

## Analysis of injury characteristics in youth elite football athletes in Indonesia

### Análisis de las características de las lesiones en deportistas juveniles de fútbol de élite en Indonesia

\*, \*\*\*\*\*Benidektus Adi Prianto, \*\*Tommy Apriantono, \*\*\*, \*\*\*\*\*Hamidie Ronald Daniel Ray, \*\*\*\*Nur Luthfiatus Solikah  
\*Bintang Physio Clinic (Indonesia), \*\*Bandung Institute of Technology (Indonesia), \*\*\*Indonesia University of Education  
(Indonesia), \*\*\*\*State University of Surabaya (Indonesia), \*\*\*\*\*Kanazawa University (Japan),  
\*\*\*\*\*Persib Bandung Football Club (Indonesia)

**Abstract.** Background: Football is the most popular sport globally, with approximately 200,000 professional players and 240 million amateur players. It is a high-intensity intermittent sport that can lead to fatigue, increasing the risk of injury. Unfortunately, injuries in young athletes are still not widely studied, making not much data available. This study tries to fill the gap by investigating the characteristics of injuries in young football athletes in Indonesia. In addition, it attempts to determine the relationship between BMI, exposure time to training and matches on injuries. Methods: This study used a retrospective cohort design with a survey method on EPA (Elite Pro Academy) U14, U16, and U18 youth football athletes from 18 teams in each age group. The data were collected from 838 young footballers as the sample. Results: This study found no association between BMI and injury ( $p > 0.05$ ), while exposure time did have an association with injury ( $p < 0.05$ ). Based on the injury location, sports injuries were mostly found in the ankle 273 (39%). The highest injury type was contusion 36%, followed by strain 25% and sprain 18%. Regarding severity, most cases were classified as minor injuries (4-7 days), with 299 (43%). The defender position had the most injuries, 188 (35%). Osgood Schlatter was most prevalent in athletes aged 13, with 29 cases. Meanwhile, the total injury incidence is 3.9/1000 hours. Conclusions: This study found that training exposure time was associated with the number of injuries. It also recorded that most injuries occur in the lower limbs, especially ankle ligament injuries. The defender received high attention as it is considered the most vulnerable position. Finally, the peak incidence of Osgood Schlatter occurred at the age of 13.

**Keywords:** sports injuries, injury incidence, youth football athletes, Osgood Schlatter

**Resumen.** Antecedentes: El fútbol es el deporte más popular a nivel mundial, con aproximadamente 200.000 jugadores profesionales y 240 millones de jugadores aficionados. Es un deporte intermitente de alta intensidad que puede provocar fatiga, aumentando el riesgo de lesiones. Desafortunadamente, las lesiones en los atletas jóvenes aún no se han estudiado ampliamente, por lo que no hay muchos datos disponibles. Este estudio intenta llenar este vacío investigando las características de las lesiones en jóvenes deportistas de fútbol en Indonesia. Además, se intenta determinar la relación entre el IMC, el tiempo de exposición a los entrenamientos y los partidos sobre las lesiones. Métodos: Este estudio utilizó un diseño de cohorte retrospectivo con un método de encuesta a atletas de fútbol juvenil de la EPA (Elite Pro Academy) U14, U16 y U18 de 18 equipos en cada grupo de edad. Los datos se recogieron de 838 jóvenes futbolistas como muestra. Resultados: Este estudio no encontró asociación entre el IMC y la lesión ( $p > 0,05$ ), mientras que el tiempo de exposición sí tuvo asociación con la lesión ( $p < 0,05$ ). Según la localización de la lesión, las lesiones deportivas se encontraron principalmente en el tobillo 273 (39%). El tipo de lesión más frecuente fue la contusión (36%), seguida de la distensión (25%) y el esguince (18%). En cuanto a la gravedad, la mayoría de los casos se clasificaron como lesiones leves (4-7 días), con 299 (43%). La posición de defensa fue la que tuvo más lesiones, 188 (35%). Osgood Schlatter fue más frecuente en deportistas de 13 años, con 29 casos. Mientras tanto, la incidencia total de lesiones es de 3,9/1.000 horas. Conclusiones: Este estudio encontró que el tiempo de exposición al entrenamiento estaba asociado con el número de lesiones. También registró que la mayoría de las lesiones ocurren en las extremidades inferiores, especialmente las lesiones de ligamentos del tobillo. El defensor recibió mucha atención porque se considera la posición más vulnerable. Finalmente, el pico de incidencia de Osgood Schlatter se produjo a la edad de 13 años.

