

The contribution of flexibility and eye-to-foot coordination to the basic skills of sepak takraw

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Abstract

Problem: The problem of this study was the low basic skills of playing sepak takraw, including sepak sila, passing, and kedeng smash. Basic skills in playing sepak takraw need to be mastered by players, but the research investigated what physical abilities that supply these skills to be widely done. This study aimed to see the contribution of flexibility and eye-foot coordination to the basic skills of playing sepak takraw. **Method:** This research was quantitative research using a correlational approach. The study population was West Sumatran sepak takraw athletes, which were 45 people consisting of 30 male and 15 female athletes. Sampling was carried out by purposive sampling technique so that the number of samples in this study was 30 male sepak takraw athletes. Data collection techniques were carried out using several tests: (1) Flexibility test with flexiometer, (2) Eye-foot coordination test by punting the ball against the wall 20 times, 10 times each with the right foot and 10 times with the left foot (3) The basic skill test of playing sepak takraw consists of sepak sila, passing and smash kedeng. **Results:** The results of the study found that (1) flexibility contributed to basic skills of playing sepak takraw by 19%, (2) eye-foot coordination contributed to basic skills of playing sepak takraw by 22%, (3) flexibility and eye-foot coordination contributed to basic skills of playing sepak takraw by 44%. **Conclusion:** Thus, it is recommended that coaches and athletes be able to pay attention to these two factors so that basic skills in playing sepak takraw can be improved.

Keywords: flexibility, eye-to-foot coordination, Basic Skills of Playing Sepak Takraw, the physical condition of sepak takraw.

Introduction

Sepak takraw is a net football game played by two teams (three people each) on a field of a specific size that is competitive and increasingly popular (Tan et al., 2022; Guo & He, 2014). This high-speed game is explosive, acrobatic, and artistic and has a high level of difficulty. Sepak takraw is a game performed by two opposing teams, each player consisting of a left apit, right apit, and tekong, which is separated by a net has the same size and height as a badminton net (Maselena et al., 2016). This game begins with a service done by tekong to the opponent's field area. Then, the opposing team players try to play the ball using their feet, head, and limbs other than hands three times. The idea of a sepak takraw game is to turn off the ball on the opponent's field of play and try or try not to keep the ball from dying on its part of the field until the last number in each set to achieve victory (Maselena & Hasan, 2012). For this reason, a sepak takraw player needs good skills. In addition, it is also supported by tactics/strategies and excellent physical condition (Jawis et al., 2005).

The factors that affect the basic skills of playing sepak takraw are physical condition, technique, tactics/strategy and mental (Boughattas et al., 2022; Birrer & Morgan, 2010; Hou & Tian, 2022). So are the facilities and infrastructure, achievement motivation, training programs, and the coach's role (Cao et al., 2022; Alfano & Ercolano, 2023). One component of sports achievement is the technique that must be trained and learned (Gløersen et al., 2018; Cunha et al., 2021). Teknik yang baik tidak dapat diperoleh tanpa Latihan yang teratur (Zhang et al., 2019). In order to play well, a sepak takraw player must master basic and extraordinary techniques. The basic techniques of sepak takraw include *sepak sila*, *sepak cungkil*, *menapak*, *main kepala*, *mendada*, *memaha*, dan *membahu*. Basic technical abilities between each other are an inseparable unity (Sujae & Koh, 2008). A player must also master special techniques in the skill of playing sepak takraw, among these special techniques are ways to play sepak takraw, which include service, smash, passing, reservice and block. If these techniques are not mastered properly, then the game of sepak takraw may not be carried out correctly and perfectly (Asmawi et al., 2019).

In the basic skills of playing sepak takraw because many have high acrobatic art movements these movements freely in moving, one of the physical conditions needed to improve the basic skills of playing sepak takraw are coordination, agility, flexibility, speed, explosive power, strength, and endurance. Flexibility is the

ability to perform joint movements with expansive space for movement. High flexibility is needed by sepak takraw players for all player positions, both for tekong and left apit and right apit (Xin et al., 2021). Flexibility for sepak takraw players in the smash position will be evident when a smash by doing acrobatic movements with high ball reach, as well as body rotation above the air. So that players will be able to kick the ball with a hard shot to the opponent's field. With good flexibility, a sepak takraw player can perform skills such as carrying the ball (*sepak sila*), smash *kedeng*, and passing. Besides flexibility, movement coordination is also needed to improve basic skills in playing sepak takraw (Sulaiman et al., 2018).

