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Correlation of Physical Conditions and Anthropometric Factors for the Risk of Sports Injuries

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ABSTRACT

Background: The purpose of this research was to know and to analyze (1) to find out if there is a relationship between physical condition factors and the risk of sports injury, (2) to find out whether there is a relationship between anthropometry factors and the risk of sports injury, and (3) is there a combination relationship between factors physical and anthropometric conditions against the risk of sports injury.

Subject and Method: This research method uses a quantitative approach using correlation analysis. The populations in this study were all male students developing UNS football achievements totaling 97 people. The sampling technique used was purposive sampling. The sample in this study was a portion of 80 male students of UNS football achievement. Data collection techniques with tests and measurement.

Result: The results of the study of physical and anthropometric factors on the risk of sports injury with the Pearson correlation coefficient number approaching 1 or -1 are: Speed with a value of -0.869, agility with a value of -0.960, endurance with a value of 0.922, Back flexibility with a value of 0.874, leg muscle strength with a value of 0.842, reaction time with a value of -0.799, dynamic balance with a

value of 0.729, leg muscle power with a value of 0.678, Coordination eye-foot with a value of 0.699, body mass index with a value of -0.929, leg length with a value of 0.739.
Conclusion: Correlations of physical and anthropometric factors to the risk of significant sports injuries are speed, agility, endurance, back flexibility, leg muscle strength, reaction time, dynamic balance, leg muscle power, ankle coordination, body mass index, leg length.

Keywords: Physical condition, Anthropometry, Risk of sports injury

INTRODUCTION

Sport is an activity that is always carried out by the community, its existence is now no longer underestimated but has become part of people's lives. Sport according to Giriwijoyo (2007: 31), is a series of regular and planned physical movements carried out by conscious people to improve their functional abilities. The community conducts sports with a variety of objectives including: for the relations of fellow colleagues, for health, gathering with old friends, spending free time, education, up to aspects of achievement coaching. Genetically determined physical abilities and is one of the determinants of achievement consisting of basic components namely; strength, explosive power, endurance, speed, flexibility, agility, balance and coordination, it is still possible to develop according to the limits of the athlete's ability. These factors greatly determine the success of a sport, including sports that are game. One of the sports games is football.

Football is one of the most popular sports in the world. The development of achievement 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 and students. One manifestation of the development of football in Indonesia, namely, the existence of Football Clubs, the emergence of Football Schools or Football Educational Institutions in various regions and the existence of Football Achievement Coaching at the level of Universities or Universities. In addition, the existence of the Indonesian Football League or Inter-College Football tournaments organized by the government is one form of the government's attention to the development and achievements of football in Indonesia.

Soccer is one type of direct and hard body contact game that demands the ability of each individual and teamwork to move, think and decide everything quickly and precisely, so it is not surprising that in football games a player is very susceptible to injury to both muscles, bones, ligaments and joints that can occur in parts of the head, body, arms, hands, or legs and feet. Injuries experienced by a soccer athlete can cause an athlete's withdrawal, trauma, psychological disorders, decreased physical condition, and permanent disability or even death.

Sports injuries are known as athlopathia. The nature of the occurrence of athlopathia is: (1) acute,

resulting from the severity of single trauma, and (2) chronic, resulting from repetitive microtrauma with cumulative effects. Athlopathia is a result of: (1) technical errors in movement, and (2) local overtrained (local overtraining), due to overuse or misuse of muscles, tendons or joints (Giriwiyono et al. 2012: 94-95). Injury is the result of complex interactions of several risk factors and events. Factors that can increase the risk of sports injury, can be classified into: factors that can be modified and cannot be modified. (1) Modifiable risk factors, namely: muscle strength and imbalance, neuromuscular control, instability, flexibility, warm-up, position, equipment, cheating, technical skills, tactical skills, endurance, speed and agility, and mental factors. Whereas, (2) unmodified risk factors consist of: previous injury, body alignment on lower ecstasy, body composition, hormones, dominant limbs, field surface, match season, and length of exposure (Soligard, 2011: 21-32) .

In addition, the risk of injury is also divided into two factors, namely: (1) the athlete's own internal factors (intrinsic) and (2) environmental factors (extrinsic). Intrinsic factors consist of components owned by athletes, namely: age, gender; body composition consists of: body weight, fat mass, body mass index (BMI), anthropometry, health consisting of: a history of previous injuries and joint instability; physical fitness consists of: strength, power, vo2 max, and scope of motion of joints; body anatomy; skill level consists of: basic sports techniques and postural stability; Psychological factors consist of: soul competing, motivation and perception of risk. Where these components affect the performance of athletes when practicing and competing. The risk factor for this intrinsic injury can be minimized for the risk of injury. Whereas, extrinsic factors are factors from the outside environment of athletes, namely: sports factors consisting of the type of sport, competition rules, and referees; protective equipment, sports equipment, and the environment consists of: weather, surface of the field, and maintenance, which these factors can affect the risk of injury (Soligard, 2011: 20). Based on the two opinions above, in this study, the risk factors that are the focus of attention of researchers are modifiable and intrinsic risk factors in the form of physical and anthropometric conditions.

