PROPRIOCEPTIVE TRAINING EFFECTS ON REDUCING ANKLE INJURY RISK IN FOOTBALL PLAYERS

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ABSTRACT

Introduction : Ankle injury is a common case in soccer players. This condition is due to the ankle as an active facilitator playing an important role in the support of movement when playing. This is one of the factors that can decrease proprioceptive. Proprioceptive is the organism's ability to sense the position and movement of joints. Proprioceptive impairment is caused by ankle injuries such as ankle sprains, ankle strains, ankle dislocations and ankle fractures. The condition of the injury was supported by age, gender, BMI, insufficient warm-up, temperature and humidity, excessive exercise, insufficient rest time and inappropriate exercise facilities. The proprioceptive improvement process needs to be carried out in the form of FIFA 11+ proprioceptive training; this exercise is able to provide an increasing effect on neuromuscular and balance so that these exercises can reduce the risk of ankle injury in soccer players. **Methods**: The study applied experimental with a quasi-experimental approach to pre- and post-test one grub design treatment, sampling technique using purposive sampling, a sample of 21 people with an exercise program 3x a week for 4 weeks. The research instrument used a modified bass dynamic balance test, and the data analysis used descriptive statistical test, normality test and hypothesis testing. **Results**: Hypothesis testing using paired sample t-test showed that there was an effect of giving proprioceptive training to reduce the risk of ankle injury in soccer players (P=0.00 P<0.05). **Conclusion**: There is an effect of giving proprioceptive training to reduce the risk of ankle injury in soccer players.

Keywords : Propioceptive Exercise, FIFA 11+, Modified Bass Dynamic Balance Test, Risk of Ankle Injury

1. INTRODUCTION

Sport is a form of regular and planned physical activity to maintain motion and improve the ability to move both in static and dynamic positions in low and high intensity. One of these sports is football. Football is a type of game that uses a lot of body contact so that it often results in injuries.

Injuries are tissue damage (soft or hard) either muscles, bones, or joints caused by technical errors, collisions, or sports activities that exceed the training load limit (over training). So that it causes pain and other complaints according to the level of injury experienced (Putri, 2019). Injuries that are often found in soccer players are ankle injuries. Ankle injury is a type of injury to the musculoskeletal system that attacks the bones, ligaments, or tendons in the ankle, causing damage to the anatomical structure of the ankle.

This injury is caused by several factors including internal factors, namely: (a) Anatomical factors: unequal leg length, flat foot arch, pinched foot, so that when running will interfere with movement. (b) Wrong movements during practice, for example: excessive shooting technique. (c) Weakened muscle strength. (d) Low fitness level. External factors, namely: (a) Sports equipment: shoes, balls. (b) Field conditions: slippery, uneven or bumpy and muddy. Another supporting factor is excessive exercise over a long period of time (Sudirman, Mahyuddin & Asyhari, 2021).

Injuries experienced both in training and in matches have different prevalence. Based on research conducted from several world cups held by the Federation International de Football Association (FIFA) in 2021, it was stated that countries with high quality injuries were in the Americas there were 9.11% injuries per 1000 hours. Meanwhile, on the European continent, the figure is even higher, namely 24.2% per 1000 hours (Bengtsson, Gallo & Ekstrand, 2021). Injuries based on body location include head injury (17.6%), waist or hip (47.1%), wrist (52.9%), arm (64.7%), knee (82.4%), leg or leg (82.4%) Simatupang & Suprayogi (2019).

The prevalence of injury shows injuries that often occur in the ankle area. This is because the ankle plays an important role when kicking and the ankle joint absorbs the mechanical loads generated by the player's interaction with the ground. Damage to the ankle, especially the ligaments, causes decreased movement and instability (Helmi et al., 2020).

