



The Impact of Training Methods And Flexibility on Smash Ability in Sepak Takraw

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ABSTRACT

This study aims to find out the differences in the influence of training models and flexibility on smash in sepak takraw. This research was conducted at the University Halu Oleo Kendari club. An experimental method with a simple 2X2 factorial design was used in this study. 40 samples were obtained through simple random sampling. The results showed that: 1) the plyometric training method had a better effect on smash ability in a sepak takraw compared with the weight training method, 2) In The high flexibility group, the plyometric training method got better effects than the weight training method, 3) In The low flexibility group, the weight training method has a better effect than the plyometric training method on smash ability in sepak takraw., 4) There was an interaction between the training method and flexibility of the Smash in the sepak takraw.

Keywords: Training Method; Plyometric; Weight Training; Sepak Takraw.

INTRODUCTION

Sepak takraw is one of the traditional games which popular from the past until now. This sport is played by tossing or bouncing the ball with the body, except hands (Hidayah, 2017). Sepak takraw has gone through many changes in its evolution, from a traditional sport played in a very simple way until became a modern sport that is played with complete rules as it is today. From a demonstration game to a competitive game sport. From a kind of sport that was originally just an activity to fill spare time, became a kind of sport for competition. To improve performance, it is necessary to enhance the

achievements through proper planning and implementation in an integrated and equitable manner throughout the country. This task is not only performed by the government but also needs support from various parties. "Sepak takraw is a traditional sport that is unique compared to other sports, the uniqueness of sepak takraw lies on the elements of gymnastics and acrobatics as the basis of skills." (Suprobo & Fudin, 2021). Sepak takraw is a sport that uses a ball made of rattan or plastic (synthetic fibre) which plays on a rectangular, flat field, both open and closed areas and limited by a net. (addriyal Pernandes, 2018). This sport originally used a ball made of rattan, now it has turned into a ball made of plastic (synthetic fibre). Previously, this game was known as "sports", then it changed its name to "sepak takraw".

This transformation was started since this game started to be competed in PON X in 1981. However, based on the history in various regions, particularly in Indonesia and Asian countries in general, which know sepak takraw with different names according to the noble values and cultural of each country. For example, in some areas in Indonesia such as South Sulawesi it is known as "marraga akraga", in Riau it is known as "rago tinggi ", West Sumatra and Bengkulu is known as "sepakrago", and generally in Indonesia it is known as "sepak raga". Then in other Asian countries have different terms, for example Malaysia is known as " sepak raga jaring ", Brunei is known as "sepak raja", China is known as "theng chew", "in Burma it is known as "chung long", Laos is known as with "kator", the Philippines is known as "sipa", Thailand is known as "takraw", and in Singapore it is known as " bola sepak raga ".

According to (Bakhtiar & Rutandi, 2018) sepak takraw is a kind of sport that uses physical activity to demonstrate movement skills with a specific purpose. According to (Andriana & Reahan, 2017) Sepak takraw is a combination of three games, namely football, volleyball, and badminton. Sepak takraw generally uses all parts of the body except the arms. According to (Bakhtiar & Rutandi, 2018) sepak takraw is a sport that is played by two teams, each team consisting of three players, (tekong, left flank, and right flank) with a reserve player, who is separated by a net that has the same size as a badminton net. Sepak takraw is a sport with a relatively high complexity of movement. Therefore, to become a skilful player, they should have motor skills that support playing sepak takraw. Various motor skills needed to support the skills of playing sepak takraw include: coordination, agility, flexibility, speed, power, strength, and endurance.

As one of the various kinds of sports that are developing in Indonesia, sepak takraw has achieved a lot of progress. All coaches in regions throughout Indonesia are

very enthusiastic to encourage their athletes who can be prepared at any time to take part in competitions, both regional, national and international. The government also paid attention to this sport, which can be shown by the establishment of the PPLP (Student Training Education Center) In 1983, Sepak takraw is a kind of sport that aims to train and develop talented and potential students who are oriented towards optimal achievement in both academics and sports. However, the expected goals have not been fully achieved.

