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Effect of training methods and body mass index on ankle injury in futsal players

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Authors’ Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Abstract

Rationale and purpose
This study aims to determine the effect of training methods (elastic resistance bands and wobble boards) and body mass index on ankle injuries in futsal players.

Material and Methods
This research refers to a quantitative approach. The research used in this study is quasi-experimental design research. The normality test uses the Shapiro Wilk test, with the rule that if the value (p) > 0.05 then it is normally distributed. The homogeneity test uses the Levene’s Test. Test the hypothesis to determine the difference in influence between 2 variables will use the two-way ANOVA test.

Results
The use of a wobble board produces a better improvement effect especially on balance and coordination. This happens because the movement when doing the wobble board requires good balance and coordination, almost all the muscles of the body will work together to adapt to this exercise. In elastic resistance band exercises it is done with isometric muscle contractions, because it will give a reaction but there is no change in muscle length, only the muscles increase. The effect of training using elastic resistance bands will increase blood circulation in joints and bone nutrition, improve the circulatory system with pull band movements. In relation to the search for both high body mass index and low body mass index, it was found that the use of the training method with a wobble board is better when compared to the training method with elastic resistance bands. So that there is no significant interaction between training methods and body mass index. Hypothesis Test I: to test the significance of two paired samples in the treatment group with normally distributed data, a parametric test was used, namely the paired sample t-test. Data on the results of hypothesis testing I from the analysis p = 0.009 it was found that there was an effect of giving Elastic resistance band and wobble board training methods to ankle injuries of futsal players. Hypothesis Test II: can be seen that the results of the paired sample t-test for SEBT from the data obtained p = 0.704 this means that Ha is rejected and Ho is accepted. So it can be concluded that body mass index has no effects on ankle injuries in futsal players. Hypothesis Test III: There is no interaction between training methods and body mass index on ankle injuries of futsal players. From the analysis of variance, the p-value = 0.477 is less than 0.05.

Conclusions
Based on the research, it can be interpreted that there are differences in the effect of the training methods given to futsal players’ ankle injuries. This is evidenced by the significance value of p = 0.003 < α (0.05). There is no difference in the effect of body mass index on ankle injuries in futsal players as evidenced by the test results, namely the significant value of p = 0.265 > α (0.05). There is no interaction between training methods and body mass index on ankle injuries of futsal players with a significance of 0.813.

Keywords
Elastic resistance band, Wobble board, Body Mass Index, Ankle Injury, Futsal Players
Анотація

Віка Арієсті Аудіні, Мухсін Довес, Шрі Сантосо Сабаріні, Сламет Ріяді. Вплив методів тренування та індексу маси тіла на травму щиколотки у футзалістів

Обґрунтування і мета

Це дослідження має на меті визначити вплив методів тренування (еластичні стрічки опору та дошки для коливань) та індексу маси тіла на травми щиколотки у футзалістів.

Матеріал і методи

Це дослідження відноситься до кількісного підходу. Дослідження, використане в цьому дослідженні, є квазіекспериментальним проектним дослідженням. Тест на нормальності використовує тест Шапіро Вілка з правилом, що якщо значення (p) > 0,05, воно має нормальний розподіл. Тест на однорідність використовує тест Левена. Перевірте гіпотезу, щоб визначити різницю у впливі між 2 змінними, за допомогою двостороннього тесту ANOVA.

Результати

Використання дошки, що коливається, дає кращий ефект покращення, особливо балансу та координації. Це відбувається тому, що рух під час виконання вобблборду вимагає хорошого балансу та координації, майже всі м’язи тіла працюватимуть разом, щоб адаптуватися до цієї вправи. У вправах з еластичною стрічкою це робиться із ізометричним скороченням м’язів, оскільки це дає реакцію, але довжина м’язів не змінюється, м’язи лише збільшуються. Ефект від занять з використанням еластичних резинок посилить кровообіг у суглобах і живлення кісток, покращить кровоносну систему за допомогою рухів тяги. Стосовно пошуку як високого індексу маси тіла, так і низького індексу маси тіла, було виявлено, що використання методу тренування з хитною дошкою є кращим порівняно з методом тренування з еластичними стрічками опору. Щоб не було значної взаємодії між методами тренувань та індексом маси тіла. Перевірка гіпотези І: для перевірки значущості двох парних вибірок у групі лікування з нормально розподіленими даними використовувався параметричний тест, а саме t-критерій парних вибірок. Дані за результатами перевірки гіпотези І з аналізу p = 0,009 було виявлено, що був ефект від застосування методів тренування з еластичною резистентною стрічкою та хитною дошкою до травм гомілковостопного суглоба футболістів. Перевірка гіпотези ІІ: можна побачити, що результати t-тесту парної вибірки для SEBT з отриманих даних p = 0,704 це означає, що На відхиляється, а Но приймається. Отже, можна зробити висновок, що індекс маси тіла не впливає на травми щиколотки у футболістів. Перевірка гіпотези ІІІ: немає взаємодії між методами тренування та індексом маси тіла при травмах щиколотки у футболістів. З дисперсійного аналізу p-значення = 0,477 менше ніж 0,05.