If this condition lasts for a long time, it will cause stability problems up to ligament laxity and decreased neuromuscular function. In muscles there will be a decrease in motor recruitment and non-activation of the Golgi body resulting in

sensorimotor deficits, while in ligaments it damages mechanoreceptors resulting in a decrease in proprioceptive. Decreased proprioceptive will be followed by a decrease in reflexes and muscle weakness in the ankle muscle group and a decrease in ankle stability. If this happens continuously, it will result in functional ankle instability. Functional ankle instability is described as a condition at the time of injury with a weak joint position, unsteady and cause pain or tenderness so that it can interfere with functional activities due to neuromuscular and proprioceptive deficits (Kolokotsios et al., 2021).

Proprioceptive is the sensory part that includes the sense of joint movement and joint position. Proprioceptive as a measure of neuromuscular response to stimuli received by the body because it works by involving sensory input, central processing, and motor output (Syafrianto, Muchlis & Ayu 2021). in the presence of proprioceptive can send signals to the brain to regulate commands to the muscles and joints how to use force and how to respond to the environment around them.

Proprioceptive exercises can provide information about the accuracy of motion and muscle tissue reflexes for the formation of dynamic stability in joints. Proprioceptive exercise aims to train afferent neurons in an effort to increase the sense of motion in the joints and activate motor nerve function in the brain so that by activating proprioceptives it can have an effect on increasing functional stability and joints can maintain their strength from various opponent attacks during training and competition.

2. RESEARCH METHODS

This study uses an experimental method with a quasi-experimental approach, namely research by conducting experiments to determine the symptoms or effects that arise as a result of a particular treatment or experiment. With the research design "pretest-posttest control one group design". given an intervention in the form of proprioceptive exercise FIFA 11+. Prior to treatment,the sample group was measured the level of risk of ankle injury using a measuring instrument in the form of a modified bass dynamic balance test then after undergoing treatment, 3 times a week for 4 weeks the group that was given proprioceptive exercise was re-measured the risk of ankle injury using a modified bass dynamic balance test.

Treating using a modified bass dynamic balance test has several tools needed such as a flat and level floor, stopwatch, insulation, meter, blank and stationery. Then the officer observed the respondent and recorded the test results. The test

results can be seen based on the measurement categories consisting of less (14-31), moderate (31-49) and good (50-68) categories.

The research variable consisted of the independent variable in the form of proprioceptive exercise while the dependent variable was the risk of ankle injury. The sample used was 21 people with an age range of 16-18 years who were selected based on inclusion, exclusion and drop out criteria and then used the slovin formula as a sample calculation.

The analysis technique in data management in this study used a frequency distribution based on age, gender, body mass index (BMI), pre and post test values of modified bass dynamic balance test. Then the data was tested for normality using the Shapiro Wilk test with criteria P> 0.005 which means that the data is normally distributed. Then to determine the effect of the given exercise, measurements were made using the paired sample t-test hypothesis test with a significance level of P <0.005.

3. RESULTS

Based on the characteristics of the respondents consisted of age, gender, body mass index and pre and post test. Characteristics of respondents, namely the age of more than 18 years as many as 9 people (42.9%) while the age of 16 and 17 there are 6 people (28.6%). In all gender categories respondents are male, totaling 21 people (100%) while the body mass index (BMI) category is dominated by normal characteristics, namely 15 people (71.4%), then underweight is 2 people (9.5%) and overweight amounted to 4 people (19.0%).

Table 1. Characteristics of Respondents

Characteristics	Category	Frequency	%
Age (Years)	16	6	28,6
	17	6	28,6
	18	9	42,9
Gender	Male	21	100
BMI	underweight	2	9,5
	normal	15	71,4
	overweight	4	19,0
	obese I	0	0
	obese II	0	0
	Total	21	100

Respondents had a modified bass dynamic balance test value before intervention with a value of 14-31 as many as 16 people (76.2%) which were categorized as lacking values, at a value of 31-49 as many as 5 people (23.8%) in the medium category and at the value of 50-68 there is no number that is categorized as good. Then in the post test modified bass dynamic balance test or after treatment, the results obtained with a value of 14-31 as many as 3 people (14.3%) as a poor category, at a value of 31-49 as many as 15 people (71.4%) as a medium category and at a score of 50-68 as many as 3 people (14.3%) as a good category.