**Palabras clave:** lesiones deportivas, incidencia de lesiones, deportistas de fútbol juvenil, Osgood Schlatter

---

Fecha recepción: 20-12-23. Fecha de aceptación: 14-03-24

Benidektus Adi Prianto  
benidektus.ap@gmail.com

### Introduction

Football is the most popular sport in the world, with about 200,000 professional players and 240 million amateur players. This sport is often used to engage in physical activities in the community, especially for children. It is good for health purposes and sometimes used as a competition for young athletes for achievement. It promotes positive effects such as psycho-social, self-development, and reduced alcohol consumption. Nevertheless, excessive intensity may have negative effects, like failure, injury, and fatigue (Malm et al., 2019). Football is a high-intensity intermittent sport that uses both aerobic and anaerobic energy systems (Hulton et al., 2022). Because this sport requires high energy, it potentially leads to fatigue, which can increase the risk of injury (Small et al.,

2009). Injury is often found and considered to inhibit young athletes from improving their performance and reaching their highest potential. This risk should be analyzed and reduced to control the incidence of injury. The analysis begins by identifying factors that cause the athletes to be injured. The factors are twofold: intrinsic and extrinsic factors. The intrinsic factors come from the athletes themselves, such as the calculation of anthropometry, nutrition, and psychological factors. On the other hand, there are extrinsic factors, such as environment, weather, equipment, and exercise intensity (Saragiotto et al., 2014).

Injury incidents in football have been extensively investigated in several studies. The studies vary greatly depending on the focus of the research, such as the definition of injury, player characteristics, and study design (Junge & Dvorak, 2004). Although research on injuries in

senior elite athletes has been well explored, there is still little scientific evidence for young players. Hence, further research on the injuries of young players is needed to understand the existing problem and find a solution based on scientific evidence (Light et al., 2021). One of the most common specific injuries to young athletes is Osgood Schlatter, an injury that occurs due to the pull of the patellar tendon on the tibial tuberosity bone during the growth period because the bone has not fully matured (apophysitis) (Corbi et al., 2022). This injury is mainly found in children aged 12-17 years old. According to (Schultz et al., 2022), Osgood Schlatter is the cause of the highest knee pain in young athletes. Thus, data on the prevalence and the incidence of injury is required and should be continuously produced in order to develop preventive programs. For this reason, this study intends to analyze the injury survey to gather data and draw conclusions that can be used as the basis of an injury prevention program. To create an injury prevention program, several stages should be done, such as (1) identifying problems (prevalence and incidence of injuries), (2) identifying the causes and mechanisms of injury, (3) implementing intervention strategies aimed at prevention; and (4) measuring of the effectiveness of the intervention strategy applied (Van Mechelen et al., 2019). This study aimed to fill the empirical gap by investigating the characteristics of injuries among young football athletes in Indonesia. It also tried to discover the relationship between injuries and BMI, exposure time to training, and matches. In addition, it sought to understand how the incidence rate indicated Osgood Schlatter's injury in younger football athletes. Therefore, researchers focused on analyzing and identifying data on the prevalence and incidence of injuries that occur in young football athletes by looking at various factors such as exposure time and playing position. This topic is still rarely discussed, especially in Indonesia. Using these data, an injury prevention program can be established to reduce the risk of injury, which is useful to the coaches, the medical staff, and the athletes.

Table 1. Operational Definition

Injury	Any physical complaint sustained by a player that resulted from a football match or football training and led to the player being unable to take full part in future football training or match play.
Training session	Team training that involved physical activity under the supervision of the coaching staff.
Match	Competitive or friendly match against another team.
Exposure Time	Time spent on training or match.
Normal BMI (Body Mass Index)	Normal value is 18.5-24.9 (Normal).
Abnormal BMI (Body Mass Index)	Abnormal value is either < 18.5 (underweight) and > 24.9 (overweight).
Injury incidence	Number of injuries per 1000 player hours (( $\Sigma$ injuries/ $\Sigma$ exposure hours) x 1000).
Injury severity	Minimal Injury (1-3 Days), Minor Injury (4-7 Days), Moderate Injury (8-28 Days), Severe Injury (>28 Days).
Surgery history	Players with history of surgery for injuries.
Injury location	Divided to three parts: upper limbs, lower limbs, and head & spine.

## Method

This study used a retrospective cohort design. It employed a survey method analyzed descriptively to determine the injury characteristics of football athletes during a certain period (Prieto & Prietoandreu, 2015).

### Sample

The sample of this study were EPA (Elite Pro Academy) male football athletes U14, U16, and U18. They were chosen using a purposive sampling technique. They comprised 18 teams competing in a young Indonesian football league in October - December 2022. These players were managed by football clubs that competed in the first league of Indonesia. The sample in this study was selected based on the inclusion criteria that the researchers have determined in advance: (1) Elite Pro Academy football athletes, (2) aged 12-19 years. Meanwhile, the exclusion criterion was (1) players who did not attend football training in the last one month. After considering the exclusion criteria, this study recruited 893 participants who met the inclusion criteria.

