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The effect of exercise model and limb length on the accuracy of kuda service in sepak takraw

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Abstract: This study aims: (1) the differences in the effect of static and dynamic targets on the accuracy of kuda service; (2) the effect long and short limb on the accuracy of kuda service; and (3) the interaction between of static, dynamic targets and limb lengths (long and short) on the accuracy of kuda service by sepak takraw male players. This study method was an experimental research factorial design. The population was 32 athletes from PSTI Club Sleman and Bantul. 24 samples were chosen based on Slovin formula using the simple random sampling method. Data were collected through pretest and posttest by measurement leg length and service accuracy ability tast. Analyzed using analysis of variance (two-way AN0VA) at the significant level of $\alpha = 0.05$. Results showed that: (1) there was a significant difference in effect of static dynamic targets on accuracy of kuda service; (2) there was significant difference in effect long short limbs on accuracy of kuda service; (3) there was a significant interaction between of static, dynamic targets and limb length (long and short) to the accuracy of kuda service in sepak takraw male players.
Keywords: static targets, dynamic targets, limb length, exactness of kuda service, sepak takraw.

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INTRODUCTION

Sepak takraw is a sport that originated in Southeast Asia. Sepak takraw began to be accepted and played at the 1990 Asian Games in Beijing, China the 1994 Asian Games in Hiroshima, Japan 1998 in Bangkok. The world's sport's governing body, the International Sepak Takraw Federation, founded in 1992, has since attracted membership from countries including the United States, Korea, China, Japan, Pueno Rico and many European countries (Sukmana & Muharram, 2017)

At first, the game of sepak takraw was known as soccer. This game is played on a rectangular court with a flat surface both indoors and outdoors such as a badminton double court area, with two teams against each other (Jawis et al., 2005). “(1). According to a study, though similar to the gameplay of volleyball, Sepak takraw is a complex netbarrier sport that players are allowed to use all parts of their body except their hands or arms to hit the ball (2). "Sepak" is the Malay word for kick and "takraw” is the Thai word for a woven ball, therefore sepak takraw quite literally means “to ball kick.” According to observation, the choosing of the Sepak takraw name for the sport was essentially a compromise between Malaysia and Thailand, the two powerhouse countries of the sport (3). In the Philippines, Sepak takraw has been closely controlled “sipa,” a traditional native sport in the country. “Sipa” used to be the national sport of the country before it was replaced by “Arnis.” In “sipa,” This game aims to kick the ball made out of rattan fragments, back and forth over a net in the middle of the court much like that of Sepak takraw.” (Han et al., 2018; Chen et al., 2018; Artyhadewa, M. (2017))

Kuda serve is a kick made by servis, using the back of the foot or a kuda with the ball position to be kicked by the flank higher than the head (Yunitaningrum, 2020). This kuda serve is also often used at the regional and national level, both in the student and general categories, because it is more effective in getting points or turning off the ball correctly and quickly compared to other top services. This is evidenced by observation entitled "Technique analysis of the kuda and sila serves in sepak takraw" by, (Sujae et al., 2008) states that the kuda servicing technique is a very complex technical skill so must be

proficient in serving on the precepts before advancing to the kuda service. kuda service. Based on the general assumption of takraw coaches and players, the superiority of kuda serve results in the ball being precise and at high speed.

There are several models of kuda service training to improve the results of service accuracy, namely by training static targets and dynamic targets. Static target training is a way of training to perform back serve movements at a stationary or fixed target position such as a suspended ball and. In the static target training model, athletes can find out errors during their service, so they are quick to fix them and the coach can always supervise or monitor the implementation of the exercise (Iqbal Nur Huda, James Tangkudung, 2021). The dynamic target training is the movement of the kuda's serve with a changing or dynamic ball target that aims to train timing, such as throwing yourself, friends, and coaches (Zularsyi Fath, 2019). In this respect the dynamic target training model there are opportunities in the enrichment of the movement skills being trained and the dynamic ball conditions require athletes to be more skilled (Guadagnoll & Lee, 2004)

In addition to mastering good technique in the game of sepak takraw, the ability to place targets is one of the most important factors in playing sepak takraw. The accuracy of the target in question is the ability to place service on a predetermined target (Hasim, 2019). That get points, a player tries to place the ball right on the target at a ball fast speed that is far from the opponent's reach and directed, making it difficult to return the ball.

One internal factors important role in service ability is leg length. The lower extremities, the longer the legs of a servise, then some of the advantages that will be obtained are the higher the ball's height range, the wider target, allowing for fast, hard, so that the ball is straight and easy to direct (Zainal Arifin, 2016).

