The effect of the interaction between the exercise method and the level of ankle sprain injury in athletes on ankle stability

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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

Purpose
The aim of this research is to determine the effect of the interaction between the exercise method and the level of ankle sprain injury in athletes on ankle stability.

Material and methods
The location of this research was carried out in two places, namely the Bintang Physio Sport Bandung Clinic which is located at Jl. Pudak No. 11, Merdeka, Sumur Bandung District, Bandung City, West Java 40133 and PhysioZone Clinic which is located at Jl. Batununggal Indah IX No.2 (Batununggal Indah Club) Bandung City. This type of research is quantitative research with experimental research methods. The population in this study were athletes with Sprain Ankle conditions with screening that the population was an athlete who was medically diagnosed as suffering from Sprain Ankle by a doctor as proven by medical records and then a specific Physiotherapy examination was carried out using a) Anterior drawer test, b) Talar inversion tilt test, and c) Talar eversion tilt test. After being selected to examine the condition of Sprain Ankle, the athlete becomes part of the population. Purposive random sampling used in this research is sampling that has been adjusted in such a way, however, it is still continued with incidental sampling, namely taking respondents who happen to be present or available with a sample target of 8 people for each group.

Results
There is an effect of the interaction between the exercise method and the level of Ankle Sprain injury in athletes on ankle stability. Comparative analysis showed differences in ankle stability to Ankle Sprain injury rates with p values = 0.010 (p < 0.05). The results of the Tukey test with values Fcalculate = 5.158 > Ftabel for degrees of freedom 2 and 48 with values 3.819, or Fcalculate > Ftabel show that there is an ankle stability interaction between interventions.

Conclusions
The results of the hypothesis test proved that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of Ankle Sprain injury in athletes, so it can be concluded that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of severe, moderate, and mild ankle injury. This is evidenced by each intervention where the Proprioceptive exercise intervention at the degree of mild and moderate injury has the same stability value, while the Theraband exercise at the degree of moderate and severe injury has the same stability value. To further clarify the interaction of ankle stability between proprioceptive exercise intervention and theraband exercise with severe, moderate, and mild degrees of injury in athletes with Ankle Sprain.

Keywords
exercise, ankle sprain injury, athletes
Анотація

Туріс Аан Сухадак, Сугіянто, Харіс Нугрохо, Сламет Ріяді. Вплив взаємодії між методом виконання вправ і рівнем травми гомілковостопного суглоба у спортсменів на стабільність гомілковостопного суглоба

Мета
Мета цього дослідження полягає в тому, щоб визначити вплив взаємодії між методом вправи та рівнем розтягнення гомілковостопного суглоба у спортсменів на стабільність гомілковостопного суглоба.

Матеріал і методи
Це дослідження проводилося у двох місцях, а саме в клініці Bintang Physio Sport Bandung, яка розташована за адресою Jl. Pudak No. 11, Merdeka, Sumur Bandung District, Bandung City, West Java 40133 та PhysioZone Clinic, яка розташована за адресою Jl. Batununggal Indah IX No.2 (Batununggal Indah Club) місто Бандунг. Цей вид дослідження є кількісним дослідженням з використанням експериментальних методів дослідження. Популяцію в цьому дослідженні складали спортсмени з розтягненням зв’язок гомілковостопного суглоба з перевіркою, що популяція була спортсменом, у якого лікар встановив розтягнення зв’язок гомілковостопного суглоба, що підтверджено медичною документацією, а потім було проведено спеціальне фізіотерапевтичне обстеження за допомогою a) Переднього ящика b) Тест нахилу талярної інверсії та c) Тест нахилу талярної вивороту. Після відбору для перевірки стану розтягнення щиколотки спортсмен стає частиною популяції. Цілеспрямована вибірка, яка використовується в цьому дослідженні, є вибіркою, яка була скоригована таким чином, однак вона все ще продовжується випадковою вибіркою, а саме відбиранням респондентів, які випадково присутні або доступні, з цільовою вибіркою 8 осіб для кожної групи.