### Research Ethics

This research was ethically licensed under regulation No. 25/KEPK/EC/X/2022 and was approved on the Declaration of Helsinki. Informed consent was required every time data were collected from team managers and individual players.

### Data Collection

Data in this study were collected using questionnaires adapted from (Fuller et al., 2006). During data collection, the researchers explained how to fill out the questionnaire. The researchers were also assisted by the physiotherapist or doctor team, which was in charge of each team academy in Jakarta, Indonesia. The questionnaires were distributed to the participants by the physiotherapist and doctor team supervised by the researchers. The questionnaire focused on the following indicators: injury location, number of games, number of training sessions, position of play, and body weight. The detailed flow of the research design can be seen in Figure 1.

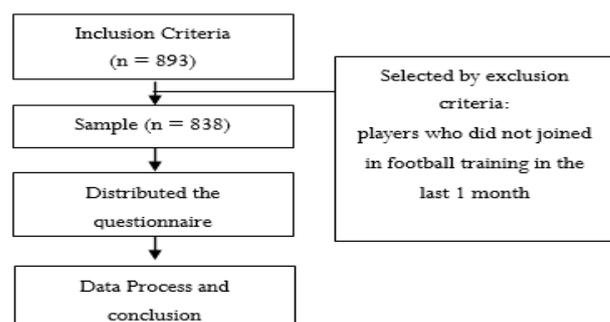


Figure 1. Design of the research

### Statistic

The data analysis began by performing a descriptive calculation to obtain the mean, standard deviation (mean  $\pm$  SD), and percentages to describe the variable and characteristics of injury (number (%)). To calculate injury incidence, this study used the following formula (Number of injuries per 1000 player hours ( $(\sum \text{injuries} / \sum \text{exposure hours}) \times 1000$ )) (Ekstrand et al., 2021). A Chi-Square test was also conducted to examine the correlation between injury, BMI, and exercise exposure. A significant level in this study was established at  $p < 0.05$ , analyzed by IBM SPSS statistics version 26.

### Result

As mentioned earlier, this study involved 893 participants. They were selected based on inclusion and exclusion criteria. Among them, 838 football athletes met the inclusion criteria and thus progressed to the next stage. These athletes were reported to have been injured, were still injured, or had not been injured. In this study, 702 injury cases were found from 531 football athletes, which indicates that some of these athletes might have the injury more than once.

Table 2.

Subject characteristics

Variable (n=838)	Value
Age (years)	14,9 $\pm$ 1,5
Body Weight (kg)	55,9 $\pm$ 8,9
Height (cm)	168,0 $\pm$ 7,6
Body Mass Index	19,7 $\pm$ 2,2
Playing Position	
Goalkeeper	93 (11%)
Survive	297 (35%)
Middle	274 (33%)
Attack	174 (21%)
Exercise Exposure Time	
< 8 hours/week	
Injury	187 (56%)
No Injury	149 (44%)
>8 Hours/week	
Injury	344 (69%)
No Injury	158 (31%)
Dominant limb	
Right	629 (75%)
Left	99 (12%)
Both	110 (13%)

Data is written as mean  $\pm$  standard deviation or number (% of variable value).

Table 2 above shows participants basic characteristics, which allows us to explore deeper analysis. For example, the combination of the participants average weight (55.9  $\pm$  8.9 kg) and height (168  $\pm$  7.6 cm) generates a BMI of 19.7  $\pm$  2.2. This BMI score means that the average athlete's body weight has a normal BMI. The table also indicates the participants' playing positions, which are dominated by defenders at 297 (35%), followed by midfielders at 274 (33%), strikers at 174 (21%), and goalkeepers at 93 (11%) as the lowest percentage. Based on training exposure time, subjects who practiced less than or equal to 8 hours per

week had fewer injuries (56%) than those who practiced more than 8 hours a week (69%). Finally, Table 2 informed participants dominant leg in the game, where third-quarter participants (75%) used their right leg, while (12%) were left-leg athletes, and (13%) could use both legs.

Table 3.

Chi Square Test of BMI vs Injury and Exercise Exposure vs Injury

Variable (n = 838)	Injured		Non Injury		p
	n	Percentage	n	Percentage	
BMI					
Normal	389	65,4%	206	34,6%	0,058
Abnormal	142	58,4%	101	41,6%	
Exercise Exposure					
</=8 hours/week	187	55,7%	149	44,3%	0,000*
>8 hours/week	344	68,5%	158	31,5%	

(\*) Significance <0,05

Table 3 above reveals that the Chi-Square analysis does not find a significant relationship between BMI and the incidence of injury. It is different from training exposure time, which is divided into two parts: those who train less than or equal to 8 hours/week and those who train more than 8 hours/week. The Chi-Square test generated a value of  $p = 0.000$  or a value  $<0.05$ , indicating that exercise exposure has a significant relationship with the participants' injury. In other words, exercise exposure is more likely to affect the incidence of injury.

