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Relationship between Injury History and Sports Injury Risk at Arema Football Academy U-18

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Abstract

Football players generally have good physical conditions, such as strength, endurance, explosive power, speed, balance, flexibility, coordination, agility, accuracy and power. However, regardless of an athlete's physical strength, 32% of all sports injuries are significant contributors to sports injuries. Factors such as age, BMI, playing technique, body posture and previous injuries can increase the risk. Common injuries include bruises, abrasions, muscle cramps, strains, sprains, and broken bones. The research aims to determine the relationship between injury history and the risk of sports injury at Arema Football Academy U-18. This research uses analytical observational methods with a cross-sectional study design, the population and sample of this research are Arema Football Academy U-18 athletes. Data were collected using the FMS and OSTRC-H questionnaires. Based on the research results, it shows that the normality test value is P= 0.000 (<0.005) so that the data is not normally distributed, so the correlation test used is the sperm correlation test. From the results of the Seperman correlation test, P= 0.000 (<0.05), so that H□ is rejected and H□ is accepted, and the value r= -0.615 is obtained, which means the relationship is strong and has a strong relationship. negative value. These results can be interpreted statistically as a relationship between injury history and the risk of sports injury at the Arema Football Academy U-18.

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INTRODUCTION

The performance of an athlete or soccer player can be seen from the physical condition of the soccer player, where soccer players must have good physical condition(Veda, 2021). These components include strength, endurance, explosive power, speed, balance, flexibility, coordination, agility, accuracy and power. A soccer player who has good physical condition or has good endurance can make fast and precise movements. However, this condition does not rule out the risk of sports injury(Ridwan, 2020).

Sports injuries are damage to the structure or function of the body caused by physical or chemical stress that occurs during exercise(Artanayasa & Putra, 2014; Setyaningrum, 2019). Sports injuries can be caused by two factors and are classified into three levels. Intrinsic factors are factors whose elements already exist within the athlete. Meanwhile, extrinsic factors are factors that include inappropriate accessories, strength coming from opponents or other athletes, and training intensity(Supriyadi, 2017).

Football is one of the highest contributors to sports injuries compared to other sports, namely 32%. Other sports such as athletics (track/running/jumping) accounted for 38% of injuries, gymnastics contributed 15%, physical fitness contributed 9% and 6% occurred in general activities. Muscle injuries are very common in football, representing up to 37% of all time-consuming injuries at the men's professional level(Puspitasari, 2019).

In European professional football, there are 15 muscle injuries each season and these injuries account for more than a quarter of the total time off. There are injuries to 4 major muscle groups in the lower extremities including the adductors, hamstrings, quadriceps and calves which account for over 90% of all muscle injuries in professional football.(Martin Hägglund et al., 2013). The incidence of injuries among soccer players in America is 58.7%, with the most common injuries occurring in the ankle at 22.4%, injuries in the thigh 17.2%, and feet 9.1%. The most common injuries include hamstring strains, ankle sprains, and adductor strains. The impact of this injury is a decrease in muscle strength which causes a decrease in performance(Mack et al., 2020).

Injury history is an important risk factor for future injury in soccer(Kucera et al., 2005). A history of previous injuries occurring in an athlete has a more significant sports injury rate compared to athletes who have no history of previous injuries (Benenson et al., 2015). A history of previous injuries is a strong predictor of sustained sports injuries to the lower extremities (Post et al., 2017).

Based on the background above, researchers are interested in conducting research entitled the relationship between injury history and the risk of sports injuries at the Arema U-18 football academy.

METHODS

The type of research used is analytical observational with a cross-sectional design. The population and sample for this study were Arema Football Academy U-18 athletes. This research will be carried out at the Arema U-18 academy training camp in September 2023. The subjects taken are Arema Football Academy U-18 athletes and are male. with a sampling technique, namely purposive sampling.

Data collection used the FMS and OSTRC-H questionnaires. FMS is used to determine the risk of injury with an interpretation value of 0-14 high risk of injury and 15-21 normal, while OSTRC-H is used to determine the history of injury with an interpretation value of 0 has no history of injury. and >0 have a history of injury. The questionnaire that has been mapped to the master table is then entered into the data processing program, after the data obtained is considered complete and there is no duplicate data. Data were processed using the Shapiro-Wilk normality test and statistical tests were carried out using the Spearman test.