Результати
Існує вплив взаємодії між методом вправи та рівнем травми гомілковостопного суглоба у спортсменів на стабільність гомілковостопного суглоба. Порівняльний аналіз показав різницю в стабільності гомілковостопного суглоба та показниках розтягнення гомілковостопного суглоба зі значеннями р = 0,010 (р <0,05). Результати тесту Тьюкі зі значеннями Fcalculate = 5,158 > Fтаблиця для ступенів свободи 2 і 48 зі значеннями 3,819 або Fcalculate > Fтаблиця показують, що між втручаннями існує взаємодія стабільністі щиколотки.

Висновки
Результати перевірки гіпотези довели, що існувала взаємодія стабільності гомілковостопного суглоба між втручанням пропріоцептивних вправ і вправ Theraband зі ступенем травми гомілковостопного суглоба у спортсменів, тому можна зробити висновок, що існувала взаємодія стабільності гомілковостопного суглоба між втручанням пропріоцептивних вправ і вправ Theraband зі ступенем важкої, середньої та легкої травми щиколотки. Про це свідчить кожне втручання, де втручання пропріоцептивної вправи за ступеня легкої та середньої травми має однакове значення стабільності, тоді як вправа Theraband за ступеня середньої та важкої травми має однакове значення стабільності. Для подальшого з’ясування взаємодії стабільності гомілковостопного суглоба між пропріоцептивними вправами та вправами theraband із важким, середнім та легким ступенями травм у спортсменів із розтягненнями гомілковостопного суглоба.

Ключові слова
фізичні вправи, розтягнення гомілковостопного суглоба, спортсмени
Introduction

Every athlete certainly has a dream to excel in sports. However, sports injuries are one of the inhibiting factors for an athlete to achieve his achievements. This is because with injuries, they are unable to achieve their achievement goals. Ankle Sprain, Jumper's Knee, Anterior Cruciatum Ligament (ACL), Posterior Cruciatum Ligament (PCL), injury meniscus, are some of the injuries that can hit athletes. When injured, they cannot follow the usual training and when left silent the condition of the injury turns chronic, this is usually the ankle sprain that occurs in sports athletes [1].

Overstretch of the ligament that occurs suddenly with inversion and plantar flexion is also called ankle sprain. This condition is usually due to activities or movements such as running, explosive lateral cutting movements or the greatest is from jumping movements with pedestal failure [2]. Some phases of Ankle Sprain injury include the acute initial phase, acute phase, sub-acute phase, and chronic phase. Where the first phase occurs three days after injury, the next phase or inflammatory phase occurs one to six days. The fibroblastic repair phase occurs more than four to ten days post-injury and the final phase, maturation remodeling, occurs more than day seven post-injury [3].

Data from the KONI Jakarta Polyclinic in 2008-2012 shows that ankle sprain is the most common complaint with a percentage of 41.1% of all injury cases [4]. It is reported that with a percentage of up to 75% of the initial Ankle Sprain conditions lead to the incidence of Repetitive Ankle Sprain which will cause functional disorders in the ankle area, and this figure has reached 80% of events, while based on [5] The lower 78% of members will be affected by the occurrence of the condition. Where in adolescence, the incidence of knee injuries is 15% while Ankle Sprain is 48%. The percentage of severe events that end up being absent from sports activities with severe injury conditions is 23%.

Many factors cause ankle sprain, including poor flexibility, muscle weakness, lack of warming up, repetitive ankle injury conditions, poor balance, uneven condition of the sports field surface, and the use of shoes or footwear is not correct with the needs of the sport [6]. There are three risk factors that make the incidence of Ankle Sprain injuries appear, namely, first people who have almost five times or even more experienced the incidence of Ankle Sprain, second the use of air cell shoes on the heel, and the last is the lack of stretching before the game [7].

In sports, coaches and athletes will look at the condition of the injury Ankle Sprain is a common and reasonable condition that is commonly concerning in every athlete and sportsperson [8]. Not so severe conditions that occur at the time of Ankle Sprain causes an athlete to assume that this condition should not be considered and considered to be taken to medical attention, and even 56.8% of basketball players experience the condition Ankle Sprain will experience Repetitive Injury and leads to Chronic Ankle Sprain. In a sense, conditions Ankle Sprain Chronic is a condition that lasts more than seven days Ligaments The lateral complex undergoes an inflammatory condition. This injury is characterized most clearly by the presence of pain, instability in carrying out activities and also the presence of chronic inflammation that causes a decrease in function including sensorimotor deficits and weakness Ligaments, this will certainly cause muscle weakness so that muscle weakness, proprioceptive, decreased postural tone, poor flexibility followed by less strong stability and weak body balance, this condition occurs when in a long enough time inflammatory conditions in Ligaments it happens [9].