Table 4.

Injury characteristics

Variable (n = 702)	U-14	U-16	U-18	Total
Time of injury				
Match	100 (27%)	115 (32%)	149 (41%)	364 (52%)
Exercise	80 (24%)	138 (41%)	120 (36%)	338 (48%)
Severity				
Minimal Injury (1-3 Days)	60 (33%)	66 (26%)	74 (28%)	200 (28%)
Minor Injury (4-7 Days)	72 (40%)	122 (48%)	105 (39%)	299 (43%)
Moderate Injury (8-28 Days)	24 (13%)	38 (15%)	50 (19%)	112 (16%)
Severe Injury (>28 Days)	24 (13%)	27 (11%)	40 (15%)	91 (13%)
Recurrent Injuries				
Yes	33 (18%)	40 (16%)	37 (14%)	110 (16%)
No	147 (82%)	213 (84%)	232 (86%)	592 (84%)
Surgery History				
Yes	6 (3%)	10 (4%)	8 (3%)	24 (3%)
No	174 (97%)	243 (96%)	261(97%)	678(97%)

Data is written as a number (% of total injuries)

While previous tables focus on the participants characteristics, Table 4 allows us to look closer at the participants injury characteristics. For example, it provides information about the time they were injured divided into two groups: in training and in matches. The table indicates that participants had slightly more injuries in the match (52%) than during training (48%). In terms of severity, most of the injuries were classified as minor injuries (43%), followed by minimum injuries (28%), moderate injuries (16%), and severe injuries (13%).

The table also shows that most participants (84%) did not feel any recurrent injury, compared to (16%) who responded to having felt it. Similarly, In the history of surgery, only 24 players (3%) had surgery before, while

nearly all players (97%) have never had surgery for their injuries.

Table 5.

Injury Location				
Injury Location (n=702)	U-14	U-16	U-18	Total
<b>Lower Limbs</b>				
Ankle	62 (50%)	99 (57%)	112 (65%)	273 (39%)
Knees	34 (27%)	38 (22%)	35 (20%)	107 (15%)
Thighs	14 (11%)	25 (14%)	18 (10%)	57 (8%)
Pelvis	2 (2%)	1 (1%)	1 (1%)	4 (1%)
Calves	9 (7%)	7 (4%)	5 (3%)	21 (3%)
Feet	4 (3%)	4 (2%)	2 (1%)	10 (1%)
<b>Upper Limbs</b>				
Wrist	29 (63%)	36 (55%)	37 (52%)	102 (15%)
Shoulders	10 (22%)	14 (22%)	24 (34%)	48 (7%)
Elbow	3 (7%)	3 (5%)	4 (6%)	10 (1%)
Hand	4 (9%)	12 (18%)	6 (8%)	22 (3%)
<b>Head &amp; Spine</b>				
Back	8 (89%)	14 (100%)	22 (88%)	44 (6%)
Head	1 (11%)	0 (0%)	3 (12%)	4 (1%)

Data is written as a number (% of total injuries)

Table 5 specifies where the injuries are located in the participants bodies. In this study, the most common injuries occurred in the lower limbs, especially in the ankle, with 273(39%). The second most common locations were in the knee, with 107 cases (15%), and in the wrist at the upper limb, with 102 cases (15%). Some participants also had injuries in the shoulder with 48 cases (7%), the back part of the head and spine with 44 cases (6%), and the head with 4(1%) injuries. Data appears similar across the U-14, U-16, and U-18 age groups.

Table 6.

Types of Injuries				
Injury Type (n = 702)	U-14	U-16	U-18	Total
Bruise (contusion)	68 (38%)	89 (35%)	94 (35%)	251 (36%)
Muscle (strain)	42 (23%)	72 (28%)	62 (23%)	176 (25%)
Ligaments (sprain)	34 (19%)	40 (16%)	51 (19%)	125 (18%)
Bones (fracture or apophysitis)	31 (17%)	41 (16%)	52 (19%)	124 (18%)
Dislocation	5 (3%)	11 (4%)	10 (4%)	26 (4%)

Data is written as a number (% of total injuries)

When looking at the type of injury, more than 30% injuries occurred due to contusion, with 251 cases. Meanwhile, a quarter of injuries were caused by muscle strain, with 176 cases. Other types of injuries in this study included ligaments (18%), bones (18%), and dislocation (4%).

Table 7.

Injuries by playing position				
Playing position (n = 531)	U-14	U-16	U-18	Total
Goalkeeper	15(10%)	18(9%)	27(14%)	61(12%)
Defender	56(39%)	60(31%)	72(37%)	188(35%)
Midfielder	44(31%)	71(37%)	55(28%)	170(32%)
Forward	28(20%)	42(22%)	42(21%)	112(21%)

Data is written as a number (% of total injuries)

Table 7 indicates the playing positions that are more vulnerable to injury. The data were taken from 531 players with 702 injury cases. The study discovered that the most vulnerable position to injury was defender (35%), followed by midfielder (32%), and attacking players (21%).