According to M. Sajoto (1995: 8-9), the physical condition in terms of its physiology is the ability of a person to know the extent to which his ability as a supporter of activities to exercise The physical condition of soccer players is a source of material to be developed by football experts in addition to technique, tactics, mentality and maturity to compete. Mochamad Sajoto (1988: 57), states that in developing technical, mental, and playing strategies, physical is an important element that becomes the foundation / foundation of every player to always be in top condition. Physical condition is an integral whole of components that cannot be separated, both in improving and maintaining it. A soccer player in defense or attack sometimes faces hard clashes, or has to run at full speed or dodging to avoid the opponent, stopping to master the ball suddenly. A soccer player in dealing with such matters must be nurtured and trained from the start to avoid an injury or risk of injury.

The components of the physical condition consist of: (1) Strength (strength); (2) Speed (speed); (3) Agility; (4) coordination (coordination); (5) Muscle power (Power); (6) Endurance (endurance); (7) Cardiorespirathory function; (8) Flexibility (flexibility); (9) Balance (balance); (10) Accuracy (accuracy); (11) reaction (reaction); and, (12) Health for sports (health for sport). Whereas, factors that influence physical conditions are: (1) exercise factors; (2) the principle of training load; (3) rest factor; (4) healthy living habits; (5) environmental factors and (6) food factors.

Anthrophometry is one of the factors that cannot be separated in sports achievement. M. Sajoto (1995: 11) states, "One aspect in achieving achievement in sports is the biological aspect which includes the structure and posture of the body, namely: (1) the size of the height and length of the leg, (2) the size, width and weight, (3) somatotype (body shape). This means that every sport requires different forms of body. For example, the body shape of a sports branch of football is certainly different from the body

shape in gymnastics, athletics, swimming and so on. To achieve basic technical skills in playing football, a soccer player must have the ideal body shape in accordance with the demands of the football sport. M. Furqon H. (2000: 4) that, "Factors that can affect sports performance seen from physical aspects include height, weight, sitting height, length of the upper and lower limbs, body type and others" .

Based on the above opinion, in this study, researchers wanted to find out the relationship between factors in physical and anthropometric conditions against the risk of sports injury. To ensure the existence of a relationship or not factor in physical and anthropometric conditions against the risk of sports injury, of course, requires a tool to measure the risk of injury. Risk of injury can be predicted by observing every functional movement in sports activities. These observations assess whether there is a movement of compensation or loss of balance in functional movements that are used as examinations. The assessment was with Functional Movement Screening (FMS) (Cook et al. 2006).

FMS is used to identify potential risk factors to see the risk of musculoskeletal injuries that might occur. FMS uses observation of functional movements as a benchmark in predicting the risk of injury. Functional movement is the basic movement in sports that requires muscle strength, flexibility, joint width, coordination, balance, and proportion (Schneider et al. 2011). The FMS used in this study consisted of: Deep Squat, Hurdle Step, In Line Lunge, Active Straight Leg Raise, Trunk Stability Push Up, and Rotary Stability.

MATERIAL AND METHODS

1. Study Design

This research method uses a quantitative approach using correlation analysis. this research has been carried out at the UNS Surakarta Football Stadium. This research was held twice, namely Tuesday, November 10 2015 and Friday, November 13, 2015.

2. Population and Sample

The population in this study were all male students developing UNS football achievements totaling 97 people. The sample in this study is that some of the 80 male students of UNS football achievement training were obtained using purposive sampling.

3. Study Variables

The variables in this study consisted of eleven independent variables: physical conditions (speed, agility, endurance, back flexibility, leg muscle strength, reaction time, balance, leg muscle power, ankle coordination), anthropometry (Body mass index, leg length and 1 dependent variable, namely the risk of sports injury

4. Data Analysis

The data collection technique used in this study was by test and measurement. The types of tests used in this study are as follows speed with a 50 meter run test, agility with shuttle run test, endurance with multilevel fitness test, back flexibility with flexometer, leg muscle strength with leg dynamometer, reaction time with nelson foot reaction test, dynamic balance with bass test modification, leg muscle power with a standing broad jump test, ankle coordination with soccer wall volley test, BMI with a weight formula divided by square height, leg length measured from major trochanter points to soles of feet and risk of sports injury with Functional Movement Screening tests.

The collected data will be processed and analyzed using the Computerized Statistical Program using the SPSS system (Statistical Product and Service Solutions) Version 16 and using normality tests, linearity tests and correlation tests with Pearson Product Moment.