Decreased stability is one of the problems that arise among other problems when experiencing Ankle Sprain, stability itself is interpreted as a position Ankle in a stable state. Nerves that include reflex components, timing muscle reactions and Propioceptive, and also the components of the muscles themselves which consist of strenght, endurance and Power, and also mechanical Mechanism (ligament laxity) are the components of the constituents of joint stability Ankle. Condition Ankle will become unstable when one of these factors does not Fulfilled. Improper handling will lead to Ankle Instability or instability Ankle, which among the causes is poor handling of the initial conditions Ankle Sprain. Decreased tissue flexibility, increased pain intensity and decreased muscle strength are physiological causes why Ankle become unstable [10]. Distractions of walking, stacking, and jumping lead to the athlete's inadequacy in playing on the field again.

Instability Ankle Surely will affect the postural body, whether static or dynamic, dynamic or mechanical instability occurs as a pathological manifestation of weakness of the talocrural joint, caused by dysfunction Ligaments and is influenced from the angle of talar slope and drawer-anterior stress. This functional instability is the effect of
neurological conditions (proprioception, muscle reaction time, and reflexes and muscles affected by a particular pathological condition) [11]

The ankle has an important role in the movement of the stretch shortening cycle (SSC). Thus, it is likely that ankle instability negatively affects the SSC. Eccentric and concentric muscle contractions occur in any type of foot movement or even at the time of jumping, whether games, such as football, basketball, volleyball, and in the action of jumping obstacles on track and court. When performing jumps, the muscles of the limbs absorb kinetic energy from the body by eccentric contractions on ground contact in the initial phase, and then convert it into forward energy or upward movement by concentric contractions in the later phases. This type of movement, which contains eccentric and concentric contractions, is called the SSC. To investigate the relationship between SSC movement and ankle instability. Balance Error Scoring System (BESS) is an assessment to assess the stability of the ankle, while for SSC it is carried out using measurements.

Poor postural control due to instability Ankle, and to assess static postural stability can use BESS where the nature of this measuring instrument is very objective. With value construct validity a good BESS can be used because it has consistency and can be used as an assessor of stability Ankle. Has value Cronbach Alpha between 0.76 to 0.92 which indicates that BESS has a value construct validity which is good, and coupled with test-retest reliability with coefficient Interclass Correlation 0.86 provides evidence that BESS can be used to measure stability values Ankle Sprain [12].

Medicamentose and Physiotherapy are some of the ways to deal with the condition Ankle Sprain. Theraband exercise is one of the clinically recommended motion exercises. Proprioceptive itself is a form in which the body is able to transmit a sense of position, analyze that information and react (consciously or unconsciously) to stimuli with appropriate movements. The mechanism of this exercise is done by stimulating the depiction of signals afferent which moves to the brain from receptors in the body that allow the brain to know where the body is. This proprioceptive exercise aims to be able to improve the proprioceptive process in Ankle Sprain. Through mechanoreceptors, vestibular receptors and visual receptors of proprioceptive input are sent and integrated into the brain resulting in proper body movement. Shashwat Prakash and Varun Singh (2014) in [13] His research found that the increase in proprioceptive balance was more influenced by exercise wobble board Compared Single leg stance exercise in 4 weeks.

Theraband is a loading tool or medium to improve Range of motion (ROM) power and MobilityWhile Theraband Exercise is an exercise using prisoners who come from External Force with the form of isotonic exercises to be able to increase muscle strength, dynamics, and Endurance and helps in stability due to damage Ligaments lateral complex. Strictly continue Increased muscle strength will be obtained so as to increase capillary blood vessel circulation from tonic muscle strength which ends with an increase in phasic muscle strength and finally there is an addition Recruitment Motor Unit in the muscles, so that the muscles will work optimally, so that good stability is formed in the Ankle [14]. Research from [15] in get the result that Theraband Exercise more effective than mobilization in the implementation of the intervention for 4 weeks.