Goalkeepers were found to be in the lowest position, with (11%) injured.

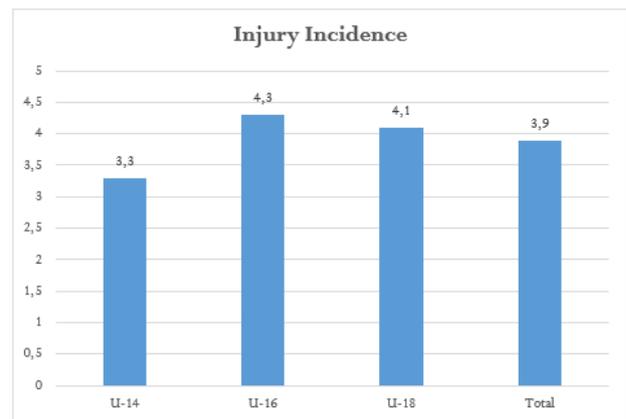


Figure 2. Injury incidence

After understanding the characteristics of injuries among young footballers, the study then continued calculating the injury incidence. Figure 2 provides the calculation result and reveals that the number of incidences might differ across age groups. For instance, the injury incidence in the U-14 athletes was 3.3/1000 hours. This number grew as the age increased and became 4.3/(1,000) hours in U-16 and 4.1/1000 hours in U-18. On average, the incidence of injuries was 3.9/1000 hours.

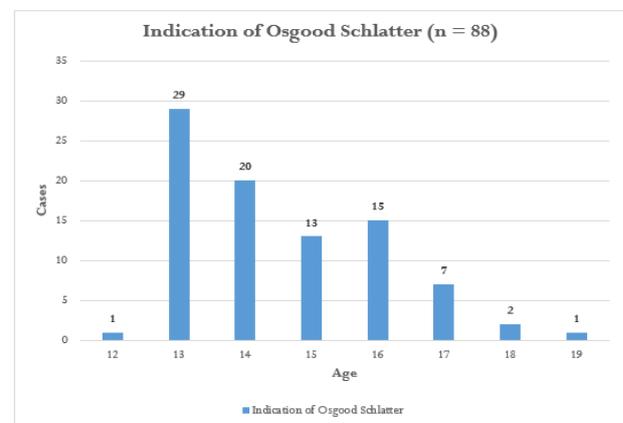


Figure 3. Osgood Schlatter indications

As mentioned earlier, one of the injuries that is commonly suffered by young football athletes is Osgood Schlatter. Similarly, Figure 3 illustrates that 88 participants in this study had Osgood Schlatter's injury. In particular, the injury was prevalent among footballers aged 13-17, with the highest indications occurring at the age of 13, with a total of 29 people. In contrast, this injury was rarely suffered by footballers aged 12, 18, and 19 in this study since the occurrence was never above 2 cases.

## Discussion

This research focuses on identifying problems and the

prevalence of injuries among youth football athletes in Indonesia. This investigation is important because empirical data on the incidence of sports injuries suffered by young football athletes in developing countries is still very limited. In fact, these data can support the development of injury prevention programs (Ekegren et al., 2016), which, therefore, can reduce the risk of injuries. Eventually, the coach's program can run optimally and achieve the best performance.

This study first investigated the participants injury characteristics. The study found that the injuries frequently occurred in the lower limbs (hips, thighs, knees, ankles, ankle, and leg area), with a total of 472 (67%) injuries. This finding was similar to previous studies, such as those by Klein et al. (2017), who reported that their participants frequently had injuries in this location, with a total percentage of 70.7%. The finding seems reasonable because the complexity of movements in the basic football techniques is dominantly supported by foot works (Firmansyah et al., 2024). Furthermore, football is a high-intensity intermittent sport that uses both aerobic and anaerobic energy systems. High-intensity movement in football will affect the greater loading of muscles and joints in the lower extremity area (Bangsbo, 2014). As a result, the risk of injuries to the lower limbs in football becomes higher.

More specifically, this study found that ankles (39%) and knees 107 (15%) were perceived as the most injured area. As revealed in a previous study, injuries in young football athletes in the U-17 and U-20 categories occurred mostly in the ankle and leg areas (Lima et al., 2021), although some also claim that professional football players were most often injured in the knee around 21.3% and thighs 15.4% (Stubbe et al., 2015). Ankle injuries are closely related to balance and stabilization, which are used to maintain a center of gravity in the body when running or kicking. This is indicated by research stating that balance exercise is important in reducing the risk of ankle injury (Felipe et al., 2023). Other scholars (Calloway et al., 2019) believed that poor field conditions, such as wavy, hard, and uneven natural or synthetic fields, may contribute to the risk factors for ankle injuries that are influenced by balance and stabilization. Therefore, an athlete's ability to balance and stabilize is really needed to prevent football athletes from twisting their ankles.