Table 2. Pre-test modified bass test dynamic balance values

Characteristics	Category	Frequency	%
Pre test	14-31 (less)	16	76,2
	31-49 (medium)	5	23,8
	50-68 (good)	0	0
Post test	14-31 (less)	3	14,3
	31-49 (medium)	15	71,4
	50-68 (good)	3	14,3
	Total	**21**	**100**

The next test was carried out to determine the normality of the data by using the saphiro wilk test in the 16-18 year age group. P value in the age group of 16 years before the intervention was 0.505 and after the intervention was 0.452. Then in the age group of 17 years, the P value before the intervention was 0.078. and after intervention 0.091. Furthermore, in the age group of 18 years, the P value before the intervention was 0.257 and after the intervention was 0.106. From the translation of the data, it is stated that in the age group of 16-18 years, the data is normally distributed, where the P value> 0.05, which means that the sample is normally distributed.

Table 3. test the normality of the data using the saphiro wilk test

Data group	Category	Normality Test (p value)
Age 16	pre	0.51
	post	0.45
Age 17	pre	0.08
	post	0.09
Age 18	pre	0.26
	post	0.11

In order to know the effect of exercise, it is possible to test the hypothesis using paired sample t-test. The results of the calculation of the hypothesis test using the paired sample t-test obtained the difference in the mean value of the modified bass test dynamic balance before and after the intervention in the treatment group aged 16 years with a value of an average of 10,833 and a standard deviation of 3,764 and the value of sig. (2-tailed) 0.001. Then the treatment group aged 17 years had an average value of 11.667 and a standard deviation of 5.164 with a sig value. (2-tailed) 0.003. Then in the treatment group aged 18 years there was an average value of 11.111 and a standard deviation of 5.465 with a sig value. (2-tailed) 0.000. From the results of the calculation of the value in the treatment group U16-U18 years using the paired sample t-test calculation formula with a standard value (P <0.05) which means Ha is accepted and Ho is rejected, risk of ankle injury in soccer players. In the three treatment groups, the most influential in reducing the risk of ankle injury was in the 17-year-old age group. Column in row P to explain how much influence on exercise from each age group. In the 16 year age group there is a value of 0.008, while at the age of 17 years it has a value of 0.374 and at the age of 18 years it has a value of 0.085 so it can be concluded that the one who has the greatest influence is in the 17 year old group where the age of 16 years has the smallest effect on given exercise. Which means that the 16-year-old group has a higher risk of injury than the 17- and 18-year-old groups.

Table 4. Test Data Using Paired Sample T-test

Sample	N	Mean ± SD	Sig.(2- tailed)	P
Treatment group	Age 16	10,833±3,764	0,001	0, 008
Treatment group	Age 17	11,667±5,164	0,003	0, 374
Treatment group	Age 18	11,111±5,465	0,000	0, 085

4. DISCUSSION

a.Characteristics by Gender

Male players have a higher speed and intensity of play than women. In this case, the use of high intensity to get maximum results with continuous training and carried out with various movements can make men's activities in the game more at risk of experiencing injury levels. Furthermore, with men playing more often so that they are more skilled in mastering techniques and increasing competence so that the skills possessed make men more often play games which result in many injuries, one of which is caused by tackles from opponents playing (P. BollarS et al. al., 2015).

Robles-Palazón, et al. (2021) stated that anatomically, men suffered a lot of injuries to muscles and bones. For women, the most common injuries are in the knee area. That when running the knees will play an important role in supporting the wider pelvis of women than men. Zech, et al. (2022) found that one of the factors that caused a high risk of injury in soccer sports which was dominated by men, one of which was the difference in the duration of play. Men have a longer game duration than women, namely in men the duration of play is 2 x 45 minutes with a rest time of 15 minutes per session. Meanwhile, women spend 2 x 25 minutes and 10 minutes for rest. This difference can trigger higher fatigue in men's physical condition. This fatigue can cause injury because the energy expended is more than the energy input.

b. Characteristics Based on Age Characteristics of age in

This study was dominated by players aged 18 years. Based on the test using paired sample correlations which concluded that the age group at risk of experiencing the risk of injury was the 16 year old group because the value in this age group showed no higher than the 17 and 18 year olds.

