.784), foot-eye coordination (0.720), speed (0.697), dynamic balance (0.646), endurance (0.588), leg power (0.528) have a dominant factor on player skill (component factor ≥ |0,5|). However, leg strength (0.380), trunk flexibility (0.410) and reaction time (0.417) has no significant contribution on player skill (component factor < |0,5|). Playing football required physical condition to maintain a competitive play in football. Coaches and athletes should consider this findings as a foundation to create a training program.**

Keywords*— *Physical Condition, Football, Sport Training Introduction

I. INTRODUCTION

Sports has an important role in human life. Practicing sports, people can enjoy an optimum health, physically and mentally as well as having a good social life through better personality with confidence, sportmanship, and dicipline. A reality that can be observed in the world of sports, shows a tendency for a rapid increase in sports achievements over time at the regional, national and international levels. This can be seen from the record-breaking that continues to be carried out in certain sports, this is possible because application of better techniques and physical conditions.

Aspects related to sports coaching include: (1) sports-related aspects; concerning physical problems: physical coaching, technical coaching, tactics coaching, athlete maturity, coaches, training and evaluation programs, (2) medical-related aspects; concerning problems as follow , physiological attribute (heart, lungs, nerves, muscles, senses, etc.), nutrition, injury, and physical assessment (3) psychological aspects; concerning problems: mental resilience, self-confidence, self-mastery, discipline and fighting spirit, pressure, perseverance, and precision, as well as motivation.

Given the very complex problem of fostering sports achievements, the strategy of fostering this sport needs to be handled professionally, both in management and in science. Every sport such as football, swimming, athletics has systems, strategies and methods of different physical training to achieve and improve sports performance. This difference in physical training can be seen from the differences in movements in each of these sports as well as football.

Football is a sport that is quite popular in the community and is loved by all levels of society ranging from children to the elderly. Many championships have been held in various world events such as the Champions League, World Cup, European Cup and so on. From these football events it is able to hypnotize all people in the world to watch football matches. Many European countries take football as a National sport. According to Beltasar Tarigan [1] that, The aim of the football game is each team or team that is trying to master the ball, put the ball into the opponent's goal as much as possible, and try to break the opponent's attack to protect or maintain the goal so the opponent cannot score.

The development of elite sports, especially Football in Indonesia has achieved popularity and gained a place in society as we see it today. Football is a sport that is favored by Indonesian people, especially among students. There are several indicators that football in Indonesia are growing that is including the existence of Football Clubs, the emergence of Football Schools or Football Educational Institutions in various regions and higher education dedicated to learn football.

In principle, aspects that must be trained and improved in the training of achievement sports (including football) include: sport-related aspect (physical, technical, tactic, athlete maturity, coaches, training programs, evaluations), medical aspects and psychological aspects. Regarding on the sport-related aspect, coaching and training basic techniques of playing football is one important factor so that football players have the skills to play football. Because the appearance of a football player or the quality of a football team can be influenced by the level of skill mastery by the players. According to Zidane [2] that, "Skills that is necessary to be mastered in playing football are: passing, heading, dribbling, shooting, kicking, moves, trapping, receiving and control.

Football requires complete physical conditions in order to be able to get higher achievements. Besides, it is also important to mastering techniques, tactics and strategies. As stated by Sajoto [3] the building of physical conditions in sports that if an athlete wants to excel they must have physical conditions such as: strength, endurance, muscular power, speed, coordination, flexibility, agility, balance, accuracy, reaction. Physical condition is a whole unit of components that cannot be separated, both for its improvement and maintenance [3]. According to Scheunemann [4] things that improve the physical abilities of a football player consist of : strenght, endurance, acceleration, flexibility, muscle mobility, coordination, agility, basic motor skill, reaction and awarenes.

Based on the overall components of the physical conditions mentioned above, the maintenance and improvement cannot be separated from one another, so that an athlete's achievements in various sports can be increased. Elements of the physical conditions needed in football include speed, leg muscle strength, leg muscle power, endurance, agility, flexibility of the toes, ankle coordination, reaction time, and balance.