Generate high-achieving athletes need a lot of effort, including time and involve various components. The components that play a role in achieving this goal according to (Mulyanto, 2019) consist of four factors that affect sports achievement, namely (1) physical condition, (2) technique, (3) tactics, (4) psychological. These four components must be developed in a programmed, regular, directed and measurable manner to get optimal performance. Referring to the technical component, practising mastery of skill techniques in the sepak takraw is very important because one of the weaknesses in sepak takraw athletes is inadequate skills which cause they could not perform optimally. There are many training models that have been applied in related sports, including the condition during training was generally carried out similar to the specifications of the game (Harun, 2019).

About mastery of skills, smash is one of the skills that must be trained in the sepak takraw. Because a good smash, can increase the points for a team as well as determine the winner in the competition. Failure to smash into the opponent's area means providing opportunities for the opponent to earn points. One of the causes of defeat in matches is due to inaccurate and efficient smash techniques. Based on data, in one set of matches, one team can get thirty-five times chances to smash the ball, but in actuality, the athletes only smash ten times and most of the time the ball was stuck in the net, blocked and went out of line. Meanwhile, the opposing team has forty times the chances to have four times fail. Thus, this is an important issue that must be considered in playing sepak takraw.

Achievement said that the overall smash score was obtained by adding up the target score with the time score of 5 times the opportunity to smash (Raihan, 2015). Smash is one of the main factors in the process of winning the match. In smash, the athlete needs to jump and hit hard. Thus, the physical condition factor is the main support to maximize the smash movement. The physical components are strength, speed, flexibility, coordination, power, endurance and so on. If an athlete does not have one of these components, it can be shown from the smash results.

Legs or feet in general play a very important role in playing the ball, kicking, as a pedestal and so on, but more specifically the role of the legs when doing a straight smash is very necessary. Where the feet must be able to reach the ball in a soaring position above the head. (Juang, 2015) mentioned that in performing a smash with the feet, the feet must be able to reach the ball. It is possible if the quality of flexibility of his legs is high to do a hard smash.

Flexibility is one of the most important physical components to consider in motion performance. Especially regarding the functional capacity of a joint, the tendons, ligaments and the muscles around them perform optimally. Flexibility is the ability to move the body or joints flexible or broad so that it is useful for movement efficiency and preventing injury (Husna, 2019). A person who lacks flexibility is usually stiff, rough and sluggish. Flexibility is very necessary for the sepak takraw, especially the flexibility of the limbs according to the dominant body parts used in playing sepak takraw. Athletes with limb flexibility can facilitate movement efficiency, such as coordination movements, speed, agility, power and skills in playing sepak takraw. Flexibility is a measure of how far a person can move his arms, legs and body at their respective joints. A certain sport that uses a lot of movements, ducking, twisting and bending, in sepak takraw requires good flexibility to become better than others (Jaka, 2016).

In improving the quality of movement skills, plyometric training methods and weight training can be used customized to the flexibility of each athlete. The plyometric training method is principally an exercise with a speed-strength approach designed to develop explosive power, reaction speed, agility, and agility in athletes. According to (Adhitya & Lukman, 2020) the plyometric training method is a way of training that can produce strong muscle contractions with very fast movements. (Gunawan & Septiadi, 2015) mentioned that plyometrics is a form of exercise that increased the quality of athletes in the form of explosive power with reactive movements as seen in our activities. The weight training method is an exercise method with a muscle strength-endurance approach designed to develop strength in athletes. The weight training method is specifically designed to increase muscle strength, power and endurance.

This exercise has various forms that are closely related to muscle movements that are carried out statically or dynamic. (Amali, 2018). The application of the two training methods is centred on the limbs according to the dominant body member used in the straight smash movement in the sepak takraw game.

METHOD

This study used an experimental method with a 2X2 factorial design. The independent variables are: Plyometric training method and weight training method, the dependent variable is high smash ability in sepak takraw, and the categorical variables are high flexibility and low flexibility. The affordable population is male athletes at the Halu Oleo University club who have participated in competitions with a sample of 40 people and divided into four groups, each group consisting of 10 people.