Based on this background, which has been written, the author draws an idea that there is an influence of interaction between the exercise method and the level of ankle sprain injury in athletes on ankle stability.

**Material and Methods**

The place of implementation of this research was carried out in two places, namely Bintang Physio Sport Bandung Clinic which is located at Jl. Pudak No. 11, Merdeka, Sumur Bandung District, Bandung City, West Java 40133 and PhysioZone Clinic which is located at Jl. Batununggal Indah IX No.2 (Batununggal Indah Club) Bandung City

The population in this study is athletes with Sprain Ankle condition with screening that the population is an athlete who is medically diagnosed with Sprain Ankle by a doctor as evidenced by a medical record and then carried out a specific examination of Physiotherapy with tets a) Anterior drawer test, b) Tilt inversion talar test, and c) Tilt eversion talar test. After being included in the selection for the examination of the condition of Sprain Ankle, the athlete becomes part of the population

Purposive random sampling used in this study is a collection that has been adjusted in such a way, even so it is still continued with incidental sampling which is taking respondents who happen to be present or available with a target sample of each group of 8 people (Notoatmodjo, 2010).
Test Analysis Prerequisites

This study used primary data. To obtain the accuracy of the model to be analyzed, it is necessary to test several requirements of classical assumptions underlying the regression model. There are several steps to test the model to be researched, including:

Population Frequency Distribution Normality Test

Have a goal in testing the regression model, whether residual variables or confounding confounding are normally distributed. The related assumption that the t-test and f-test should be this normal distribution in violation is therefore invalid. There are two ways to detect whether residuals are normal or not: by chart analysis and statistical tests. With the following formula:

\[ X^2 = \sum \left( \frac{O_i - E_i}{E_i} \right)^2 \]

Information:
X2 = Value of X2
Oi = Observation value
Ei = Expected value, the area of the class interval based on the normal table multiplied by N (total frequency) (pi x N)
N = Number of numbers in the data (total frequency)

Population Variance Homogeneity Test

This test aims to see whether two or more sample data groups come from populations that have equivalent variances or the similarity of the dataset being studied by looking at the variance values can be determined from MSB (Mean Square Bentween) and MSW (Mean Square Within). With the formula calculate MSB and MSW as follows:

\[ MSB = \frac{\sum [a_i + b_i] - \overline{X}_{(a+b)}]^2}{2(n-1)} \]
\[ MSW = \frac{\sum [a_i + b_i] - \overline{X}_{(a+b)}]^2}{2n} \]

The description of the above formula is:
a = Data on pre value
b = Data on post value
X bar = Average
n = The amount of data or the total of all repetitions

Test the hypothesis

Two Ways of Analisys of Variants Test

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Squares (MS)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within</td>
<td>[SSW = \sum_{i=1}^{k} (x_i - \overline{x})^2 ]</td>
<td>[df_w = k - 1 ]</td>
<td>[MSW = \frac{SSW}{df_w} ]</td>
<td>[F = \frac{MSB}{MSW} ]</td>
</tr>
<tr>
<td>Between</td>
<td>[SSB = \sum_{i=1}^{k} (x_i - \overline{x})^2 ]</td>
<td>[df_b = n - k ]</td>
<td>[MSB = \frac{SSB}{df_b} ]</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>[SST = \sum_{i=1}^{n} (x_i - \overline{x})^2 ]</td>
<td>[df_t = n - 1 ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scheme 1. Algorithm of the counting of ANOVA coefficients:

\[ F = ANOVA \text{ coefficient} \]
\[ MSB = \text{Average sum of squares between groups} \]
\[ MSW = \text{Average number of squares in a group} \]
\[ MSE = \text{Average sum of squares due to error} \]
\[ SST = \text{Total number of squares} \]
\[ p = Total population \]
\[ n = Number of samples in a population \]
\[ SW = \text{Number of squares in a group} \]
\[ SSB = \text{Number of squares between groups} \]
\[ SSE = \text{Number of squares due to error} \]
\[ s = \text{Sample standard deviation} \]
\[ N = \text{Total number of observations} \]