Moving to the type of injury, this study discovered that the highest result was contusion, with 251 cases (36%). It was followed by muscle injuries in 176 cases (25%) and ligaments in 125 cases (18%). This finding confirmed the results of previous studies, such as those by Nilsson et al. (2016), who found that more than half of their participants were injured in muscles (53%) and ligaments (24%). The data distribution of muscle injuries is quite broad to various body locations. However, injury in the ligaments occurs very frequently in the ankle. It is not surprising that ankle sprain was reported as the highest injury in this study.

In terms of severity, this study reported that the injuries

were mainly classified as minor injuries (4-7 days), with 299 incidences (43%). It was followed by minimum injuries (1-3 days) of 200 incidences (28%), moderate injuries (8-28 days) with 112 (16%), and severe injuries with 91 cases (13%). However, results on the severity of the injury cannot be compared between studies. It would be better if it is compared with the same subjects but in different years or seasons (Mallo et al., 2011).

Playing positions in football are also interesting to discuss in this study. Every player usually has their favorite playing position, and each position will affect the types of injuries. As an example, this study showed that the highest injury occurred to the defender (35%), while the lowest position was a goalkeeper (11%). Interestingly, this finding differs from the research revealed by Hall et al. (2022). In their context, the most vulnerable position in the football academy was a midfielder at 8.67/1000 hours. However, the study is consistent regarding the incidence rate of goalkeepers, which is always the lowest compared to every player in other positions.

The incidence of injuries in this study is 3.9/1000 hours. This important result is used to evaluate the incidence rate of injury in young football athletes in Indonesia. Incidence values will also vary greatly according to the research data obtained. In one study, the incidence of injuries was 42/1000 hours (Reis et al., 2015). As with the data on the severity level, comparing injuries between studies would be less effective. Comparisons will be better if they are done on the same subject or object in different years or seasons so that there will be an increase or decrease in injury incidence. In this way, it would be easier to evaluate.

In addition to some injuries above, there is one injury that really often happens with young athletes, namely Osgood Schlatter. In this study, the researchers searched for the number of athletes who experienced Osgood Schlatter cases. The result was that 88 participants suffered this injury, with the peak incidences occurring at 13 years old. This finding is in accordance with previous research, which stated that the peak of Osgood Schlatter occurred at 9-15 years old (de Schepper et al., 2022). These injuries are closely related to recurring movements such as jumping, running, and kicking (Itoh et al., 2018). In addition, with movements performed in football, it is natural for this case to be cautious. Proper training programming can help reduce the incidence of these injuries. Currently, researchers are still using retrospective cohort study research design in the collection of research data, and it is expected that the future could be done using the design of a prospective Cohort Study that is better recognized in the study of sports injury surveys. This can be achieved if Indonesia already has its own Injury Surveillance System that can be applied to any sport rather than just football because the injury recording system has been common even since decades ago in some developed countries (Ekegren et al., 2016). It is important to analyze and conduct further research on the injury data that occurred in each sport.

Therefore, the data can be processed into an injury prevention program based on injury characteristics in Indonesia. This is done to reduce the risk of sports injuries and ensure that all athletes follow every training program or competition optimally. Thus, they can achieve the highest achievement.

### Conclusions

This study found that the highest injury location in young elite football athletes in Indonesia occurred in the lower limbs, especially the ankle and knee area. The most common injuries were contusion, muscle injury (strain), and ligament injury (sprain). The incidence of injury to young football players in Indonesia was 3.9/1000 hours of training as well as matches. Indications of injury incidence specific to young athletes, namely Osgood Schlatter, were highest at the age of 13 years.

### Recommendation

This study has provided some information about the characteristics and relationship of injury with training exposure time, injury location, type of injury, severity of injury, incidence of injury, and special injuries in young athletes, namely Osgood Schlatter. Based on these findings, the researchers recommend that athletes maintain their muscle strength, balance, and stability, especially in the lower limbs, in order to reduce the risk of injury. At the same time, the coaches are expected to create an optimal program and implement an injury prevention program in their training sessions to control the risk of injury in young football athletes. For sports researchers and practitioners, it is very important to develop an ISS (Injury Surveillance System) in Indonesia so that sports injury data can be recorded properly, not only in football but for all sports. The best design in this research model is a prospective cohort study that must be supported by a good ISS and also supported by policymakers. It is expected that research on sports injuries will continue in order to control the incidence of sports injuries in Indonesia.

### Acknowledgements

We thank all participating clubs from EPA (Elite Pro Academy) league U14, U16, U18 conducted by PSSI (the Indonesian Football Association) season 2022/2023. All of the team doctor, physiotherapist, coaches and players, for the contributions in this research.