This study aims to determine: (1) the differences in the effect of static target training and dynamic targets on the accuracy of kuda serve on young men sepak takraw athletes, (2) differences in the accuracy of back serve on young men sepak takraw athletes who have long legs and short legs, and (3) the interaction between static target training, dynamic target and leg length on the accuracy of kuda serve in young men sepak takraw athletes.

METHOD

This research is an experimental study of factorial design. The factorial experiment is a modification of the true experimental design, taking into account the possibility of a moderator variable affecting the independent variable on the dependent variable (Zaenal Arifin, 2020). The research method used in this study is a 2x2 factorial design, where each factor consists of two levels, by comparing the results of the final test (posttest). According to (Anam et al., 2019) factorial experiments are experiments in which almost or all levels of a factor are combined or crossed with all levels of every other factor in the experiment.

The independent manipulative variables in this study were static target exercises and dynamic targets. The attributive independent variable is leg length. Then the dependent variable is the accuracy of the kuda serve on the sepak takraw athlete. The research design in question can be seen in table 1.

Table 1. Factorial Research Design 2 x 2

Model exercise (A)	V. Attribute	Leg Length (B)	
	V. Manipulative	Long (B1)	Short (B2)
	Target Statis	A_1B_1	A_1B_2
	Target Dinamis	A_2B_1	A_2B_2

Description :
(A1B1) : The sample group skilled using static target exercises that have long legs.
(A2B1) : The sample group skilled using dynamic target exercises that have long limbs.
(A1B2) : The sample group skilled using static target exercises that have short limbs.
(A2B2) : Sample group trained using dynamic target exercises that have short limbs.

The population in this study amounted to 32 young male athletes at the sepak takraw club PSTI Sleman and Bantul. The number of samples was 24 athletes, consisting of 12 from the PSTI Sleman club who were given static target training and 12 from the PSTI Bantul club with dynamic target training, aged 14-18 years, calculated using the slovin formula and taken by random sampling.

Table 2. Grouping of Samples Based on Treatment

Model exercise (A)	Leg Length (B)	
	Long (B1)	Short (B2)
Static Target	6	6
Dynamic Target	6	6

Based on the table above, it was found that 12 athletes who had long legs and 12 athletes who had short legs were given static target and dynamic target training models.

Technical analysis of data in this study using SPSS version 20.0 software for windows with analysis of variance or two-way ANOVA (two-way ANOVA) with a significant level of = 0.05, then by comparing the averages, the Tukey test is used (Zahara et al., 2017). Before arriving at the two-way ANOVA test, it is necessary to test the requirements inclusive of: normality test with Kolmogorov Smirnow and homogeneity with Levene test and hypothesis testing.

Measurement of leg length the method of measurement is: 1) Testi stands upright in an anatomical position on a flat floor without wearing footwear. 2) The testor palpates the outermost bone on the lateral side of the thigh and when the thigh is lifted up and returned to its original position, the greater trochanter appears to move. 3) The testor puts the tape measure at the major trochanter point, then pulls the tape measure up to the bottom of the foot, the instrument used to measure is the anatomical meter which is calculated in centimeters. Sepak takraw accuracy service test implementation of the test: 1. Being in the tekong circle line position on the takraw field, 2. Tekogg tries to direct the ball to the field area by crossing the net, 3. Tekong serves 20 times with the help of bounces from other players, 4. The target area consists of 5 target directions with a score of 1-5 according to the level of difficulty, 5. The overall score is obtained by adding up the scores.

Table 3. Service Instrument Validity

Instrument	Validity	Description
Service Accuracy Ability	0,759	Valid

Table 4. Serviceability Test Reliability

Instrument	Validity	Description
Service Accuracy Ability	0,822	Reliabel

RESULT AND DISCUSSION

The results of the prerequisite test, namely the normality and homogeneity test of the data, were produced, research data were normal and homogeneous. The research hypothesis was tested based on the results of data analysis and interpretation of the analysis of variance (two-way ANOVA). The results of the calculation of the analysis of variance are presented in Table 5.

Table 5. Summary Two-Sided. Analysis of Variance (AN0VA) *Two-Way*

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Exercise Model	12,042	1	12,042	5.850	0.025
Leg Length	345.042	1	345.042	167.632	0.000
Model_Practice * Leg Length	135.375	1	135.375	65.769	0.000

Based on the results of the analysis of variance, the first hypothesis, the calculation shows the difference in effect between static and dynamic target training. This is evidenced by the calculated F value of 5.850, p of 0.025 <0.05. That is, there is a difference in the effect of static and dynamic target training on the accuracy of kuda service in young men sepak takraw athletes.

The results of the second hypothesis, the calculation is known, there is a difference in the effect of long legs and short legs on the accuracy of kuda service in young athletes of sepak takraw. This is evident from the F value of the final test count of 167,632 at a significance level of 0.000 <0.05.