Висновки

На основі дослідження можна зробити висновок про те, що існують відмінності в ефекті тренувальних методів при травмах гомілковостопного суглоба футболістів. Про це свідчить значення значущості p = 0,003 <α (0,05). Різниці у впливі індексу маси тіла на травми гомілковостопного суглоба у футболістів немає, про це свідчать результати тестування, а саме достовірне значення p = 0,265 > α (0,05). Немає взаємодії між методами тренування та індексом маси тіла при травмах гомілковостопного суглоба у футболістів зі значущістю 0,813.

Ключові слова

Еластична стрічка опору, дошка, що коливається, індекс маси тіла, травма щиколотки, футзалісти
Introduction

Sports are great for everyone since they are one of the only really universally beneficial forms of physical activity [1]. An elevated heart rate beyond the training zone is a sign of overtraining in sports. Sports can be categorized as achievement sports and recreational sports. To achieve a specific goal through coaching and development in the context of competitions is the definition of a "achievement sport," while the goals of recreational sports performed by an individual, a group, or a community are health and fitness and the development of positive interpersonal relationships [2].

The success of the sport of futsal is one of the most popular and quickly expanding in the world. Due to the limited playing area and quick tempo of the game, futsal is classified as a fast-intensity sport. There is a considerable danger of injury in futsal sports because of the many collisions that occur between players, including pushing, scuffing, elbowing, and tumbling. Common injuries that occur in futsal players are shoulder injuries, wrist injuries, waist injuries, knee injuries and ankle injuries. Lower extremity injuries are common in both men and women. Ankle sprains account for 90% of lower extremity injuries, while lower extremity injuries overall account for 13.5% more injuries than other areas of the body. Intentional or inadvertent contact, improper body motions, and inadequate protective gear are all potential sources of injury during a futsal game [3].

An ankle sprain is an injury to one or more ligaments in the ankle on either the medial or lateral sides. Usually these injuries cause overstretch of the lateral ligaments of the ankle due to sudden inversion and plantar flexion. Most ankle sprains result from damage to the lateral ligamentous structures of the ankle (anterior talofibular, calcaneofibular, and posterior talofibular ligaments) after stress in inversion and plantar flexion (supination) [24]. Sprained ankles are classified as Grades 1, 2, and 3 depending on the severity of the injury. Grade 1 ankle sprain is mild and is usually described by stretching of the ligament fibers, Grade 2 ankle sprain is moderate and is characterized by stretching or tearing of the ligaments, Grade 3 ankle sprain is characterized by tearing one or more ligaments.

Injuries with complaints of pain, chronic inflammation and instability in carrying out activities caused by ligament weakness and decreased function including sensorimotor deficits which can cause muscle weakness so that postural tone and muscle strength decrease and decrease proprioceptive, adaptive flexibility, stability and balance decrease (25). In the case of this ankle sprain, it affects stability in futsal players. Where the ankle has a very important role such as running, jumping, dribbling, controlling the ball, kicking the ball, and passing the ball because the focus is on the ankle. However, due to disturbances in futsal players, it will cause a decrease in reaction speed because they cannot respond to the stimulus given.

One of the forms of treatment that can be done is to provide sports training that can increase the ability of futsal players. The training method that the author will apply is elastic resistance bands and wobble boards. A wobbling board is a common tool for practicing dynamic balance. Ankle proprioceptors, in particular mechanoreceptors, may be stimulated and the motor unit recruited with the use of the wobble board exercise. while you stand on a wobble board, your feet will move in all directions, simulating the motion your feet experience while walking, running, or leaping. When exercising with a wobble board, the leg muscles play a crucial role in maintaining balance. Where strong muscles, suppleness, proprioception, and coordinated leg muscles are all required for this activity. Static and dynamic wobble board exercises are utilised in physical therapy, rehabilitation, injury prevention, and restoration of balance. By standing on the wobble board with one or two feet, you’re challenging your body to maintain stability in a fixed posture, which is a dynamic stabilisation exercise. The goal of this training is to increase flexibility and coordination in the areas of the body responsible for maintaining balance, including the senses, the brain, and the muscles [5].