Flexibility is an ability related to joints, namely the flexibility of joint movement owned by a person influenced by muscle flexibility and joint motion. Elasticity determines flexibility, whether or not the muscles, tendons, and ligaments are correct (Azevedo et al., 2008). It is carried out through programmed and continuous exercises (Cejudo, 2022). The thing that needs to be considered by the coach is that the development of athletes' flexibility abilities in children will be easier to improve compared to the abilities of older people, so this time needs to be used and challenged as the athlete's age increases (Shukuya et al., 2021).

Smash is the final attack in the skill of playing sepak takraw; one of the roles of physical condition needed is flexibility. It is suspected in this study that flexibility is thought to contribute to the skill of playing sepak takraw. One of the skills is smash *kedeng*. It can be seen during the implementation of the *kedeng* smash when the legs swing up. The fulcrum legs push up, as well as the rotation of the body as fast as possible by punting the ball on the air, acrobatic movements with good waist rotation will be seen until the time of a good landing as well (Nur & Ilham Kamaruddin, 2021). This is where it is suspected that the flexibility needed is the flexibility of the *togok* or the waist joint, which is more dominant to the smash skill. If the flexibility of the waist is not good, surely the landing time will not be good, and the fall of the leg will be wrong so that injury occurs. So, it can be concluded that the flexibility of *togok* is dominant in the skill of playing sepak takraw (Yarsiasat et al., 2019).

Coordination is a person's ability to combine several elements of motion into a series of harmonious movements per the goal. The coordination of movements needed is eye-foot coordination, the eyes to see when the ball comes, and the feet to control and hold the ball. With good eye-foot coordination, specific movements can be made to control and play the ball. With good eye-foot coordination, a sepak takraw player can control and play the ball well (Burnie et al., 2018; Jarvis et al., 2014). An athlete with good coordination can perform skills perfectly and easily and quickly perform skills that are new to him (Akpinar, 2022). He can also change and move quickly from one movement pattern to another to make his movements efficient (Chardonens et al., 2013). Good coordination is not only needed for individual sports but also required for team sports such as sepak takraw.

The dynamic movements in the sepak takraw game make coordination between players must be precise, and they must be able to understand each other so that there is no miscommunication between fellow players. (Davids, 2015) mentioned that coordination can be influenced by thinking power. Famous athletes are not only impressive with unique skills or good motor skills but also with ideas and how to solve complex motor and tactical problems, skills, speed of processing information, and accuracy of the five sensory organs (sensory) motor analysis and kinesthetic sensors and balance of the rhythm of muscle contractions are important factors in terms of coordination (Mulya et al., 2023). The role of coordination during sports is critical because, with high coordination skills, the athlete's reaction time and ability to change direction quickly will increase. This is certainly very much needed in the sport of sepak takraw, which requires athletes to move as quickly as possible using various existing techniques (Menezes et al., 2021).

Studies in sports biomechanics try to analyze the service techniques performed by sepak takraw players. This analysis is done by recording when athletes serve. The results of this analysis were beneficial for coaches because, with the analysis of the service image, it will appear that movement errors must be corrected by athletes so that in the future, the mistakes can be corrected and carried out training with strict control by the coach (Sujae et al., 2008). Other studies have also developed training models to improve serviceability in the sport of sepak takraw. The development research conducted by this researcher tried to develop a model of flexibility exercises needed by a *tekong* (server) when servicing. The height of the foot reach that can be achieved by the *tekong* when serving will be very advantageous because the ball can dive sharply because of the opponent's court if the contact between the foot and the ball is higher than it. This flexibility exercise model can increase the height of the foot position when a *tekong* serves (Syafaruddin & Ramadhan, 2021). Furthermore, A descriptive study reported that the movements made by the server and striker when competing are more than feeders, and players in this position also have much movement on the vertical axis, so this needs to be a concern for coaches to prepare their training programs.

From some of the research that has been done before, the physical condition factors that determine basic skills in sepak takraw games still need to be more, so this research needs to be done. This study aims to determine and reveal the contribution of hip flexibility and eye-foot coordination to the basic skills of playing sepak takraw. This research was expected to benefit athletes and coaches in finding out about the physical condition factors that determine the basic skills of playing sepak takraw and as input to improve achievement so that coaches can determine and apply the right factors that can improve the basic skills of playing sepak takraw.