Speed is an essential physical condition attribute. In football games, it requires quick moves, especially the speed of running during the game to chase the ball given by the teammate, to chase the opponent, to do pressing against the opponent, to proceed counterattack. Strength is a component of the main physical condition of the overall physical condition because it is the driving force for every physical activity. In football games, the strength of the leg muscles overcomes the pressure or burden caused by a player in dribbling the ball.

Power is muscles' capability to deal with high-speed yet heavy resistance in full motion that works in a short time. According to Bompa [5] "Strength is the ability to apply force". Judging from football games, the dominant power is leg muscle power. Power of leg muscles is deployed in the technique of kicking the ball, especially shooting into the opponent's goal or doing long-distance pass. Endurance is known as a person's ability to use a group of muscles, to contract continuously in a relatively long time, with a certain load. In a competition or competition a soccer player is required to be able to play during the match without experiencing significant fatigue in implementing techniques and tactics in football.

Agility defined as body's capability to change direction quickly, start and stop quickly. Football games really need agility because agility is a characteristic of football. Flexibility is the ability of a person to be able to move with the widest possible space in joints. Football players need flexibility to support other movements in this case the flexibility of the token. Coordination is the harmony of work of a group of muscles smoothly and accurately when carrying out activities that are indicated by high skill levels. Coordination that plays a role in football is eye-foot coordination.

Reaction time is the shortest time needed to provide kinetic answers after receiving stimuli through various senses, nerves and others. The speed of reaction plays an important role in football, so what is meant in reaction speed in football is the reaction speed of the foot to grab the ball from the opponent (intercept), determine the timing of dodging with the opponent, and kicking into the goal. Balance is basically the ability of a person to control the nerve organs of the muscle and maintain his body during activities. Dynamic balance is the ability to maintain a balanced state in motion.

Based on the problems stated above, it illustrates that football skills can be achieved through series of exercise. Exercise must be carried out systematically, continuously and programmed as a step that must be taken to improve the skills of playing football. On the other hand, the skill of playing football can be optimum with the support of several factors. Factors that can support football playing skills include physical conditions. Factors of physical condition can support the skills of playing football, because when playing football there is a component of the dominant physical condition in it. But it is not yet known which components of the physical condition are dominant with the skills to play football. To find out this, it is necessary to study and examine more deeply, both in theory and practice through tests and measurements of physical conditions with the skill of playing football. The purpose of this study is to analyze dominant physical condition determinant to play football.

II. METHOD

a. Participants

Participant in this study is withdrawed from member of football clubs of two university in Surakarta city, one being Universitas Sebelas Maret (UNS) and the other is Universitas Tunas Pembangunan (UTP). 125 collegiate male athletes participated in this study.

b. .Research Variables

This study employed nine independent variables and one dependent variable. The independent variables being speed, leg power, leg strength, physical endurance, agility, trunk flexibility, foot-eye coordination, reaction time, and balance. The dependet variable is skills to play football.

c. Procedure

This study design as cross-sectional where all variables are being measured on the same occasion. This study used test and measurement method to quantify independen variables by ismaryati [6]. Dependent variable was measured using football skill test developed by Plooyer as cited in Soekatamsi [7] including juggling, dribbling with shooting,and passing accuracy. Initially participants were asked to wear comfort clothes and shoes design for soccer.

They were given time to perform warm up. Each independet variables measured using designated methods as the following 50-m run (speed), standing broad jump (leg power), leg dynamometer (leg strength), multilevel fitness test (physical endurance), shuttle run test (agility), flexometer (trunk flexibility), football wall volley test (foot-eye coordination), nelson foot reaction test (reaction time), and bass test for measure dynamic balance. Prior to each test, participants were explained the purpose of the test and being motivated to be at their best level of performance. There was a 30-minute break time for each participant between test items to avoid a decrease on performance due to fatigue.

d. .Statistical Method

The approach in this study is a quantitative approach, using a confirmatory analyzed design by Emzir [8]. Multivariate statistics was used to analyze the data. According to Joseph et al [9] factor analysis is used to analyzed interrelationship structure among variables. Assumptions existed in factor analysis is for any given variables there is as association with other variables. Factor analysis analyzed correlation among variables. Statistical work is done using SPSS Ver 22 Software by Ghozali [10].

