**Abstract**

**Rationale and purpose**: Football is the most commonly injured sport, especially ankle injuries. The number of risk factors associated with ankle injuries includes warming-up, coach knowledge, the physical condition of athletes, and socio-economic circumstances of athletes. Ankles require strong muscles, especially for soccer players. Activities that are too frequent and heavy will potentially cause injury. At the age of adolescents where in growth can affect the risk of injury that can affect in the future. Core muscles play an essential role in body control. The core muscle is vital for stabilizing the lower limbs and ankle joints. Core muscles can be measured with a prone plank test. Sensorimotor ankle mechanism joints are influenced against the risk of an ankle injury. Discussion for core muscle as an intervention against ankle injuries has been a lot, but predictions to anticipate the risk of ankle injury are very low, especially in football players. This study aims to determine the contribution of muscle strength using the prone plank test to anticipate the ankle risk in football players.

**Material and Methods**: The study respondents were 44 student football players aged between 13-15 years. This study used product-moment correlation analysis.

**Results**: The results showed that core muscle strength contributed to the risk of ankle injury by 31.82%. In addition, the product-moment correlation showed that core muscle strength contributed to the risk of ankle injuries (p≤0.05). This research can be a reference for clinical and coaches to better understand and increase core muscle strength training in anticipation of the risk of an ankle injury.

**Conclusions**: This study showed that the relationship between core muscle strength and prone plank test could predict the risk of an ankle injury. It seems that an exercise routine for core muscle strengthening should be recommended at a primary age. These programs should be concentrated and circulated early on in any long-term athlete training model to prevent the risk of ankle injury in football school students. Clinicians and coaches should consider incorporating core muscle strengthening into a daily exercise warm-up program as one of the most important elements and recommend that players do exercises at home. The results showed that predictions of core muscle strength could anticipate the risk of an ankle injury.

**Keywords**: Prone Plank Test, Core Muscle Strength, Risk, Ankle Injury, Soccer Player
Анотація

Фахру Ніса Софія Хасанах, Сугіянто, Сламет Ріяді. Визначення внеску сили основних м’язів на основі тесту на планку лежачі для прогнозування ризику травми щиколотки для футболістів

Обґрунтування і мета
Футбол є найбільш часто травмованим видом спорту, особливо травми щиколотки. Число факторів ризику, пов’язаних із травмами гомілковостопного суглоба, включає розминку, знання тренера, фізичний стан спортсменів та соціально-економічні обставини спортсменів. Щиколотки потребують міцних м’язів, особливо для футболістів. За разряд часті та важкі дії можуть призвести до травм. У підлітковому віці зростання може вплинути на ризик отримання травми, що може вплинути на майбутнє. Основні м’язи відіграють важливу роль у контролі тіла. Основний м’яз життєво важливий для стабілізації нижніх кінцівок і гомілковостопних суглобів. М’язи кора можна виміряти за допомогою тесту на дошці лежачі. Суглоби сенсомоторного гомілковостопного механізму піддаються впливу проти ризику травми гомілковостопного суглоба. Було багато дискусій щодо кора м’язів як втручання проти травм гомілковостопного суглоба, але прогнози щодо передбачення ризику травми гомілковостопного суглоба дуже низькі, особливо у футболістів. Це дослідження має на меті визначити внесок м’язової сили за допомогою тесту лежачі, щоб передбачити ризик щиколотки у футболістів.

Матеріал і методи

Результати
Результати показали, що сила основних м’язів сприяє ризику травми щиколотки на 31,82%. Крім того, кореляція продукт-момент показала, що сила основного м’яза сприяє ризику травми гомілковостопного суглоба (р≤0,05). Це дослідження може стати довідкою для клінічних спеціалістів і тренерів, щоб краще зрозуміти та збільшити тренування сили основного м’яза в очікуванні ризику травми щиколотки.