Material & method

Study design

This research was classified as Quantitative research with a correlational approach, which aimed to determine the contribution of hip flexibility and eye-foot coordination to the basic skills of playing sepak takraw.

Participants

The population in this study was all sepak takraw players who were members of the West Sumatra sepak takraw training center, the total was 45 athletes consisting of 30 male athletes each with age characteristics between 17 years-24 years, height between 160 cm-182 cm, with body weight 50 kg-68 kg. Sampling was carried out using a purposive sampling technique. Determination of the sample by purposive sampling was some female athletes were injured and in an unfit state while conducting this research. So, it was feared that they were not optimal in doing the test and making the results of the study biased. Thus, the sampling in this study was determined to be only male athletes totaling 30 people.

Instrument

Flexibility test

A sit and reach test with a reliability level of 0.997 and validity of 0.993 was used to measure the flexibility of a person's hips. The test was carried out with the testee sitting upright with both feet closed and both toes flush with the edge of the measuring instrument. The testee made a bending motion or snubs forward. Position the hands while straightened parallel to the feet. The amount of pulling strength of the Testee's back muscles can be seen on the measuring device after the subject performs the test, measured in centimeters (cm). It was conducted three times. The best score was taken. The picture of the sit and reach test implementation can be seen in the following figure.

Eye-Foot Coordination Test

For eye-foot coordination, a foot-eye coordination test was conducted (Winarno, 2004). The Testee bounces the ball up, kicks it into the target, kicks the ball that bounces off the target before it falls on the floor, and catches it back. Before the test is carried out, testees were allowed to try so that they adapt to the test. The test is successful if the kicked ball hits the target; the bouncing ball can be kicked and caught again. Testees may not kick and catch the ball that bounces before the boundary line. The testee got the opportunity to do the test 10 times using the right foot and 10 times using the left foot. One kick that hit the target and can be caught correctly gets a score of 1. The number of scores obtained by the test is a kick that hits the target, is kicked and can be recaptured by the testee. The highest score the testee can achieve is 20.

Basic Skills Test for Playing Sepak takraw

The basic skills test for playing sepak takraw consisted of sepak sila, passing, and smash kedeng. The test items are taken as a T-score and then combined into an average T-score of basic skills playing sepak takraw. The test instrument was the dominant technique used by sepak takraw athletes and techniques often used when playing sepak takraw. The following can describe the forms of basic skill test instruments playing sepak takraw:

Sepak sila

The ball handling ability test is a test of the dominant basic technical abilities that must be possessed by sepak takraw athletes. This test instrument comes from (Winarno, 2004) with a reliability of 0.63. This test was carried out with two executions, and the best score was taken. This sila sepak test is carried out using the left and right feet for 1 minute as much as possible with the ball at shoulder height. The score was calculated from the numbers obtained from each soccer cross using the left and right feet for 1 minute and entered into the sheet format provided.

Passing test

The ball passing the test was carried out by controlling the ball with two touches directed at the target or plots, which the score obtained by the testee sums up. This test has a reliability of 0.78 and a validity of 0.99. This test was carried out with the testee at the boundary of the attack line that has been set. A ball bouncer from the opponent's area bounces the ball to the testee over the net. The testee controls the ball once first, then then makes a pass using a soccer cross. The pass must pass through the stretched rope, and the ball falls in the attack area with a value. Each testee is allowed to make 5 passes. The score was taken from the score where the ball falls in the target area, provided the ball must pass through the stretched rope. Ball passes that do not pass through the rope and do not fall in the attack area are scored one, provided that the ball bounces over the high point of the rope and falls close to the attack line. Passes over the net will not be scored. The overall score was obtained by adding up all the target scores from 5 passes.

Kedeng Smash skills

This Smash Kedeng test has determined the target score plots, which are summed up as a whole. This test was carried out with the testee in front of the net and ready to do a kedeng smash. The ball was floated toward the testee based on the desired height, usually as high as three meters in the air near the net. The testee will jump and perform Smash Kedeng over the net into the opponent's field. Each testee is given the opportunity 10 times to do kedeng smash. The score is taken from the score in the target area where the ball falls. If the ball falls right on the line that divided the two target plots, the score is recorded as the highest number. The overall score is obtained by adding up the total score of the target score with 10 opportunities.