III. RESULTS

This section is presented regarding the results of the study based on the Confirmatory Factor Analysis design. Factor analysis is a multivariate statistical method explaining the relationship between a number of changes that are mutually independent from one another and to find out the dominant factors in explaining a problem. In this study the independent variables analyzed to determine the dominant factors determining the skills to play football were speed, leg muscle strength, leg muscle power, endurance, agility, eye-leg coordination, flexibility of the pitch, reaction time, and dynamic balance.

a. *Factor Analysis I*

The results obtained Kaiser-Meyer-Olkin Measure of Sampling Adequacy abbreviated as KMO-MSA and Bartlett's Test of Sphericity. The results of the KMO-MSA test on the 9 tested variables obtained a value of 0.509> 0.5 while the Bartlett's Test of Sphericity number showed an Approximate Chi-square number of 52.461 with a Degree of Freedom (df) 36 and a significance of 0.037. The magnitude of the correlation between the independent measured variables has a value between 0 and 1, to state that the STRONG relationship of KMO-MSA numbers must be above 0.5 and the opportunity value (Sig.) Must be <0.05. This shows that the collection of variables in this study is significant and can be further processed.

In the Anti Image Matrices Correlation, there are three variables that have MSA values below 0.50 each, which are leg muscle strength (0.380), flexibility (0.410) and reaction time (0.417) which must be reduced and must be removed or eliminated because it is not significant for further testing.

The next step is to reduce the analysis factor II again, which is the same as the first analysis factor. But for the second factor analysis it has eliminated or eliminated leg muscle strength, flexibility of the tongue, and reaction time because the first factor of analysis of the MSA value of the three has a value below 0.5, which means that in factor II analysis is not included.

b. *Factor Analysis II*

The results obtained by the Kaiser-Meyer-Olkin Measure of Sampling Adequacy abbreviated as KMO-MSA and Bartlett's Test of Sphericity. The results of the KMO-MSA test on the 6 tested variables obtained a value of 0.621> 0.5 while the Bartlett's Test of Sphericity number showed an Approximate Chi-square number of 28,751 with a Degree of Freedom (df) 15 and significance of 0.017. The magnitude of the correlation between the independent measured variables has a value between 0 and 1, to state that the STRONG relationship of KMO-MSA numbers must be above 0.5 and the opportunity value (Sig.) Must be <0.05. This shows that the collection of variables in this study is significant and can be further processed.

In the Anti Image Matrices it turns out that there are no variables that have an MSA value below 0.50 which means that all of these variables can be tested further into extraction process with the Principal Component Analysis method and produce Communalities.

Table 1. Results of comunalities Physical Condition Analysis Determinants of soccer playing skills

Variable	*Initial*	*Extraction*
Speed	1.000	.488
Leg power	1.000	.265
Endurance	1.000	.353
Agility	1.000	.632
Foot-eye coordination	1.000	.547
Dynamic balance	1.000	.424

Extraction Method: Principal Component Analysis.

The results of comunalities for agility variables are 0.632, which means that 63.2% of the variance of this variable can be explained by the factors formed in the rotated component matrix. To clarify the position of each variable in each component, a rotation process is produced which results in the rotation of the component Matrix as above.

Table 2. Results of *Rotated Component Matrix*[a] Physical Condition Analysis Determinants of soccer playing skills

Variable	*Component*
	Physical Condition
Speed	-.697
Leg power	.528
Endurance	.588
Agility	.784
Foot-eye coordination	-.740
Dynamic balance	.646

Based on the results of *Rotated Component Matrix*[a] Physical Condition Analysis Determinants of soccer playing skills, it turns out that the value of the component factor ≥ | |0,5| means that the dimensions of the physical condition factor consist of variable speed, leg power, endurance, agility, eye-foot coordination, and dynamic balance is a member of the dominant physical condition for football.