Isotonic workouts, in which the muscles contract and relax against a steady load or resistance, are sometimes performed in conjunction with eccentric exercises using elastic resistance bands. Regaining mobility, strength, and function via this kind of training is possible. Dynamic strength, endurance, and muscular power may be improved with elastic resistance training, which makes use of resistance coming from external pressures. Exercises using elastic resistance bands in which muscles contract and relax against a steady load or resistance, sometimes performed together. It is possible to regain mobility, strength and function through this kind of training. Dynamic strength, endurance, and muscle strength can be improved by elastic resistance training, which utilizes resistance that comes from
external stress.

The value of body mass index is still not well understood by the general public. They incorrectly attribute good nutrition to those who are tall and lean, and poor nutrition to those who are short and stocky, rather than understanding that BMI is based on a person's height and weight and can be calculated to match a BMI table. The BMI may be used to characterise body composition as well as one of the easy metrics to study the body to monitor nutrients connected to being overweight or underweight. Normal body composition may be maintained with regular exercise and a healthy diet. An athlete's output suffers when their body is overweight. The circulatory system, body composition, muscular endurance, muscle strength, and glands may all be negatively impacted by a high body fat percentage.

**Material and Methods**

In this study take part 24 futsal players 22-25 years age.

This research refers to a quantitative approach. The research used in this study was a 2x2 factorial design study. Factorial design is an action on one or more variables that are manipulated simultaneously in order to study the effect of each variable on the dependent variable or the effect caused by the interaction between several variables.

<table>
<thead>
<tr>
<th>Source</th>
<th>Elastic Resistance Band (A1)</th>
<th>Wobble Board (A2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI + (B1)</td>
<td>A1B1</td>
<td>A2B1</td>
</tr>
</tbody>
</table>

### Table 1

**Information:**
A1B1 : BMI high group with elastic resistance band to ankle injury
A1B2: BMI low group with elastic resistance band to ankle injury
A2B1 : BMI high group with wobble board against ankle injury
A2B2 : BMI low group with wobble board against ankle injury

The normality test uses the Shapiro Wilk test, with the rule that if the value (p) > 0.05 then it is normally distributed. Meanwhile, if the value (p) < 0.05 then the data is abnormally distributed. This normality test is analyzed using the help of the computer program SPSS for windows version 24.

The homogeneity test uses the Levene's Test, aiming to determine the variation of the initial sample data, with the rule that if the value of (p) > 0.05 then the data group has a homogeneous variant, on the contrary if the value of (p) < 0.05 then the data group has a heterogeneous variant. This homogeneity test is analyzed using the help of the SPSS for windows version 24 computer program.

Test the hypothesis to determine the difference in influence between 2 variables will use the two-way ANAOVA test. In this study, there are three hypotheses where each hypothesis will be tested to find out whether there are differences in the effect of the training method on ankle injuries of futsal players before and after being given treatment in each treatment group I and treatment group II.

### Result

**Normality Test**

The normality test in this study was conducted to find out whether the samples were normally or not normally distributed, so the researchers conducted a normality test in the treatment group I and treatment group II using the Shapiro Wilk test. Based on table 2 the data is said to be normally distributed because all normality test results get a P-value > 0.05.
Normality Test Results

<table>
<thead>
<tr>
<th>Factors</th>
<th>Kolmogrov-Smirnov</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>Df</td>
</tr>
<tr>
<td>A1B1</td>
<td>0,228</td>
<td>10</td>
</tr>
<tr>
<td>A1B2</td>
<td>0,183</td>
<td>10</td>
</tr>
<tr>
<td>A2B1</td>
<td>0,171</td>
<td>10</td>
</tr>
<tr>
<td>A2B2</td>
<td>0,225</td>
<td>10</td>
</tr>
</tbody>
</table>

**Homogeneity Test**

The homogeneity test in this study was carried out to find out whether the two samples analyzed had the same (homogeneous) or different (non-homogeneous) variants, so the researchers conducted a homogeneity test in the treatment group I and treatment II using the Levene's test (Table 3).

Based on table 3 the results of the homogeneity test using the Levene's Test obtained P-value = 0,117 where P > α (0.05), it can be concluded that the variance in the two groups is the same or homogeneous.

**Hypothesis Test I**

To test the significance of two paired samples in the treatment group with normally distributed data, a parametric test was used, namely the paired sample t-test. Data on the results of hypothesis testing I from the analysis p = 0,003 it was found that there was an effect of giving Elastic resistance band and wobble board training methods to ankle injuries of futsal players (Table 4).