Procedure

Following the problems and research objectives described earlier, the research was conducted to find information about the correlation of flexibility and eye and foot coordination on the basic skills of playing sepak takraw athletes. Systematic steps were first arranged by requesting permission from the samples involved, the campus and the West Sumatra Provincial sepak takraw Management. Researchers also formed a team to assist in implementing the research to be carried out. The team was trained in advance so that no errors occurred when the data collection was carried out. Before the test was carried out on the day of data collection, an explanation is given regarding the test items that will be used. All players followed the entire series of tests from start to finish. The players were in good health and are willing to take part in the data collection process to be carried out.

Statistical analysis

The data analysis technique used is simple and multiple correlation analysis. The first and second hypotheses were analyzed with a single correlation, while hypothesis 3 was analyzed with multiple correlations. Before analyzing the data above, the requirements test was carried out, namely the normality test to determine whether the data comes from a normally distributed population, carried out by the Lilliefors test and the linearity test.

Result

The data collected in this study was from the flexibility test results of eye-foot coordination on the basic skills of playing sepak takraw. Data that meets the requirements of the instrument is then processed. Before the hypothesis of this study was tested, the data is first tested for normality and linearity. The purpose of testing the normality of the sample was to test whether the data comes from a normally distributed population. The state of the data coming from a normal distribution was vital because it was required to use statistics for correlation and regression techniques. There are many normality testing techniques, but in this study, the normality test used was the Lilliefors Test with a real level (α) = 0.05.

Table 1. Summary of normality test of flexibility variables, eye-foot coordination, and basic skills of playing sepak takraw.

Variables	N	L_o ($\alpha=0.05$)	L_{label}	Conclusion
Flexibility	30	0.062	0.161	Normal
Eye-foot coordination	30	0.103	0.161	Normal
Basic skills of playing sepak takraw	30	0.097	0.161	Normal

It is necessary to do the F test to determine whether the equation is linear. With the criteria, if $F_{statistics} < F_{table}$ means the data is linear, and if $F_{statistics} > F_{table}$ means the data was not linear. For the linearity test of the regression of flexibility data on the basic skills of playing sepak takraw, $F_{statistics} 1.78 > F_{table} 5.77$ is declared linear regression. Furthermore, in eye-foot coordination on primary skills of playing sepak takraw, $F_{statistics} 0.61 < F_{table} 5.77$ was declared linear regression.

Table 2. Correlation test results between variables

Correlations between variables	N	r/R	Coefficient of determination
The relationship between flexibility and playing skills Sepak takraw	30	0.43	19%
Eye-foot coordination relationship with playing skills Sepak takraw	30	0.47	22%
The relationship between flexibility and eye-foot coordination with sepak takraw playing skills	30	0.67	44%

Discussion

In the first hypothesis test, flexibility significantly contributes to the basic skills of playing sepak takraw according to the results of the correlation coefficient analysis, $r = 0.43$, which states the magnitude of the relationship between flexibility and the basic skills of playing sepak takraw. Meanwhile, the contribution of the flexibility variable to the basic skills of playing sepak takraw is 19%. This means if the level of flexibility is high, the basic skills of playing sepak takraw tend to be high. On the other hand, if the level of flexibility is lower, the basic skills of playing sepak takraw tend to be lower. The results of this study are in line with the results of research conducted by (Henjilito et al., 2021), which states that good and accurate smash results will be obtained when athletes have good flexibility, coordination, and power as well, that the intellectual intelligence component will also support the achievement of a good smash. The flexibility needed in the basic skills of playing sepak takraw is dynamic and static because, with a wide area, it is straightforward to make movements, so the freedom of movement will be faster, too (Cappozzo, 2008). A smash needs flexibility in jumping up by turning the hips and legs as fast as possible. Flexibility is dominant in the skill of playing sepak takraw, where the flexibility needed is the flexibility of the hip. If flexibility training is carried out continuously after every exercise, the flexibility ability will be better; hence, flexibility training must pay attention to the factors that influence the athlete. Stretching exercises can improve and will make the body feel good. One method that can be used to increase flexibility is to dance. A study experiment conducted by (Alricsson et al., 2003) revealed that dance could increase muscle flexibility and joint movement of people who do it regularly.