This research has been approved by the Health Research Ethics Committee (KEPK) of the Faculty of Medicine, Muhammadiyah University of Malang. Statement of Ethics Conformity with Number No.E.5.a/301/KEPKUMM/X/2023.

RESULTS AND DISCUSSION

Table 1 shows characteristics based on age, playing position, body mass index (BMI), leg dominance, history of injury, and risk of injury.

Table 1. Subject characteristics (n=37)

Variable	N	%
Age		
18 years	2	5.4
17 years	17	45.9
16 years	15	40.5
15 years	3	8.1
Playing Position		
Goalkeeper	7	18.9
Back line	11	29.7
Midfield	9	24.3

Front line	10	27.0
BMI		
Thin	9	24.3
Normal	24	64.9
Fat	2	5.4
Grade 1 obesity	2	5.4
Foot dominance		
Left	4	10.8
Correct	3	89.2
OSTRCH Injury History		
Injury history	11	29.7
No history of injury	16	70.4
FMS Injury Risk		
Risk of injury	9	24.3
No risk of injury	28	75.7
Total	37	100

Age

Table 1 shows the characteristics based on age, namely the age range 15-18 years. The results showed that 2 respondents (5.4%) were 18 years old, 17 respondents (45.9%) were 17 years old, 15 respondents (40.5%) were 16 years old, and 3 respondents (8.1%) were 15 years old. Based on the diagram, this research was dominated by 17 year olds with a percentage of 45.9%. It is known that this age group covers various stages of development from childhood to adolescence. in generalaathletes experience rapid physical, psychological, physiological, cognitive, and behavioral changes during this period of life. They also experience changes in body composition, height, muscle mass and weight. In addition to hormonal fluctuations and motor control, this anthropometric growth may lead to different injury patterns in young soccer players. A number of studies show that as age increases, the incidence of injury also increases. Over time, athletes develop greater strength and speed, as well as greater exposure and intensity of competition than in the past; all of these things can lead to a higher risk of injury. However, it appears that young soccer players have a higher prevalence of training injuries, whereas it is true that the total incidence of injuries increases with age(Mandorino et al., 2023).

Adolescence is a time of rapid psychological and physiological development. Previous research has examined the relationship between biological age and injury level. To differentiate between early, normal, and late maturity players, three studies used X-ray assessments. According to Materne et al., (2021) stated that players who are just starting to mature have the highest overall risk of injury. Previous research also noted that early and late adulthood may be vulnerable to different forms of injury, but they did not find significant changes in the total incidence of injury(Mandorino et al., 2023). Johnson et al., (2009), found that early maturing players experienced more injuries than late maturing players or normal mature players. However, if training time, playing time, height and playing position are taken into account, research shows no difference. To determine whether early or late maturation may influence injury propensity, more research is needed(Bahr et al., 2020). However, studies that use a maturity offset approach to determine time to maturity show higher levels of agreement. In particular, a greater frequency of damage was found in a time period known as circa-PHV, which is characterized by a sudden growth spurt(Mirwald et al., 2002). Soccer players are more susceptible to injury during a phase of time referred to as "adolescent clumsiness," when their methods of motor control change due to the rapid development of anatomical structures including tendons, ligaments, and bones.(Light et al., 2021).

Both biological and chronological age seem to influence how severe an injury is. Comparing results from different published studies is challenging because of the variation in time intervals used to categorize mild, mild, moderate, and severe injuries.(Khodaee et al., 2017). Severe injuries are common, according to several studies. Additionally, older players may be more likely to suffer serious injuries. These findings are consistent with previous research on adult soccer players. Repetitive injury rates are rarely reported; the number is almost always in the range of 3% to 15%(Ergün et al., 2013; Frisch et al., 2011). The availability of team doctors and the emphasis on return play, especially in senior and elite divisions, may impact re-injury rates. In addition, injury burden a combined outcome of severity and incidence was only recorded in four trials (61). Soccer players in the U16 and U18 age groups have the highest injury rate (62). This makes sense considering the rapid changes in height and weight across age groups and the higher demands of exercise and training. This metric has been commonly used in rugby epidemiological studies, although less frequently used in studies of youth football, and it has proven to be very helpful in assessing the total impact of injuries. (Bahr et al., 2020).