Висновки
Це дослідження показало, що залежність між силою м’язів кора та тестом на дошці лежачі може передбачити ризик травми щиколотки. Здається, що тренування для зміщення основних м’язів слід рекомендувати в молодшому віці. Ці програми повинні бути зосереджені та поширені на ранньому етапі будь-якої тривалої моделі підготовки спортсмена, щоб запобігти ризику травми гомілковостопного суглоба в учнівських шкіл. Клініцисти та тренери повинні розглянути питання про включення зміщення основних м’язів у щоденну програму розминки вправ як один із найважливіших елементів і рекомендувати страхові вправи вдома. Результати показали, що прогнози сили основного м’яза можуть передбачити ризик трави щиколотки тест планки лежачі, сила основного м’яза, ризик, травма щиколотки, футболіст

Ключові слова
тест планки лежачі, сила основного м’яза, ризик, травма щиколотки, футболіст
Core muscles can be measured with a prone plank test. In addition to the core muscle test, the Prone plank test can also be used as a training program [13–15]. Prone plank tests are used because good measurements for core muscle strength are easier to model and do in adolescent student football players. In addition, the prone plank test is more efficiently used by football player-coaches. Prone plank tests can provide coaches and examiners to take more objective and standardized measurements [16].

Ankle injuries can be caused due to lack of warm-up, coach knowledge, the athlete's physical condition, and the socio-economic state of the athlete. Previous research has shown that increased risk of ankle injury is found in high-level athletes due to previous injuries and high frequency of ankle use., games against the practice, player position, foot anatomy, and individual sports participation [17–19]. Numerous injury prevention programs have been considered to reduce and prevent the severity and number of football injuries in youth players, ankle injury prevention programs, and improving performance programs. These programs include core muscle strengthening that focuses on improving ability and physical performance, which has been recommended as a significant injury risk factor in young athletes and is grounded on the target population's injury biological and profile status [20]. An earlier study required an early understanding of advantageous injury prevention to refute the potential risks of an ankle injury. Therefore, this study was conducted to determine if core muscle strength prediction can prevent the risk of an ankle injury. Researchers hypothesize that predictions of core muscle strength with prone plank tests can anticipate the risk of ankle injury in soccer players.

Materials and Methods

This research is quantitative research with correlational research methods. The population used in this study was all junior graders at Browidjoyo City Football School (SSB) Yogyakarta City. The samples in this study used purposive random sampling. The sample in the study was 44 students. Participants recruited from the football school team were involved in the study. All participants were classified and met three inclusion conditions: (1) had no history of interference with ankle injuries in the six months before the study; (2) all participants are free from muscle pain at each testing session; and (3) participate during the study in two sessions per week. Moreover, two exclusion criteria: (1) missed
one meeting session and (2) suffered an injury during the study. All procedures are fully explained orally or in writing to the participants and coaches.

Instruments used a stopwatch and core muscle strength measurement with prone plank test and ankle injury with Start Excursion Balance Test (SEBT) [16,21,22]. Respondents were given an explanation and demonstration first before taking the prone plank test and SEBT measurements. The initial preparation of the respondent's SEBT measurement stood in the center of the star axis. Then the participants were instructed to maintain the support base with one leg while reaching as far as possible to 8 different directions in the star pattern with the reverse foot. The individual initiates the range towards the anterior and advances clockwise. Then the tester gives a dot on each range line. Subjects were given a 5-second break each range. Finally, the individual performs the test repeated three times [23–25].

The prone plank test starts with the subject lie down on his stomach, holding at both elbows just below the shoulders and hands together. Respondents were then permitted to bridge from the ground while keeping their heads neutral. Once the respondent maintains the correct position, the stopwatch starts, and for 120 seconds the subject held that position, the subject is declared failed if the hips fall to the floor because the back cannot hold, or the subject cannot hold its shape for 120 seconds [26–29].

Based on data collected in research data analyzed using SPSS software version 26. The data analysis technique used to answer the research hypothesis uses correlation and regression analysis techniques. The correlation between independent and dependent variables was analyzed by analyzing the type of product-moment correlation. Regression analysis is a follow-up analysis used to predict how far a variable's value changes. The analysis requirements test is the normality test using the Kolmogorov Smirnov test with the results that all data have a normal distribution (p> 0.05).