IV. DISCUSSION

Based on the results of the descriptive analysis, it shows that the factors of the physical condition of football achievement among collegiate athletes have various value. The speed ranges from 6.33 seconds to 5 seconds, with an average speed of 5.69 seconds. Leg muscle power factor with values between 2.12 m to 2.68 m with an average of 2.43 m. Leg muscle strength between 58 kg to 88 kg with an average of 73.18 kg. Physical endurance expressed in VO2Max score is value between 41.1 to 52.5 with an average of 49.1. Agility factor with a value between 15.99 s up to 13.04 s with an average of 14.19 s. The flexibility factor of trunk is between 27cm and 54cm with an average value of 42.97 cm. Factor of ankle coordination with a value between 5 and 9 with an average of 7.5. The reaction time factor is 17.7 cm to 9.7 cm with an average of 13.59 cm and a dynamic balance factor with a value between 6 and 10 with an average of 8.63.

The results of the factor analysis calculated using the KMO and Bartlett's Test program through SPSS and supported by the theoretical foundation obtained the physical condition factor determinant of soccer playing skills which is a summary of the 9 factors analyzed, as the following:

a. Physical Condition Factors Dominant determinants of soccer playing skills are agility, ankle coordination, speed, dynamic balance, endurance, and leg muscle power. There is a group of samples that the ability of soccer players lies in agility (0.784), ankle coordination (0.720), speed (0.697), dynamic balance (0.646), endurance (0.588), and leg muscle power (0.528). Because of the six variables the physical condition has a positive correlation value and is above ≥ 0.5 based on the value of rotated component matrixa. Then it can be concluded that the greater the value of the physical condition variables the more profitable the player is in playing football skills.
b. Factors that are less dominant physical conditions determinants of playing football skills are leg muscle strength, flexibility of pitch, and reaction time. Because in the Anti Image Matrices correlation tabulation, there are three variables that have MSA values below 0.50 each, which are leg muscle strength (0.380), flexibility (0.410) and reaction time (0.417) which must be eliminated or excluded from the analysis factor because it is not significant for further testing.

The hypothesis in this study is that the variables that are more dominant determinants of playing football skills are speed, leg muscle strength, leg muscle power, endurance, agility, flexibility of the eyes, eye-leg coordination, reaction time, and balance.

Based on the results of *Anti-image Matrices Correlation* and *rotated component matrix*[a] on the analysis of factors in determining the physical condition of playing football skills using the SPSS program there are three physical condition variables that must be eliminated or excluded from the dominant analysis factor because they have a MSA value below 0.5. It included leg strength (0.380), trunk flexibility (0.410) and reaction time (0.417). Whereas the dominant physical condition factor in football that benefits soccer players or which has a component value factor ≥ |0,5| are:

a. agility with a component value of 0.784
b. ankle coordination with a component value of 0.720
c. speed with a component value of 0.697
d. dynamic balance with a factor value of 0.646
e. endurance with a component value of 0.588
f. leg power with a component value of 0.528

The results of this study illustrate that the dominant physical condition factors that favor football skills are agility, ankle coordination, speed, dynamic balance, endurance, and leg muscle power

V. CONCLUSION

Based on the results of the research this study provides the following conclusions:

1. Factors dominant physical condition determinants of playing football skills are agility, ankle coordination, speed, dynamic balance, endurance, leg muscle power.
2. Factors that are less dominant physical conditions determine the skills to play football are leg muscle strength, flexibility of pitch and reaction time.

On the basis of the conclusions that have been taken, the implications can be expressed in an effort to improve football performance specifically improving the physical condition of football. Based on the results of the analysis, the most dominant physical condition factors affecting football playing skills are agility, ankle coordination, speed, dynamic balance, endurance, and leg muscle power. Coaches and athletes should aware of the findings and work harder to improve those physical attributes.

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