Playing Position

Position in a football game influences the risk of injury(McCunn et al., 2017). **Table 1** shows the characteristics of the positions in a

football game that results are obtained7 respondents (18.9%) were in the goalkeeper position, 11 respondents (29.7%) were in the back line position, 9 respondents (24.3%) were in the midfield position, and 10 respondents (27%) were in the front line position. Based on diagram 5.2, this research is dominated by players in back line positions with a percentage of 29.7%.

This research is in line with research that has been researched by previous researchers which states thatThe prevalence of sports injuries is higher in the attacking or front line positions in soccer games compared to other positions(Onaka et al., 2017). The position of attacker and defender is more at risk of injury compared to goalkeeper and midfielder, this is because defenders and attackers have more frequent contact or collisions with their opponents.(Faude et al., 2006). Goalkeepers have the lowest risk of injury when compared to all football player positions. Strikers in the game of football have the highest risk of injury compared to all positions in the game of football(Owoeye et al., 2020).

A soccer team consists of 11 players who occupy different playing positions, reflecting their location on the field and different tactical roles during the game. Specific skills or physical qualities may cause players to be selected for particular playing positions due to variations in the tactical and physiological requirements of those positions. In professional football, goalkeepers (GK) perform mostly low-intensity actions, in contrast to field players, who engage in more running, ball possession, and high-intensity activities (Clemente et al., 2013). However, the distance covered and frequency of in-game playing actions vary across outfield positions and may contribute to the different physical demands experienced by outfield ASPs (Abbott et al., 2018). Knowledge of whether these differences are associated with injury in ASP can inform position-specific training and recovery strategies in an effort to mitigate injury risk in this under-researched population.

Playing position is associated with injury incidence rate (IIR) in professional football, with wing midfielders having the highest match IIR and center backs (CD), the highest training IIR (Leventer et al., 2016). High-speed running is one of several playing demands in professional football that causes fatigue and muscle damage that can influence the risk of non-contact injuries in certain positions (Nedelec et al., 2014). Likewise, players in positions that require them to tackle more frequently may be at higher risk of contact injuries, whereas players who frequently jump and land may experience more injuries to ankle or knee ligaments (alentorn-Geli et al., 2009). Therefore, differences in the number, intensity, and duration of playing actions may underlie positional differences in injuries reported in several studies of professional and collegiate soccer athletes (Leventer et al., 2016).

In previous studies, differences between outfield players were mainly driven by higher IIR in CD compared to LD for general injuries, soft tissue injuries, and ligament or tendon injuries. Given the lack of differences in injury prevalence between positions, position-dependent differences in injury incidence highlight the importance of recording exposure when investigating injury risk by playing position in this population and suggests that injury prevention strategies should be a focus in ASP performance. central position(Hall et al., 2022).

Previous research stated that relatively more LAT/FWD would be injured compared to CENT and relatively fewer GK would be injured compared to players in outfield positions. Our LAT/FWD players tend to experience more hamstring injuries than GK, possibly because more sprints involve high intensity eccentric contractions of the hamstrings and quads (Nedelec et al., 2014).These actions create indicators of muscle damage, which can increase susceptibility to muscle strain injuries (Howatson et al., 2009). In a study with statistical analysis, the authors reported that among players aged 14 to 16 years, GKs experienced more hand and upper body injuries and fewer ankle injuries than players in outfield positions (Le et al., 2006). However, other studies explain that IPP in all playing positions, with and without GK, shows that the proportion of ASP injured during one season is not affected by playing position.(Hall et al., 2022).

It was found that more tackles were made in the middle position or more jumps and landings with the CD, potentially causing more severe injuries (Buchheit et al., 2010). The IIR for all injuries was greater in CENT compared with LAT/FWD and GK, indicating that ASPs in central positions have a greater injury risk in general. Comparison of specific outfield roles revealed that rates of all injuries, soft tissue injuries, and ligament or tendon injuries were statistically higher for CDs than LDs. Greater frequency of tackling and blocking may increase the risk of contact injury to the CD, with having to regularly jump and land when heading the ball potentially increasing the risk of ligament or tendon injury. Although no specific injury location was associated with playing position, ankle IIR appeared to be higher in CD compared to other positions, thus possibly lending support to the hypothesis. However, this finding was not significant, possibly due to the relatively low prevalence of ankle injuries (alentorn-Geli et al., 2009).