### Conflict of Interests

The authors declare no conflicts of interest.

### References

Bangsbo, J. (2014). PHYSIOLOGICAL DEMANDS OF

- FOOTBALL. *Sports Science Exchange*, 27(no.125), 1–6.
- Calloway, S., Hardin, D., & Baldwin, W. (2019). Injury Surveillance in Major League Soccer: A 4-Year Comparison of Injury on Natural Grass Versus Artificial Turf Field. *Sage Journal*, 47(10). <https://doi.org/10.1177/036354651986052>
- Corbi, F., Matas, S., Álvarez-Herms, J., Sitko, S., Baiget, E., Reverter-Masia, J., & López-Laval, I. (2022). Osgood-Schlatter Disease: Appearance, Diagnosis and Treatment: A Narrative Review. In *Healthcare (Switzerland)* (Vol. 10, Issue 6). MDPI. <https://doi.org/10.3390/healthcare10061011>
- de Schepper, E., Bindels, P., Bierma-Zeinstra, S., van Middelkoop, M., Rathleff, M., & van Leeuwen, G. J. (2022). Incidence and management of Osgood–Schlatter disease in general practice: retrospective cohort study. *British Journal of General Practice*, 72(717), E301–E306. <https://doi.org/10.3399/BJGP.2021.0386>
- Ekegren, C. L., Gabbe, B. J., & Finch, C. F. (2016). Sports Injury Surveillance Systems: A Review of Methods and Data Quality. *Sports Medicine*, 46(1), 49–65. <https://doi.org/10.1007/s40279-015-0410-z>
- Ekstrand, J., Spreco, A., Bengtsson, H., & Bahr, R. (2021). Injury rates decreased in men's professional football: An 18-year prospective cohort study of almost 12 000 injuries sustained during 1.8 million hours of play. *British Journal of Sports Medicine*, 55(19), 1084–1091. <https://doi.org/10.1136/bjsports-2020-103159>
- Felipe, A., Hurtado, V., Alejandro, D., & Mayorga, J. (2023). Effects of strength training on ankle injuries in soccer players: a systematic review Efectos del entrenamiento de fuerza en lesiones. In *Retos* (Vol. 49). <https://recyt.fecyt.es/index.php/retos/index>
- Firmansyah, A., Reza Aziz Prasetya, M., Arif Al Ardha, M., Ayubi, N., Bayu Putro, A., Cholikh Mutohir, T., Garcia Jimenez, J. V., & Nanda Hanief, Y. (2024). The Football Players on Plyometric Exercise: A Systematic Review Entrenamiento pliométrico en jugadores de fútbol: Una Revisión Sistemática. In *Retos* (Vol. 51). <https://recyt.fecyt.es/index.php/retos/index>
- Fuller, C. W., Ekstrand, J., Junge, A., Andersen, T. E., Bahr, R., Dvorak, J., Häggglund, M., McCrory, P., & Meeuwisse, W. H. (2006). Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. In *British Journal of Sports Medicine* (Vol. 40, Issue 3, pp. 193–201). <https://doi.org/10.1136/bjism.2005.025270>
- Hall, E. C. R., Larruskain, J., Gil, S. M., Lekue, J. A., Baumert, P., Rienzi, E., Moreno, S., Tannure, M., Murtagh, C. F., Ade, J. D., Squires, P., Orme, P., Anderson, L., Whitworth-Turner, C. M., Morton, J. P., Drust, B., Williams, A. G., & Erskine, R. M. (2022). Playing Position and the Injury Incidence Rate in Male Academy Soccer Players. *Journal of Athletic Training*, 57(7), 696–703. <https://doi.org/10.4085/1062-6050-0346.21>