2X2 Factorial Test

This test has two factors, where within each factor has levels. The simplest factorial design is 2 x 2 (Emzir, 2015). The 2x2 factorial test uses the Two Way Anova test, or the 2-Way ANOVA test which aims to compare the average difference between groups that have been divided into two independent variables, with the following formula:

\[ p = \left( \frac{A + C}{A} \right) \left( \frac{B + D}{B} \right) \left( \frac{N}{A + B} \right) = \frac{[(A + C)(A + C)] [(B + D)(B + D)]}{N! [A + B] [C + D]!} \]

\[ = \frac{(A + B)(C + D)(A + C)(B + D)!}{N! A! B! C! D!} \]

The initial hypothesis is rejected if the
p-value obtained is smaller than the level of significance used. The p-value is obtained by adding the odds of data generation with the odds of more extreme occurrence or using Fisher's table, see Sidney Siegel's book Nonparametric Statistics for the Social Sciences. For the 1-way test, it is only taken from one side of the more extreme appearance, while for the 2-way test it is taken from both sides of the more extreme appearance. Under

Post Hoc Test

1) Scheffe Test Statistics
   Post follow-up test anava is performed if on the analysis of variance H rejected. This is done to find out which treatment is more e.g. better or more effective than others. One of the easy-to-use and most frequently used post-anava tests is the Scheffe' method.

Identify all existing mean comparison pairs. If there is k treatment, then there is k(k−1)/2 mean pairs and formulate a hypothesis corresponding to the comparison.

Determine the level of significance of α (in general, the selected α is the same as in the variance analysis test).

Find the statistical price of test F by using the following formula: a. For the average comparison between the i-th and j-th lines

\[
F_{i-j} = \frac{(X_i - X_j)^2}{\frac{1}{RKG} \left( \frac{1}{n_i} + \frac{1}{n_j} \right)}
\]

With:
- \(F_{i-j}\) = Fobs value on treatment comparison to-i and treatment to-j;
- \(X_i\) = flattening on sample to-i;
- \(X_j\) = flattening on sample to-j;
- \(RKG\) = mean squared error, which is obtained from the calculation of variance analysis;
- \(n_i\) = sample size to-i;
- \(n_j\) = sample size to-j

Results

Analysis of the interaction between proprioceptive exercise and theraband exercise interventions with the degree of severe, moderate, and mild ankle sprain injury to ankle stability in athletes. The Tukey test is used as a comparative test to see the difference if the data scale of the two variables is quantitative (Interval or Ratio) can be seen in full in appendix 3, with the following results:

**Table 1**

Test Results Stability Interaction Ankle between Interventions Proprioceptive Exercise and Theraband Exercise with Degree of Injury Ankle Sprain

<table>
<thead>
<tr>
<th>Variable</th>
<th>F calculate</th>
<th>Ftable</th>
<th>Sig</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction of ankle stability between proprioceptive exercise intervention and theraband exercise with degree of ankle Sprain injury</td>
<td>5.158</td>
<td>3.19</td>
<td>0.01</td>
<td>There is an interaction of ankle stability between proprioceptive exercise and theraband exercise interventions and the degree of ankle Sprain injury</td>
</tr>
</tbody>
</table>

Source: Data processed, 2023

The results of the comparative analysis showed the difference in ankle stability to the level of Ankle Sprain injury with a value of \(p = 0.010\) (\(p < 0.05\)). The results of the Tukey test with a value of \(F_{\text{calculate}} = 5.158\) > \(F_{\text{table}}\) for degrees of freedom 2 and 48 with a value of 3.819, or \(F_{\text{calculate}} > F_{\text{table}}\) show that there is an interaction of ankle stability between proprioceptive exercise intervention and Theraband exercise with the degree of Ankle Sprain.

In other words, the results of the hypothesis test proved that there was an ankle stability interaction between the Proprioceptive exercise intervention and Theraband exercise with the degree of Ankle Sprain injury in athletes, so it can be concluded that there is an ankle stability interaction between the Proprioceptive exercise intervention and Theraband exercise with severe, moderate, and mild degrees of ankle injury. This is evidenced by each intervention where the Proprioceptive exercise intervention at the degree of mild and moderate injury has the same stability value, while the Theraband exercise at the degree of moderate and severe injury has the same stability value. To further clarify the interaction of ankle stability between proprioceptive exercise intervention and theraband exercise with severe, moderate, and mild degrees of injury in athletes with Ankle Sprain.
Recapitulation of Analysis of Variance