This statement is in line with Mandorino, et al. (2022) it is known that the 5-16 year age group is a transitional stage of development from childhood to adolescence. At this time players experience rapid changes psychologically, physiologically, cognitively, and behaviorally accompanied by an increase in weight, height, muscle mass and changes in body composition. This anthropometric growth, together with hormonal changes and motor control, can predispose to injury.

The risk of injury to soccer players is mostly in the lower extremities such as soft tissue hematomas, tears or muscle tension, and ligament damage. The risk of injury is multifactorial, one of which is injury based on age group. The age group of 16-18 years did core exercises in the form of strength, speed and endurance with different durations for each age group. Ages 16-17 do core exercises for 4 days a week with a duration of 2 hours in 1 exercise. The exercise consisted of active recovery, strength, endurance, speed, and 1 trial. Rest time for 2 days. While the age of 18 years did 1.5 hours of exercise in 1 exercise. This difference occurs because the 16-17 year olds have quite complex training targets and the purpose of training is to train to compete so that training is focused on physical training, tactics, and techniques as well as the division of training portions with 50:50 matches.

Ages 18 years and over have a training to win goal. is said to be a professional player and the training carried out is used to prepare for the match after match with the portion of practice for the competition ratio of 25:75. This condition can make players aged 18 years to be more prepared physically, mentally and the tactics used when playing. (Costa, Teles & Fragoso, 2022). Soccer players are at risk of injury occurring during matches rather than during training caused by various injury mechanisms such as traumatic injuries and overuse due to excessive use so that there is not enough repetition of injuries in the natural regenerative process (Bult et al., 2018).

c. Characteristics of Respondents Based on Body Mass Index (BMI).

Body Mass Index (BMI) is one form of measurement or initial screening in determining one of the factors causing injury. If someone with a weight that is not ideal will make a player's running speed slow down, where speed or agility is one of the important components in supporting the success of the player. Excess body weight will cause the need for more oxygen (O2) when running. If you are overweight, the

volume of oxygen will decrease quickly which will cause you to experience fatigue more quickly.

Richmond, et al. (2016) in his research stated that soccer players having a body weight that is not ideal will make 34% of the risk of injury. Besides that, it is also at risk for ankle injury, this is related to the function of the ankle as an important role in supporting body weight during activities. Ankle injuries can reduce functional activity. This decrease in functional activity will have an impact on reducing the use of the ankle in carrying out movements so that muscle imbalance occurs which increases the risk of falling. The high risk of falling will reduce productivity and performance in playing.

The study found that there was an average of soccer players with a body weight of 18.5-22.9 Kg/M2 in the normal category. This normal category can support one of the successes in reducing the risk of ankle injury that comes from body weight. A normal body weight can support the success of several components of fitness such as good balance, good agility, as well as endurance and body readiness to accept various kinds of opponent attacks.

d. Proprioceptive Training Mechanism Using FIFA 11+ in Reducing the Risk of Ankle Injury in Football Players.

The statistical test used the paired sample t-test hypothesis test. shows the value of P = 0.000 means the value of P <0.005. This results in a significant difference in the mean value of providing proprioceptive training using FIFA 11+ before and after training. This means that proprioceptive training is effective in reducing the risk of ankle injury in soccer players.

Research conducted regarding proprioceptive training took place for 4 weeks with an intensity of 3x a week which was carried out before core training, proprioceptive training using FIFA 11+ was carried out for 20 minutes as a warm-up consisting of very complex movements such as running, strengthening, polyometric, and balance exercises. The complex movement consists of the first part, doing exercises at a slow pace and then combined with active stretching and doing controlled movements with body contact in pairs. Part two, six sets of exercises focusing on core and leg strength, balance, agility, each with three levels of difficulty. The third part is doing exercises at high speed combined with tracking and cutting movements, namely movements in the form of running exercises (Nur Fitranto et al., 2021).