On the other hand, flexibility training is used to maintain and increase strength (Nair et al., 2019). Flexibility can be improved through a variety of physical activities. The development of insufficient flexibility or no flexibility reserves will lead to various limitations, namely the degree of joint ability with movements that can be performed maximally at standard freedom of movement. If an athlete's flexibility is low, there will be obstacles to implementing one of the techniques commonly performed (Yennan et al., 2010). Therefore, it is a loss if the athlete's flexibility is very low. Explained that there are several disadvantages when flexibility is very low, namely: (a) learning or refinement of various kinds of movements will be damaged (Sulowska-Daszyk et al., 2020), (b) athletes tend to get injured easily (Mizutani et al., 2023), (c) the development of strength, speed and coordination is negatively affected (Valadão et al., 2021), (d) the quality of motion performance is limited (if an individual has flexibility, skills can be performed quickly, energetically, and expressively) (Liang et al., 2019). In the second hypothesis test, eye-foot coordination makes a significant contribution to the basic skills of playing sepak takraw according to the results of the correlation coefficient analysis obtained $r = 0.47$, which states the magnitude of the eye-foot coordination relationship with the basic skills of playing sepak takraw. Meanwhile, the contribution of the eye-foot coordination variable to the basic skills of playing sepak takraw is 22%. This means if the level of eye-foot coordination is high, the basic skills of playing sepak takraw tend to be high. On the other hand, if the level of eye-foot coordination is lower, the basic skills of playing sepak takraw tend to be lower. The level of coordination ability of a sepak takraw player reflects the ability to move in various levels of difficulty quickly, purposefully and efficiently. Players who have a good level of eye-foot coordination will be able to perform skills perfectly and also quickly solve task problems that arise unexpectedly during training. In connection with the above, determining the level of coordination ability (eye-foot) can be seen when the player performs movements efficiently, sequentially, and on time.

The movement is well controlled, meaning the movements appear easy, simple, and smooth; rhythm requires coordination, and the results are optimal (Raab et al., 2005). High eye-foot coordination will support performance in creating effective and efficient technical skills (Cherepov et al., 2021). Good coordination can be improved in various ways, including audio-visual media technology. Athletes trained with non-audio-visual media need better coordination skills, which will also affect their playing skills (Chaeroni & Surur, 2023). The ability to play sepak takraw is related to the athlete's cardiorespiratory fitness level. Players who quickly experience fatigue tend to have poor coordination because their muscles can no longer perform optimally, so what the brain commands no longer follows what is done (Kriswanto et al., 2019). The coach should give training during technical training sessions and coordination tactics. It aims to increase the athlete's coordination. Coordination exercises that are consistently trained will improve athletes' skills when playing in a match (Jaworski et al., 2021). In addition, the ability of the lungs to consume oxygen optimally will support the muscle work process to perform good coordination, and oxygen supplied by the blood to all body tissues optimally will increase the athlete's ability to exercise (Garnov et al., 2019). Sepak Takraw players must be able to coordinate their leg and hand muscles to move quickly and precisely in anticipating attacks that will be carried out by opposing players, so coordination is essential in this sport (Weir et al., 2019).

Although the researcher has made every effort, the researcher realizes there are still some areas for improvement in this study. The study only used a male sample. Therefore, it could not be generalized to female samples. This research was only conducted on West Sumatra province sepak takraw athletes, so the results of this study cannot be generalized to other sports clubs. Other physical factors that are not controlled are also thought to influence the results of research, including agility, explosive power, reaction speed, balance, and speed.

Conclusion

Flexibility and eye-foot coordination significantly contributed to the basic skills of playing sepak takraw. The results of this study were expected to be able to increase the knowledge of sepak takraw coaches in training flexibility, predominantly static and dynamic flexibility, because this element was very much needed to improve the skills of playing sepak takraw, one of which is the *kedeng* smash skill. It indicates the coach must have excellent knowledge in developing these flexibility exercises. Coaches forming a good team must look for players with high flexibility and eye-foot coordination. In addition, coaches need to develop various forms of training that can improve flexibility and eye-foot coordination.

Moreover, the practical impact of this research was that the skill of playing sepak takraw was influenced by physical elements, not only the number of repetitions carried out, but the coach must also think about the relationship of these skills with various physical aspects based on what this study was found. It was to correlate with flexibility and coordination of the hand's eye. The coach must continue to dig deeper about what methods are suitable to improve both elements of physical condition and apply it to athletes so their basic skills in playing sepak takraw can be improved. Theoretically, the results of this study had an impact on new knowledge of the sport of sepak takraw, which still needs to be found in the existing literature. The assessment of physical aspects associated with skills becomes new knowledge for coaches, which can be applied to existing clubs during field training. Future researchers are expected to conduct research with a larger sample and look at other physical conditions.

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