RESULTS AND DISCUSSION

RESULTS

Table 1.
 Summary of Smash Ability Results

| Flexibility(B) | Statistics Source | Model Exercise (A) | | Total |
|------------------------|-------------------|------------------------------|--------------------------|-------------|
| | | Plyometric (A ₁) | Weight (A ₂) | |
| High (B ₁) | N | 10 | 10 | 20 |
| | X | 14.80 | 11.20 | 13.00 |
| | S | 1.229 | 0.789 | 2.103 |
| | ΣX | 148 | 112 | 260 |
| Low (B ₂) | N | 10 | 10 | 20 |
| | X | 11.00 | 12.50 | 11.75 |
| | S | 0.816 | 1.269 | 1.293 |
| | ΣX | 110 | 125 | 235 |
| Total | N | 20 | 20 | 40 |
| | X | 12.90 | 11.85 | |
| | S | 2.198 | 1.226 | |
| | ΣX | 258 | 237 | 495 |
| | | 3420 | 2837 | 6257 |

The results of data analysis carried out using Anova is summarized and presented in Table 2.

Table 2.
 Summary of Two-Way Anava Results on Smash Ability.

| Source Variance | JK | Db | RK | Fh | Ft (0.05) | Ft (0.01) |
|--------------------|----------------|-----------|--------|----------|-----------|-----------|
| JKA (b) | 131.375 | 1 | 131.37 | 119.13** | 4.11 | 7.39 |
| JKA (k) | 11.025 | 1 | 11.025 | 9.997** | 4.11 | 7.39 |
| JKA (bk) | 65.0 | 1 | 65.025 | 58.96** | 4.11 | 7.39 |
| JKD | 39.7 | 36 | 1.103 | | | |
| Total (R) | 247.125 | 39 | | | | |

Based on Table 2, the results of the two-way analysis of variance can be described as follows.

Differences in Smash Ability between the Plyometric Exercise Method Group and the Weight Training Method Group. Based on the calculation results of the analysis of variance regarding the difference in the effect of the Plyometric method compared to the Burden Method on students' physical condition as shown in Table 16 above. It is proven that there was a difference between the training treatments, the value of F_h between column A is 9.997 which is greater than F_t of 7.39 ($F_h = 9.997 > F_t = 7.39$) with DK in the numerator $V1 (a-1)(b-1) = 1$, DK the denominator $V2 ab (n1) = 2 \times 2 (11-1) = 36$. This means that the null hypothesis (H_0) which states that there is no difference in smash ability between the Plyometric Method group and the Load Method group is rejected, or the research hypothesis fails to be rejected. In other words, it can be stated that there is a very significant difference in smash skills between the Plyometric Method Group and the Load Method Group.

Table 3
 Results of Advanced Two-Way ANOVA with Tukey Test

| Groups Compared | Price Difference Absolute Average | Dk | Q_h | Q_t | Result |
|---|-----------------------------------|------|--------|-------|-------------|
| A ₁ and A ₂ | 1.05 | 2;40 | 38.086 | 3.79 | Significant |
| B ₁ and B ₂ | 1.25 | 2;40 | 45.340 | 3.79 | Significant |
| A ₁ B ₁ and A ₂ B ₁ | 3.60 | 4;40 | 65.290 | 3.96 | Significant |
| A ₁ B ₂ and A ₂ B ₂ | 1.50 | 4;40 | 27.204 | 3.96 | Significant |

Based on further tests carried out using the Tukey test, the value of calculated Q (Q_h) = 38,086 is greater than Q table (Q_t) = 3.79 or $Q_h > Q_t$ at a significance level of = 0.05, with DK 2:40, so H_0 is rejected. Thus, it can be concluded that there is a significant difference between the Plyometric method and the Load Method. In other words, it can be stated that the smash ability of the Plyometric Method group has a higher effect than the Load Method group. Differences in Smash Ability with High Flexibility between the Plyometric Exercise Method Group and the Weight Training Method Group.

Based on the calculation results of the advanced analysis of variance with the Tukey test regarding the difference in smash ability which has high flexibility between the Plyometric group and the Load group, as shown in the table. There is a difference for the group with high flexibility between the Plyometric group (A₁B₁) and those trained with Weights. In groups A₁B₁ and A₂B₁ the calculated value of Q (Q_h) = 65.290 is greater than $Q_t = 3.96$ or $Q_h > Q_t$ at a significant level of 0.05, thus the null hypothesis (H_0); was rejected or the second hypothesis failed to be rejected. This means that the results of the smash ability with high flexibility with plyometrics are higher (good) than those with load ($XA_{1B1} = 14.80 > XA_{2B1} = 11.20$). Differences in Smash Ability with Low

Flexibility between the Plyometric Exercise Method Group and the Weight Training Method Group.