This exercise can make your core and leg muscles

stronger. In addition, coordination, balance, agility and jumping technique are also improved which can prepare players for balance and promote better neuromuscular components. In this case, it will prepare players to improve exercise performance, physical skills and improve fitness so as to minimize the risk of injury.

There are many aspects that can reduce the risk of injury, one of which is the proprioceptive ability. Proprioceptive is the sensory ability to sense body movements that contribute in a complex manner to underlying balance control. The properties possessed by proprioceptive are able to adapt to postural habits and movement exercises, so that improving balance ability can be done with programmed proprioceptive training. Balance is a complex interaction of sensory (vestibular, visual, and somatosensory including proprioceptive) and musculoskeletal (muscles, joints and other soft tissues) systems that are regulated in the brain. In its journey to maintain balance, Proprioceptive will provide body information such as muscle strength, joint position and information from the environment. Information will be conveyed in the form of pressure on the joints, joint position, tension and muscle contraction. Information in the form of these stimuli will later join together with interactions in the visual and vestibular systems, thus forming sensory input. Sensory input received in the intra and extrafusal fibers will increase the activity of the gamma motor and cause an increase in the sensitivity of the muscle spindle, so that it will increase the readiness of the muscles to respond to changes in force that occur when moving. The readiness of these components will increase the body's performance to maintain balance.

Balance can play a role as the ability to perform tasks while maintaining or regaining a stable position. Good balance can maintain the body's gravity as a pedestal (Emily & Wibisono, 2021). Good balance will also affect the player's agility, with agility a player can change the direction and position of the body quickly and precisely when moving without losing balance and awareness. To create excellent agility, there is a complex combination of the components of speed, coordination, flexibility, and power. This series of components is already present in proprioceptive training using FIFA 11+ where a good combination of balance and agility can minimize the risk of injury (Rokaya et al., 2021).

Al Attar, et al. (2017) argues that there is an effect of proprioceptive training using FIFA 11+ on reducing the risk of injury. This exercise can provide extra focus on core stability,

balance, and neuromuscular control as well as hip control and ankle stabilization against attack. Furthermore, in research conducted by researchers, it was found that in repetitive ankle injuries, proprioceptive exercises can be given to help repair tissue damage and can restore neuromuscular abilities and accelerate joint stimulation so that they can again feel body awareness about their position in the surrounding environment.

Repeated ankle injury will cause a decrease in proprioceptive due to inflammation so that the threshold of motor stimulation at the ankle, nerve conductivity, reaction speed, effectiveness and efficiency of movement decreases. This inflammation also occurs in ligaments and muscles so that it can inhibit the performance of tissue flexibility, muscle tone, muscle strength, decreased balance and decreased stabilization which can cause disturbances in ankle motion and function. With problems with ligaments, nerves, muscles, and circulation in cases of repeated ankle injuries, there is a decrease in ankle stability so that ankle performance decreases (Anggita & Ramadani, 2018).

Decreased performance can be overcome in various ways, one of which is exercise proprioceptive. Proprioceptive training can help to form the basis for the balance, coordination, strength and agility needed to cope with injury and improve sports performance or performance. This exercise needs to be done repeatedly so that it can increase the sensory input that will be processed in the brain as central processing. Central processing serves to determine the fulcrum of the body and the alignment of gravity on the body to form good posture control and organize the sensory motor responses that the body needs. then the brain will transmit these impulses to the effector so that the body is able to create good stability when moving, can increase a more efficient sensory-motor response or increase the brain's ability to record changes that exist in order to create good ankle stability. With this proprioceptive improvement, it will have an impact on tissue repair around the ankle and can accelerate healing.

5. CONCLUSION

Based on the results of research and discussion, it can be concluded that there is an effect of providing proprioceptive training on reducing the risk of ankle injury in soccer players.

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