In a previous UK academy study, defenders and midfielders were most frequently injured among 9 to 19 year olds, with thigh muscle injuries occurring more frequently in midfielders than defenders and midfielders in the other 8 to 16 year old group (Cloke et al ., 2012).

Body mass index (BMI)

Body mass index or BMI is a measurement index used to measure nutritional status in adolescents and adults(Veria & Matin, 2013). BMI results according to WHO are underweight or thin (<18.5 kg/m2), Normal (18.5 - 22.9 kg/m2), overweight or fat (23 - 24.9 kg/m2), obese I or obese level I (25 – 29.9 kg/m2), and obese II or obesity level II (>30 kg/m2)(Bolang et al., 2021). Body mass index can be measured through body weight in kilograms divided by body height in meters squared(Spehnjak et al., 2021).

Table 1 shows the characteristics of the BMI results obtained9 respondents (24.3%) had a thin BMI, 24 respondents (64.9%) had a normal BMI, 2 respondents (5.4%) had a fat BMI, and 2 respondents (5.4%) had a grade 1 obesity BMI. However, in the study This is dominated by normal BMI results with a percentage of 64.9%. Body composition is related to performance in the game of football(Nikolaidis & Karydis, 2011). Players with high BMI scores were 1.21 times more likely to suffer injuries compared to players with lower BMI scores(Nawasreh et al., 2022).

This research is also in line with previous research which states that obesity has an increased risk of sports injury by 34%, compared to students with a healthy weight (Richmond et al., 2013). Being overweight has a higher risk of sports injuries, as well as losing time and knee injuries, compared to those of a healthy weight. Overweight teens may be at higher risk of sports-related injuries because forces are absorbed through soft tissues and joints. The literature in this area has long established that a lack of lower extremity strength and power increases the risk of knee and ankle related injuries (Richmond et al., 2016). There is an increased risk of anterior cruciate ligament injury (greater in women) with a greater hamstring:quadrices ratio (Hewett et al, 1988). In this study, students with greater unhealthy mass had poorer lower extremity strength which may be due to less exposure to types of activities that can improve lower extremity strength.

According to Richmond (2016), there is an increased risk of sports-related injuries in overweight/obese adolescents when considering exposure to participation. Specifically, adolescents with a higher BMI showed an increased risk of more severe injuries (missing more than seven days) and knee injuries.

Players with lower BMIs have lower injury rates. Higher BMI in soccer athletes increases susceptibility to ankle sprains, with relative risk (Dolan et al., 2022). This increased risk is associated with increased ligament load during the support phase in complex movements typically performed in soccer, such as spinning and pivoting (McBurnie & Dos' Santos, 2022).

Previous researchers found that neither height, weight nor BMI were significantly associated with injury incidence among players. A recent study among English Premier League professional football players revealed that players with a low BMI may be susceptible to a greater injury burden. Our findings suggest that SSB students should be aware that players who are too small or too big are at risk of injury. higher levels and additional attention should be paid to screening and training loads, as well as injury prevention techniques (Manoel et al., 2020; Seow & Massey, 2022; Toomey et al., 2022).

Foot Domination

Table 1 shows the characteristics of foot dominance in the game of football which results are obtained4 respondents (10.8%) dominated the left foot, 33 respondents (89.2%) dominated the right foot. Based on diagram 5.4, the highest results were obtained with right foot dominance of 89.2%. Results: 11 respondents (29.7%) had a history of injury and 26 respondents (70.3%) had no history of injury. The results showed that 9 respondents (24.3%) had a risk of injury and 28 respondents (75.7%) had no risk of injury. This research is also in line with previous research which states that soccer players are more likely to experience injuries to the dominant limb(DeLang et al., 2021). The most likely differences between dominant and non-dominant limbs that may be caused by injury events in soccer players are kicking performance and kicking frequency. Although the dominant limb does not function exclusively in a kicking role and the nondominant limb is not always stable, soccer kicking is a unilateral task. The stabilizing limb (most often nondominant) functions to resist external forces to maintain posture and transfer mechanical energy through proximal to distal segmental movements of the kicking limb (most often dominant) (Inoue et al., 2014).