Based on the calculation results of the advanced variance analysis by using the Tukey test regarding the difference in smash ability which has low flexibility between the plyometric group and the load group, overall, as shown in the table above. There is a significant difference in low flexibility between the Plyometric group (A1B2) and the Load group (A2B2). In groups A1B2 and A2B2 the value of calculated Q (Q_h) = 27,204 is greater than Q table (Q_t) = 3.96 or $Q_h > Q_t$ at a significance level of = 0.05 meaning the null hypothesis (H_0) is rejected or the third hypothesis is accepted. Interaction between Training Model and Flexibility on Top Service Performance.

Based on the results of ANOVA calculations as shown in Table 2, there is an interaction between the exercise method and flexibility, namely the value of F_h column AB is 58.96 which is greater than F_t of 4.11, with DK in the numerator $V_1(a)(b) = 1$, DK in the denominator $V_2 ab(NL) = 2 \times 2 (10-1) = 36$. It means that the achievement of a high smash ability level is influenced by the interaction between exercise method and flexibility.

The interaction between training methods and flexibility on smash ability is described in the following figure.

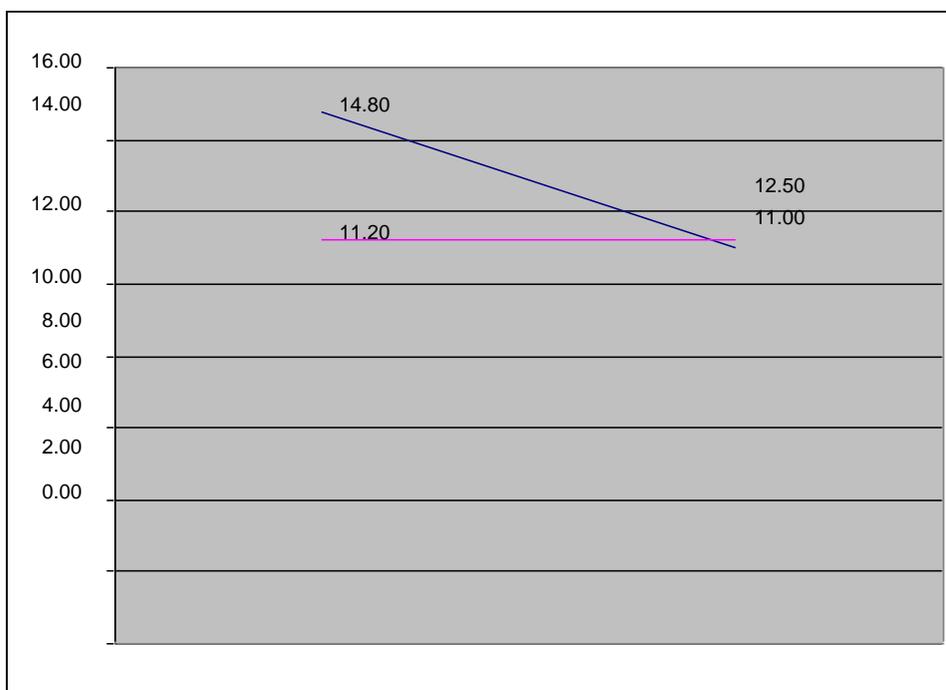


Image 1
Interaction of exercise model with flexibility

Discussion

The first hypothesis states that the plyometric training method (A1) has a better effect than those trained with the weight training method (A2) on smash skills in the sepak takraw. This can be accepted as true because it is following a significant analysis result. Plyometric exercise is one of the training methods that can increase strength, power explosive, and speed of muscle contraction. This exercise is very effective for improving straight smash ability. In plyometric training, athletes were directed to train kind of exercises that relies on developing explosive strength, reaction speed, and movement agility. Automatically the work of tendons, cross-bridges, actin filaments and myosin filaments that compose muscle fibres and sensors in the muscle spindles (proprioceptors) will produce fast muscle contractions or fast-twitch fibres and stretch reflex movements. Plyometric training aims to move quickly with full strength and lasts in the shortest time. This condition causes the protein myosin acts as an enzyme to break down Adenosine Triphosphate (ATP). In this condition, it used anaerobic energy.