RESULTS AND DISCUSION

This study uses a correlation analysis with Pearson Product Moment through the SPSS.16.0 program. The following are the results of the correlation analysis on each variable. The summary of the results of the analysis of the correlation of physical and anthropometric conditions against the risk of sports injury are as follows:

Table 1. Summary of the results of a correlation analysis of physical and anthropometric conditions against the risk of sports injury

Variables	Sig. (2-tailed)	Pearson Correlation	Conclusion
Speed	.000	-.869**	Significant
Agility	.000	-.960**	Significant
Endurance	.000	.922**	Significant
Back flexibility	.000	.874**	Significant
Leg muscle strength	.000	.842**	Significant
Reaction time	.000	-.799**	Significant
Dynamic balance	.000	.729**	Significant
Leg muscle power	.000	.678**	Significant
Coordination eye-foot	.000	.699**	Significant
BMI	.000	-.929**	Significant
Leg length	.000	.739**	Significant
Combination	.000[a]	.986[a]	Significant

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Primary data that is processed, 2015

Based on the table above, the results of the correlation analysis of each variable can be explained as follows:

Speed, the number of Pearson correlation coefficients is -.869 **. This means that the correlation between the variable speed and FMS is -0.869 or very strong because it approaches the number -1. The two-star sign (**) means a significant correlation to the significance number of 0.01 and has a two-way possibility (2-tailed).

Agility, the number of Pearson correlation coefficients is -960 **. This means that the correlation between the variable agility and FMS is -0,960 or very strong because it approaches the number -1. The two-star sign (**) means a significant correlation to the significance number of 0.01 and has a two-way possibility (2-tailed).

Endurance, the number of Pearson correlation coefficients is .922 **. This means that the magnitude of the correlation between endurance and FMS variables is equal to 0.922 or very strong because it is close to number 1. The two-star sign (**) means a significant correlation on the significance number of 0.01 and has two-way possibilities (2-tailed).

Back flexibility, the number of Pearson correlation coefficients is .874**. This means that the magnitude of the correlation between back flexibility, and FMS s equal to 0.874 or very strong because it is close to number 1. The sign of two stars (**) means a significant correlation on the number of significance of 0.01 and has a two-way possibility (2-tailed).

Leg muscle strength, the number of Pearson correlation coefficients is .842 **. This means that the magnitude of the correlation between variables of Leg Muscle Strength and FMS is 0.842 or very strong because it is close to -1. The two-star sign (**) means a significant correlation to the significance number of 0.01 and has a two-way possibility (2-tailed).

Reaction time, the number of Pearson correlation coefficients is -.779 **. This means that the correlation between the variable Reaction Time and FMS is -0.777 or very strong because it is close to -1. The two-star sign (**) means a significant correlation to the significance number of 0.01 and has a two-way possibility (2-tailed).

Dynamic balance, the number of Pearson correlation coefficients is .729 **. This means that the magnitude of the correlation between the Dynamic Balance and FMS variables is 0.729 or strong because it is close to number 1. The two-star sign (**) means a significant correlation on the significance number of 0.01 and has two-way possibilities (2-tailed).

Leg muscle power, the number of Pearson correlation coefficients is .678 **. This means that the magnitude of the correlation between Power Limb Muscle and FMS variables is 0.678 or strong because it is close to number 1. The two-star sign (**) means a significant correlation on the significance number of 0.01 and has two-way possibilities (2-tailed).

Coordination eye-foot, the number of Pearson correlation coefficients is .669 **. This means that the magnitude of the correlation between the variable foot and eye coordination is equal to 0.669 or strong because it is close to number 1. The sign of two stars (**) means a significant correlation on the number of significance of 0.01 and has two-way possibilities (2-tailed).

Body mass index, the number of Pearson correlation coefficients is -.929 **. This means that the magnitude of the correlation between BMI and FMS variables is equal to -0.929 or very strong because it approaches -1. The two-star sign (**) means a significant correlation to the significance number of 0.01 and has a two-way possibility (2-tailed).

Leg length, the number of Pearson correlation coefficients is .739 **. This means that the magnitude of the correlation between the Leg Length and FMS variable is 0.739 or strong because it is close to number 1. The two-star sign (**) means a significant correlation on the significance number of 0.01 and has a two-way possibility (2-tailed).

Based on the results of the correlation analysis calculated using the Pearson Product Moment program through SPSS media and supported by the theoretical foundation that has been stated, the results of the 11 variables consisting of variables of physical and anthropometric conditions have a relationship or are significant against the risk of sports injury with a significance value amounting to 0,000 <0.01 (2-tailed).

Physical and anthropometric conditions are very important elements in almost all sports, this aim to apply them to a game in any sport in this case football. Physical and anthropometric conditions consisting of speed, agility, endurance, back flexibility, leg muscle strength, reaction time, balance, leg muscle power, ankle coordination, body mass index and leg length needed by muscles to create harmony with the required performance by muscle in doing various techniques in soccer games. From the results of the analysis test, the results show that all of these variables are simultaneously related to the risk of sports injury.

The results showed that there was a significant joint relationship between speed, agility, endurance, back flexibility, leg muscle strength, reaction time, balance, leg muscle power, ankle coordination, body mass index and leg length with the risk of sports injury with significance value 0,000 <0,05.

CONCLUSION

The conclusions in this study are as follows: Correlation of physical and anthropometric factors to the risk of significant sports injuries are speed, agility, endurance, back flexibility, leg muscle strength, reaction time, dynamic balance, leg muscle power, ankle coordination, mass index body, leg length.

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