<table>
<thead>
<tr>
<th>No</th>
<th>Groups of Hypotheses compared</th>
<th>$Q_{calculate}$</th>
<th>$Q_{table}$</th>
<th>Sig.</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comparison of Proprioceptive Exercise and Theraband Exercise interventions</td>
<td>16.892</td>
<td>2.843</td>
<td>0.002</td>
<td>There are differences</td>
</tr>
<tr>
<td>2</td>
<td>Ankle stability to Ankle Sprain injury rates</td>
<td>5.199</td>
<td>2.843</td>
<td>0.009</td>
<td>There are differences</td>
</tr>
<tr>
<td>3</td>
<td>Interaction of ankle stability between proprioceptive exercise intervention and theraband exercise with degree of ankle Sprain injury</td>
<td>5.158</td>
<td>3.19</td>
<td>0.01</td>
<td>Interaction occurs</td>
</tr>
</tbody>
</table>

Table 2. of the recapitulation results of the analysis of variance can be concluded that the three hypotheses put forward are acceptable, in addition, based on the findings of this study each hypothesis can be elaborated based on the theory underlying these findings.

The next test is carried out to see whether there is a difference in comparison which is not only in the form of pairs, but is a combination of several treatments and in the form of contrast. Because contrast is more commonly used than pairwise comparisons using the Scheffe test, based on the results of the Scheffe test obtained the following results in the Proprioceptive Exercise intervention treatment group:

Table 3. Test Scheffe Group Proprioceptive Exercise

<table>
<thead>
<tr>
<th>Degree of Injury</th>
<th>Degree of Injury</th>
<th>Mean Difference</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Injuries</td>
<td>Moderate Injury</td>
<td>-1,375*</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>Severe Injuries</td>
<td>-2,000*</td>
<td>0.000</td>
</tr>
<tr>
<td>Moderate Injury</td>
<td>Minor Injuries</td>
<td>1,375*</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>Severe Injuries</td>
<td>-0.625</td>
<td>0.350</td>
</tr>
</tbody>
</table>

Table 4. Test Scheffe Group Theraband Exercise

<table>
<thead>
<tr>
<th>Degree of Injury</th>
<th>Degree of Injury</th>
<th>Mean Difference</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Injuries</td>
<td>Moderate Injury</td>
<td>-1.000</td>
<td>0.197</td>
</tr>
<tr>
<td></td>
<td>Severe Injuries</td>
<td>-2,875*</td>
<td>0.000</td>
</tr>
<tr>
<td>Moderate Injury</td>
<td>Minor Injuries</td>
<td>1.000</td>
<td>0.197</td>
</tr>
<tr>
<td></td>
<td>Severe Injuries</td>
<td>-1,875*</td>
<td>0.008</td>
</tr>
<tr>
<td>Severe Injuries</td>
<td>Minor Injuries</td>
<td>2,875*</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Moderate Injury</td>
<td>1,875*</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Source: Data processed, 2023

In addition, judging from Sig. in this case, the group of mild injuries with moderate and light injuries with severe has a value of Sig. < 0.05, the group of mild injuries with moderate has a Sig value of 0.013 and light injuries with a weight of 0.000 so that there is a significant difference between the group of light and moderate injuries and light and severe injuries.

The mean difference in the group of mild injuries with moderate impairment of -1.357 and minor injuries with a weight of -2,000, it can be concluded that the striking difference from the Proprioceptive Exercise intervention group was in the group of minor injuries and severe injuries.

The next test was carried out to see whether there were differences in comparison that were not only in the form of pairs using the Scheffe test, based on the results of the Scheffe test obtained the following results in the Theraband Exercise intervention treatment group:
group of light injuries with severe and moderate injuries with severe.

The mean difference in the group of mild injuries with a weight of -2.875 and moderate injuries with a weight of 1.875, it can be concluded that the striking difference from the intervention group of Theraband Exercise is in the group of minor injuries and severe injuries.