- Hulton, A. T., Malone, J. J., Clarke, N. D., & Maclaren, D. P. M. (2022). Energy Requirements and Nutritional Strategies for Male Soccer Players: A Review and Suggestions for Practice. *Nutrients*, *14*(3). <https://doi.org/10.3390/nu14030657>
- Itoh, G., Ishii, H., Kato, H., Nagano, Y., Hayashi, H., & Funasaki, H. (2018). Risk assessment of the onset of Osgood–Schlatter disease using kinetic analysis of various motions in sports. *PLoS ONE*, *13*(1), 1–14. <https://doi.org/10.1371/journal.pone.0190503>
- Junge, A., & Dvorak, J. (2004). Soccer injuries: A review on incidence and prevention. *Sports Medicine*, *34*(13), 929–938. <https://doi.org/10.2165/00007256-200434130-00004>
- Klein, C., Bloch, H., Luig, P., Henke, T., & Platen, P. (2017). Injuries in Men'S Professional Football. *British Journal of Sports Medicine*, *51*(4), 344.2-344. <https://doi.org/10.1136/bjsports-2016-097372.154>
- Light, N., Johnson, A., Williams, S., Smith, N., Hale, B., & Thorborg, K. (2021). Injuries in youth football and the relationship to player maturation: An analysis of time-loss injuries during four seasons in an English elite male football academy. *Scandinavian Journal of Medicine and Science in Sports*, *31*(6), 1324–1334. <https://doi.org/10.1111/sms.13933>
- Lima, V. P., Gomes De Souza Vale, R., Lucas, B., Lima, P., Ramos De Oliveira Filho, G., Da, J., Novaes, S., Pinto De Castro, J. B., Alkmim, R. De, & Nunes, M. (2021). *Epidemiologia de lesões em jovens atletas de futebol das categorias sub-17 e 20 de um clube profissional de futebol do Rio de Janeiro Epidemiology of injuries in young soccer athletes in the U-17 and 20 categories of a professional soccer club in Rio de Janeiro*. [www.retos.org](http://www.retos.org)
- Mallo, J., González, P., Veiga, S., & Navarro, E. (2011). Injury incidence in a spanish sub-elite professional football team: A prospective study during four consecutive seasons. *Journal of Sports Science and Medicine*, *10*(4), 731–736.
- Malm, C., Jakobsson, J., & Isaksson, A. (2019). Physical activity and sports—real health benefits: A review with insight into the public health of sweden. *Sports*, *7*(5). <https://doi.org/10.3390/sports7050127>
- Nilsson, T., Östenberg, A. H., & Alricsson, M. (2016). Injury profile among elite male youth soccer players in a Swedish first league. *Journal of Exercise Rehabilitation*, *12*(2), 83–89. <https://doi.org/10.12965/jer.1632548.274>
- Prieto, J. M., & Prietoandreu, J. M. (2015). *Sport and personal variables in the occurrence of sports injuries. Differences between individual and team sports Variables deportivas ypersonales en la ocurrenciade deportivas lesiones. Differences between sports individualesycollectivos Sport and personal variables in the occurrence of sports injuries. Differences between individual and team sports*. [www.retos.org](http://www.retos.org)
- Reis, G. F., Santos, T. R. T., Lasmari, R. C. P., Oliveira, O., Lopes, R. F. F., & Fonseca, S. T. (2015). Sports injuries profile of a first division Brazilian soccer team: A descriptive cohort study. *Brazilian Journal of Physical Therapy*, *19*(5), 390–397. <https://doi.org/10.1590/bjpt-rbf.2014.0120>
- Saragiotto, B. T., Di Pierro, C., & Lopes, A. D. (2014). Risk factors and injury prevention in elite athletes: a descriptive study of the opinions of physical therapists, doctors and trainers. *Brazilian Journal of Physical Therapy*, *18*(2), 137–143. <https://doi.org/10.1590/s1413-35552012005000147>
- Schultz, M., Tol, J. L., Veltman, L., Kaaden van der, L., & Reurink, G. (2022). Osgood-Schlatter Disease in youth elite football: Minimal time-loss and no association with clinical and ultrasonographic factors. *Physical Therapy in Sport*, *55*, 98–105. <https://doi.org/10.1016/j.ptsp.2022.02.024>
- Small, K., McNaughton, L. R., Greig, M., Lohkamp, M., & Lovell, R. (2009). Soccer fatigue, sprinting and hamstring injury risk. *International Journal of Sports Medicine*, *30*(8), 573–578. <https://doi.org/10.1055/s-0029-1202822>
- Stubbe, J. H., Van Beijsterveldt, A. M. M. C., Van Der Knaap, S., Stege, J., Verhagen, E. A., Van Mechelen, W., & Backx, F. J. G. (2015). Injuries in professional male soccer players in the Netherlands: A prospective cohort study. *Journal of Athletic Training*, *50*(2), 211–216. <https://doi.org/10.4085/1062-6050-49.3.64>
- Van Mechelen, W., Hlobil, H., & Kemper, H. C. (2019). Incidence, Severity, Aetiology and Prevention of Sports Injuries. *Sports Medicine*, *49*(10), 1621–1623. <https://doi.org/10.1007/s40279-019-01154-1>

#### Datos de los/as autores/as y traductor/a:

Benidektus Adi Prianto	<a href="mailto:benidektus.ap@gmail.com">benidektus.ap@gmail.com</a>	Autor/a
Tommy Apriantono	<a href="mailto:tommy@fa.itb.ac.id">tommy@fa.itb.ac.id</a>	Autor/a
Hamidie Ronald Daniel Ray	<a href="mailto:hamidieronald@upi.edu">hamidieronald@upi.edu</a>	Autor/a
Nur Luthfiatus Solikah	<a href="mailto:nursolikah@unesa.ac.id">nursolikah@unesa.ac.id</a>	Autor/a
Mhsproofreading	<a href="mailto:mhsproofreading@gmail.com">mhsproofreading@gmail.com</a>	Traductor/a