The dominant kicking leg carries out the swing and contact phases of the ball, with evidence suggesting that subsequent ball speed output is primarily due to knee extension torque (Sinclair et al., 2014). Primary movers of the dominant limb undergo higher angular velocities of knee extension and hip flexion which may contribute to the

mechanism of injury in either sudden-onset (acute) or gradual-onset (overuse) injury scenarios. In addition, the dominant limb is clearly more frequently exposed to this load. At the 1998 World Cup in France, players used their dominant limb in approximately 82-84% of all ball contacts (Carey et al., 2001). These factors may bias the dominant limb, resulting in a greater incidence of kick-related injuries. For example, the adductor region is very active during passes inside the foot and pushing. Serner et al. (2015) reported a greater incidence of sudden onset of adductor-related groin pain in the dominant extremity, while adductor-related groin pain of long standing. Previous studies also reported 79.2% and around 70% of injuries to the dominant kicking limb (Rafn et al., 2015; Tak et al., 2016). The result of a single high torque (sudden onset) or repeated high torque (gradual onset) is most likely caused by adductor-related groin pain, although this relationship has not been directly studied. More broadly, amateur soccer players can utilize their dominant limb to kick at higher speeds than more skilled professional players. It may be that amateur players have a non-dominant limb that is less developed for kicking compared to professional players or even elite youth players, thereby increasing the likelihood of sustaining a dominant limb injury from kicking.(DeLang et al., 2021).

Table 2. Normality Test

Variable	N	means	Std. Deviation	P
Injury history	37	10.68	18,936	,000
Risk of injury	37	15.81	2,331	,000

Based on the results of the Shapiro-Wilk normality test in **Table 2**, the results obtained are that the injury history data is abnormally distributed and the injury risk data is normally distributed. The average result obtained from injury history is 10.68 and the standard deviation is 18.936, with the lowest value being 0 and the highest value being 72. The average result from injury risk is 15.81 and the standard deviation is 2.331, with the lowest value is 10 and the highest value is 20.

Table 3. Correlation Test

Variable	N	P	R
The relationship between injury history and sports injury risk	37	,000	-.615

The results of statistical tests using the sperm correlation test obtained p=0.000. If the significant value is smaller than 5% (p<0.005) then there is a significant relationship between the two variables, so that Hohrejected and H_0 accepted. There is also a value of r = -0.615, which means the correlation coefficient is strong and negative. It can be concluded that there is a significant relationship between injury history and the risk of sports injury at Arema Football Academy U-18.

In previous studies, a history of hamstring injury, groin injury, and knee joint trauma was associated with an increased risk of similar injuries two to three times greater than the risk on the same leg. This occurs because many of these injuries are caused by incomplete rehabilitation or return to play after the initial injury. This event may be caused by deficits in joints or muscles that have experienced previous injuries, making athletes more susceptible to repeated injuries (Hägglund et al., 2006).

This research was also confirmed by Van Der Horst et al., (2015) who stated that a history of injury has the greatest influence on the occurrence of re-injury, around 30% is caused by body tissue that has experienced damage or trauma. This can involve damage to muscle fibers, ligaments, or bones. However, the risk of re-injury can be overcome by reducing the training portion and using more parts of the body that are not injured, even though the effectiveness is only 41% (Breno et al., 2019).

Also supported by research (Ergün et al., 2013) the frequency of re-injury is 25%, with most injuries occurring in the early stages or within the first 2 months. This occurs due to overuse and tends to occur more frequently during exercise. The much higher percentage of re-injury may also be due to the high demands of intensive training and competition at a young age. This creates excessive pressure on young players in joining football teams.

CONCLUSION

From the research conducted and the previous discussion regarding the relationship between injury history and the risk of sports injury, it can be concluded that the results of the Spearman correlation test between the two dependent and independent variables obtained a value of 0.000 < 0.05, so Hohrejected and H□ accepted so that the results obtained are that there is a strong relationship between injury history and the risk of sports injury at Arema Football Academy U-18.

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