Discussion

Based on the analysis that has been done to see the effect of the interaction between the exercise method and the level of Ankle Sprain injury in athletes on ankle stability can be seen in table 4.14, where the results of the comparative analysis show the difference in ankle stability to the level of Ankle Sprain injury with a p value = 0.010 (p < 0.05). The results of the Tukey test with a value of Fecalculate = 5.158 > Ftable for degrees of freedom 2 and 48 with a value of 3.819, or Fealculate > Ftable showed that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of Ankle Sprain. In other words, the results of the hypothesis test proved that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of Ankle Sprain injury in athletes, so it can be concluded that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of severe, moderate, and mild ankle injury. This is evidenced by each intervention where the Proprioceptive exercise intervention at the degree of mild and moderate injury has the same stability value, while the Theraband exercise at the degree of moderate and severe injury has the same stability value. To further clarify the interaction of ankle stability between proprioceptive exercise intervention and theraband exercise with severe, moderate, and mild degrees of injury in athletes with Ankle Sprain.

The proprioceptive exercise and theraband exercise more increase stability than proprioceptive exercise and antero posterior glide in basketball players who experience chronic Ankle Sprain, this means that exercise with the Wobble Board can restore the function of proprioceptive through afferent nerve fibers will bring a response to the central nervous system (CNS) which plays a role in maintaining body balance with a stable position. The principle of this exercise is to improve the function of the body's balance controller. During exercise, the stimuli received by intrafusal and extrafusal fibers enrich the sensory input that will be sent and processed in the brain for processing so as to determine how much muscle contraction can be given. Some of the responses sent back to the extrafusal will activate the Golgi tendon then there will be an improvement in the coordination of intrafusal fibers (myofibrils) and extrafusal fibers (Golgi tendon organ) with afferent nerves in the muscle spindle so that good proprioceptive is formed.

Theraband exercise intervention given to increase stability in chronic Ankle Sprain conditions due to the overstretch of the Ligament due to stacking, the position of the Ligament will tend to stretch out and cause instability in the Ligament so that other muscles will work excessively to stabilize the ankle joint, with proprioceptive exercises and theraband exercise, the ankle muscle which is a tonic muscle type (antagonist) can improve blood vessel circulation Capillaries so that it will increase muscle strength, while agonist muscle strength will result in increased motor unit recruitment in the muscle that will activate the Golgi body, so that the muscle will work optimally which is depolarized during exercise, with many depolarized motor units will produce great strength. Correct and regular exercise will increase the strength of the stabilizer muscles in the ankle.

Proprioceptive Exercise concluded that proprioceptive training programs are effective in reducing the incidence rate of ankle sprains in the athletic population, including those who have and those who do not have a history of ankle sprains. Proprioception is defined as a neural process in which the body receives sensory input from the surrounding environment and integrates that information to produce motor responses. While the Theraband Exercise aims to strengthen the ankle muscle using elastic resistance rubber aims to increase the strength of the foot and ankle drive muscles, so as to maintain anatomical position, increased muscle tone, increased stretch reflexes that can prevent re-injury, and improve foot stability.

Muscle strengthening training using elastic resistance rubber, in the form of isotonic exercises can help and correct muscle weakness caused by complex lateral ligament damage. Increased muscle strength is obtained by continuous training so that tonic muscle strength can increase capillary blood vessel circulation which can increase phasic muscle strength which will result in the addition of motor unit recruitment in the muscle that will activate the Golgi body so that the muscle will work optimally, so
that good stability is formed in the ankle, in reducing foot and ankle disability in cases of chronic ankle sprain.

**Conclusions**

There is an effect of the interaction between the exercise method and the level of Ankle Sprain injury in athletes on ankle stability. Comparative analysis showed differences in ankle stability to Ankle Sprain injury rates with p values = 0.010 (p < 0.05). The results of the Tukey test with values F{\text{Calculate}} = 5.158 > F{\text{Table}} for degrees of freedom 2 and 48 with values 3.819, or F{\text{Calculate}} > F{\text{Table}} show that there is an ankle stability interaction between interventions.

The results of the hypothesis test proved that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of Ankle Sprain injury in athletes, so it can be concluded that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of severe, moderate, and mild ankle injury. This is evidenced by each intervention where the Proprioceptive exercise intervention at the degree of severe and moderate injury has the same stability value.

The results of the hypothesis test proved that there was an interaction of ankle stability between the intervention of Proprioceptive exercise and Theraband exercise with the degree of Ankle Sprain injury. The authors declare that they have no conflict of interest.

**Conflict of interest**

The authors declare that they have no conflict of interest.

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