**Hypothesis Test II**

From table 4 above it can be seen that the results of the paired sample t-test for SEBT from the data obtained p = 0,265 this means that Ha is rejected and Ho is accepted. So it can be concluded that body mass index has no effects on ankle injuries in futsal players.

**Hypothesis Test III**

There is no interaction between training methods and body mass index on ankle injuries of futsal players. From the analysis of variance, the p-value = 0,813 is less than 0,05.

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**Table 2**

**Table 3**

**Table 4**
Discussion

Futsal sports are included in sports that require playing patterns with fast intensity due to the short playing time and narrow space for movement [7]. In playing the game there are no collisions that can occur between players such as pushing each other, touching each other, elbowing each other and falling so that the game in futsal has a high risk of injury [8].

The ability to keep one's body in a stable position or move with little muscle effort is balance [9]. Maintaining stability and self-control in the face of sudden changes in attitude and body position is the essence of balance [10]. Maintaining an immobile posture requires that the body be in a state of static equilibrium. Body posture during movement is maintained in a state of dynamic balance [11].

One form of exercise for dynamic balance is generally in the form of a wobble board [12]. A wobble board or also called a plank is a kind of sports equipment in the form of a semicircular round board with an uneven surface. Therefore, balance exercises that are adapted to various kinds of movements are often carried out on a wobble board [13]. The wobble board exercise helps the ankle mechanoreceptors, which are important for proprioception, and motor unit recruitment. Similar to how the feet stand while walking, jogging, or jumping, the wobble board exercise causes the feet to move in all directions when standing on top. Leg muscles play an important role in maintaining body stability during wobble board exercises so that the user remains balanced. Strength, flexibility, proprioception and leg muscles should all work well together during this exercise [14].

Eccentric exercises are a different strategy to increase flexibility [15]. The agonist muscle contracts eccentrically to move the joint slowly and deliberately through its complete range of motion, stretching the agonist muscle group. Eccentric contractions or exercises allow muscles to lengthen naturally and in calm conditions [16]. This exercise is more effective in increasing flexibility, increasing strength, and preventing muscle breakdown [17].

One form of exercise for dynamic balance is generally a wobble board. A wobble board is a modality in the form of a semicircular round board that has an uneven surface, so this tool is often called a balance board. Therefore the wobble board is often used to increase balance exercises modified with various movements. The wobble board exercise is an exercise to stimulate proprioception in the ankle, especially the mechanoreceptors and activate the recruitment motor unit. This exercise creates movement in all directions to the feet when standing on the wobble board, the same as when the feet are standing while walking, running or jumping. In exercises using a wobble board, the muscles of the legs have a big influence in maintaining the stability of the body to stay balanced. Where in this exercise there must be good coordination between muscle strength, flexibility, proprioceptive and leg muscles.

Injuries to the lower extremities are common in both men and women. Lower extremity injuries, especially the ankle, hold the second highest injury, as much as 13.5% greater than other parts of the body, one of which 90% of injuries occur is ankle sprains [21]. Women and men are equally susceptible to injuries to the lower limbs. Ankle sprains account for 90% of all injuries to the lower extremities and are 13.5% more common than injuries to other parts of the body. Injuries during futsal sports occur intentionally or unintentionally and can be caused by field factors, wrong body movements and not using good equipment [22]. Sports injuries to the muscular and skeletal systems of the body due to sports are called sports injuries.

Sports injuries are categorized into two, namely sports injuries caused by trauma (trauma injuries) and fatigue/small trauma to joints (capsule, synovial, meniscus), soft tissue (skin, nerves, ligaments, muscles) and bones. In futsal, almost all bodies are prone to injury [23]. Futsal injuries can be broken down into two categories: extremity, foot and head. The first segment is the upper body consisting of the head (12%), arms (10%) and body (7%). Second, the feet and ankles occupy 17% of the body, followed by the thighs (14%), knees (15%), and calves (12%). The structures and tissues of the ankle, including bones, joints, ligaments and muscles, are all used in the game of futsal. Many futsal players get injured from practicing and playing at high intensity, therefore it is important to give them rest between sessions.

Conclusion

Based on the research, it can be concluded that there is a difference in the effect of the training methods given to futsal players' ankle injuries. This is evidenced by the significance value of p = 0.003 <α (0.05). There is no difference in the effect of body mass index on ankle injuries in futsal players as evidenced by the test results, namely a significant value of p = 0.265 > α (0.05). There is no interaction between training methods and body mass index on ankle injuries of futsal players the significance p-value = 0.813.

Conflict of interest

The author declares no conflict of interest.
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