Weight training is an exercise method that uses mechanical equipment such as barbells, dumbbells, weighted clothes, bats, flexible tubes, leg belts and so on which aims to increase strength, explosive power, strength and endurance, and have a positive impact on the development of technical abilities. straight smash in sepak takraw. Weight training is performed slower than plyometric training because the body gets resistance from a load. Physiologically, slow-twitch movements mean that muscle fibres are more active, than more slow-twitch fibres and the energy system tends to lead to aerobic energy. Weight training is also beneficial in the formation of muscle hypertrophy which helps the endurance of the muscles when doing explosive straight smashes. However, straight smashes are generally performed quickly. People who usually trained with weight training needs adjustments to do so.

Principally, plyometric training is more directed to the speed-strength approach which aims to produce explosive power according to the characteristics and the process of implementing a straight smash in quick and hard performance. Meanwhile, weight training is based on a muscular strength-endurance approach, so it seems static in the process but the end goal is to improve the quality of the straight smash technique. Thus, the overall results of the straight smash ability of sepak takraw athletes who were trained with the plyometric training method were better than the athletes trained with the weight training method. For the high flexibility group trained by the plyometric training method, the effect was better than those trained by the weight training method. The results of the

second hypothesis stated that for the group with high flexibility, plyometric training had a better effect on smash ability than weight training. This is accepted as true based on the results of the analysis which show the high significance.

These results are reinforced by the theory that flexibility is the ability to stretch the joint space as widely as possible, in addition to joint space, flexibility is determined by the elasticity of the muscles, tendons and ligaments. An athlete who has high limb flexibility will provide a great opportunity to produce faster and more agile movements. The athlete is more flexible in taking jumps, easier to lift his feet when hitting the ball, has the opportunity to hit the ball strongly, easier to move the ball during a smash and when he lands on the floor his feet spread more perfectly.

In connection with the formation of fast and agile movements, plyometric training is one of the exercises that aim to increase speed, explosive power, flexibility and especially flexibility in the limbs. The plyometric training resembles the movement in the basic straight smash technique in sepak takraw, which improved the quality of jump and speed. If someone has high limb flexibility, they will quickly and easily adjust when doing plyometric exercise movements. While the implementation of weight training is more emphasized in controlling movement and focusing on the limbs being trained to obtain a static result. Of course, athletes who have high flexibility need their adjustments when performing weight training.

Therefore, the smash ability in sepak takraw athletes who have high limb flexibility when trained with the plyometric method was better than athletes who were trained with the weight training method. For low flexibility, the weight training method has a better effect than the plyometric training method on high smash skills in the takraw game. The results of the third hypothesis stated that the plyometric training method (A1B2) had a better effect than the group training with the weight training method (A2B2) at a low level of flexibility on high smash skills in the sepak takraw game. This is accepted as true because the results of the analysis showed a high significance.

Athletes with low limb flexibility have a slower movement, so the weight training method was more suitable because the movement is almost static and it is easier to monitor movement errors. So, weight training will provide a solution for athletes with low flexibility to do straight smashes. Because smash does not always perform quickly but sometimes it should be slowly but the results are deadly. In principle, a takraw athlete whose movement is slow or has low flexibility does not mean that he has to force himself to smash quickly, but that he must be more adaptable to his physical condition. While

plyometric exercises aim to increase explosive power and are carried out dynamically and quickly, this certainly requires athletes with high limb flexibility. Thus, the smash ability for athletes who have low flexibility when trained with the plyometric training method is less effective than for athletes who were trained with the weight training method. The interaction between the plyometric training method and the weight training method with limb flexibility on the straight smash ability in the takraw game. The fourth hypothesis described that there is an interaction between the training method and flexibility on the smash ability in the sepak takraw game. This can be accepted as true since the results of the analysis showed a statistical significance.