Result

Data Based on Figure 1, student SSB Browidjoyo Yogyakarta city has a core muscle strength score with grade four as 16 people (36%) and grade three as many as 28 people (64%). Based on table 1, the data analysis method is a product-moment correlation. The results showed a positive correlation between core muscle strength and the risk of ankle injuries. Core muscle strength scores were somewhat positively correlated with the risk of ankle injuries (0.315). The product-moment correlation showed the core muscle contribution the risk of ankle injuries. In addition, core muscle strength could be one of the risk factors of ankle injuries in a student football school.

![Figure 1. Histogram Core Muscle Strength](image-url)
Core muscle strength

<table>
<thead>
<tr>
<th>Variable</th>
<th>$R_{xy}$</th>
<th>$P$ (sig)</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Muscle Strength (X1) with Risk of Ankle Injury (Y)</td>
<td>0.315</td>
<td>0.000</td>
<td>Positive and significant relationships</td>
</tr>
</tbody>
</table>

Core muscle strength can be considered a significant risk influence for ankle injuries in young football players ankle injuries. Therefore, future research may focus on the strength and endurance of core muscles using quantitative measures to understand the causes of ankle injuries and is effective for program training core muscle for this subgroup to find the risk of an ankle injury.

**Conclusion**

This study showed that the relationship between core muscle strength and prone plank test could predict the risk of an ankle injury. It seems that an exercise routine for core muscle strengthening should be recommended at a primary age. These programs should be concentrated and circulated early on in any long-term athlete training model to prevent the risk of ankle injury in football school students. Clinicians and coaches should consider incorporating core muscle strengthening into a daily exercise warm-up program as one of the most important elements and recommend that players do exercises at home. The results showed that predictions of core muscle strength could anticipate the risk of an ankle injury.

**Acknowledgements**

The authors thank Browidjoyo Yogyakarta Football School for their support in completing this research. The author also thanks the Sports Science Study Program, Faculty of Sports, Universitas Sebelas Maret and the thesis advisors Professor Sugiyanto and Dr. Slamet Riyadi who has guided me to complete this research.

**Conflict of interest**

The author declares no conflict of interest.
References


Information about the authors

Fachrun Nisa Sofiyah Khasanah
http://orcid.org/0000-0002-9465-793X
fachrunsofiyah@gmail.com
Sports Science Study Program, Faculty of Sports, Universitas Sebelas Maret
Ir. Sutami Street Number 36, Keningan, Kec. Jebres, Surakarta City, Central Java 57126, Indonesia

Sugiyanto
http://orcid.org/0000-0002-9991-5264
sugiyantoprobo@gmail.com
Sports Science Study Program, Faculty of Sports, Universitas Sebelas Maret
Ir. Sutami Street Number 36, Keningan, Kec. Jebres, Surakarta City, Central Java 57126, Indonesia

Slamet Riyadi
http://orcid.org/0000-0002-6403-7051
slametriyadi70@staff.uns.ac.id
Sports Science Study Program, Faculty of Sports, Universitas Sebelas Maret
Ir. Sutami Street Number 36, Keningan, Kec. Jebres, Surakarta City, Central Java 57126, Indonesia

Інформація про авторів

Фашрун Ніса Софія Хасанах
http://orcid.org/0000-0002-9465-793X
fachrunsofiyah@gmail.com
Програма вивчення спортивних наук, факультет спорту, Університет Себелас Марет
Ir. Sutami Street Number 36, Keningan, Kec. Джебрес, місто Суракарта, Центральна Ява 57126, Індонезія
Сугіянто
http://orcid.org/0000-0002-9991-5264
sugiyantoprobo@gmail.com
Програма вивчення спортивних наук, факультет спорту, Університет Себелас Марет
Ir. Sutami Street Number 36, Kentingan, Kec. Джебрес, місто Суракарта, Центральна Ява 57126, Індонезія

Сламет Ріяді
http://orcid.org/0000-0002-6403-7051
slametriyadi70@staff.uns.ac.id
Програма вивчення спортивних наук, факультет спорту, Університет Себелас Марет
Ir. Sutami Street Number 36, Kentingan, Kec. Джебрес, місто Суракарта, Центральна Ява 57126, Індонезія

This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

Received: 2023-04-22     Accepted: 2023-06-07      Published: 2023-07-25