Based on the results of the analysis calculation of variance regarding the interaction between exercise methods and achievement motivation on students' physical fitness, as a whole, which is shown in the table. It is proven that there is an interaction between the training method and flexibility, in which the value of Fh column AB is 58.96 which is greater than Ft of 4.11, with DK in the numerator $V1 (a)(b) = 1$, DK in the denominator $V2 ab(NL) = 2 \times 2 (10-1) = 36$. This means the null hypothesis (H0) which states that there is an interaction between exercise methods and flexibility in their effect on smash ability is accepted. In other words, it can be stated that the achievement of a high ability level of the smash was influenced by the interaction between training methods and achievement motivation. Based on these results, it can be concluded that there is an interaction between the exercise model and limb flexibility.

Previous research provides information about plyometric training (Arifin & Sofyan, 2018), which compared the effect of plyometric training on agility and power for soccer. There was an increase in high jump ability and agility but there was no impact on sprint ability. (Aldia & Pamekas, 2017) research proved that plyometrics in basketball players, who had been trained for eight weeks with three times a week meetings. The results of the study showed a significant effect on anaerobic power. (Ramadhan & Putra, 2015), the effect of plyometrics on the 30-meter running speed horizontal jump ability. A sample of 14-17 years old soccer players with plyometric training twice a week for four weeks showed no impact on running speed and horizontal and vertical jumping ability tests. (Saefulloh & Saputra, 2017), the effect of jumping rope with diagonals on leg power and agility showed an increase in leg power of 12% and agility of 1%. While the results for the diagonal jump are 8% for power and 2% for agility. (Ilham & Bagas, 2014) Plyometric training and weight training are both effective for increasing technical efficiency in running.

The next discussion is about weight training (Firmansyah, 2016). In this context, researchers proved that weight training can be used to lose weight. After 12 weeks of moderate-intensity exercise, five times a week, body weight and fat were reduced, and fitness improved. (Fadillah & Algifary, 2017) investigated the effect of weight training on balance, after training for four weeks there was an increase in balance from the initial score of 42 to 46. Subsequent research (Sholeh & Oktaviandi, 2010) Athletes did endurance training for more than 6 hours per week and weight training for 5 hours per week. After six months these two workouts increased VO2 max and efficiency as well as increased power. Based on a meta-analysis conducted by (Depdiknas,2018) concluded that weight training with heavy weights provides benefits in increasing running efficiency, exercise with maximum weights is carried out explosively, further (Slameto, 2018) in a fairly long exercise, for 40 weeks provides evidence that strength training increases maximum strength and relative strength, increases the effectiveness of running, increasing VO2max with a maximum dose of one repetition per device.

Both of these exercises can be used to increase strength and power. When strength and power have increased, it is assumed that can increase the ability to smash in sepak takraw. Smash is a combination of biomotor abilities and techniques (body coordination). The factor that induces biomotor is power, while power is obtained from strength and speed. Weight training will increase strength or power, while plyometric training could increase power. Weight training can also increase power by determining the dose of intensity and repetition rhythm that should be for power purposes. Plyometric exercises are exercises that are specifically intended to train power. Weight training based on research evidence also has the same impact on efficiency, strength, power, BMI, fat content, endurance and fitness. Based on this research and consideration, if the biomotor element is increased, it will automatically give a positive value to technical ability. An athlete who has stronger and more flexible can reduce the possibility of failing to perform a technique. By increasing the power, the smash ability also will be an increase.

CONCLUSIONS AND SUGGESTIONS

This study investigated the plyometric training method and the weight training method, the dependent variable was the ability to smash in sepak takraw, and the categorical variables were high flexibility and low flexibility. The following conclusions can be drawn from the present study. First, the overall results of the straight smash ability of sepak takraw athletes who were trained by the plyometric training method were better

than those who were trained by the weight training method. Second, sepak takraw athletes who have high flexibility of limb showed a better smash ability when trained with the plyometric method than athletes who were trained with the weight training method. Third, athletes who have low flexibility showed less effectiveness in smash ability when trained with the plyometric training method than athletes who were trained with the weight training method. Lastly, there was an interaction between the exercise model and limb flexibility.

Based on this conclusion, it can be understood that plyometric method training and weight training were able to increase smash ability in sepak takraw. When compared these two methods, plyometric was more effective in improving the smash ability of a takraw athlete.

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