Interaction between Training Model and Leg Length on Accuracy of Kuda Service in Young Athletes

The results of the third hypothesis, the calculation is known, "there is an interaction between the training model of static, dynamic targets and leg length on the accuracy of kuda service in young men sepak takraw athletes". This is evidenced by the p of 0.000 < 0.05. Because the significance value of p is 0.000 <0.05, and the F count is 65,769, it means that Ho is rejected. Based on this, it means that the hypothesis states that there is a significant interaction between the service training model (static and dynamic target) and leg length (long and short) on the accuracy of kuda service in young men sepak takraw athletes, has been proven.

Diagram of the interaction results between service training models (static and dynamic targets) and leg length (long and short) on the accuracy of kuda service in young men sepak takraw athletes. It can be seen in Figure 1, as follows.

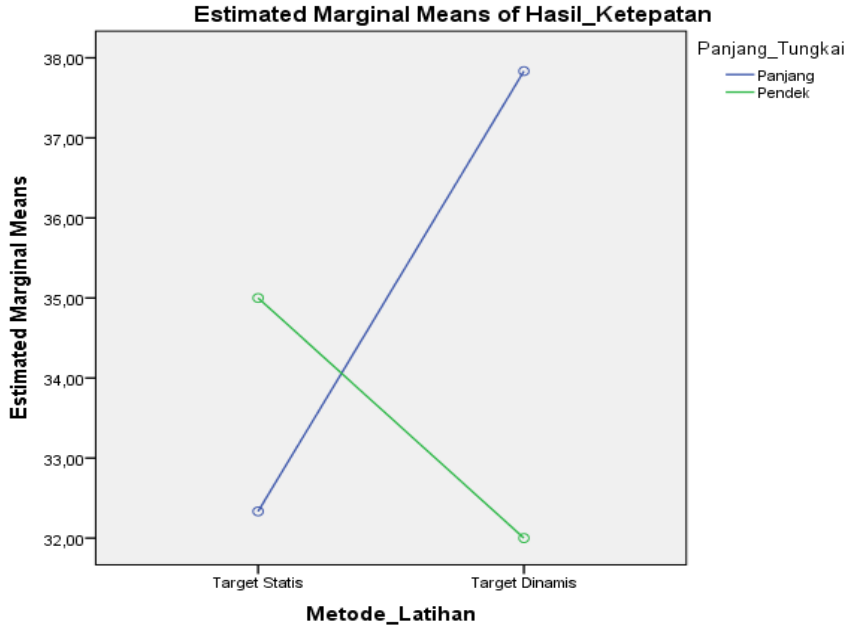

Figure 1. Interaction Diagram

After being tested, it can be seen from the interaction diagram that they cross each other, due to the impact of the interaction. The results of the hypothesis test state that there is an interaction between the static target service training model and the dynamic target and leg length (long and short) on the accuracy of kuda service in young men sepak takraw athletes, it is necessary to carry out further testing using the Tukey test. Further test results can be seen in Table 6 below:

Table 6. Summary of Test Results *Post Hoc*

Group	Interaction	Mean Difference	Sig
A1B1	A2B1	-6,1667*	0,000
	A1B2	2,8333*	0,013
	A2B2	6,1667*	0,000
A2B1	A1B1	6,1667*	0,000
	A1B2	9,0000*	0,000
	A2B2	12,3333*	0,000
A1B2	A1B1	-2,8333*	0,013
	A2B1	-9,0000*	0,000
	A2B2	3,3333*	0,003
A2B2	A1B1	-6,1667*	0,000
	A2B1	-12,3333*	0,000
	A1B2	-3,3333*	0,003

Based on the results of the Tukey test calculation on the asterisk sign (*) it shows that the pairs that have interactions or pairs that are significantly different (significantly) are: (1)A1B1-A2B1, (2) A1B1-A1B2, (3) A1B1-A2B2, (4) A2B1-A1B2, (5) A2B1-A2B2, and (6) A2B2-A1B2, Thus it can be concluded that: (1) the sample group trained using dynamic target exercises that have long limbs is better than those trained using static target exercises that have long limbs, (2) the sample group trained using static target exercises that have long limbs is better than the sample group who were trained using static target exercises that had short limbs, (3) the sample group trained using static target exercises that had long limbs was better than the sample group trained using dynamic target exercises that had short limbs, (4) the the sample trained using dynamic target exercise that has long limbs is better than the sample group trained using static target exercise which has short limbs, (5) the sample group trained using dynamic target exercise which has longer limbs is better than and the sample group trained using dynamic target exercises that have short limbs, (6) the sample group trained using dynamic target exercises that have short limbs is better than the sample group trained using static target exercises that have short limbs.

The results of the pairwise analysis of variance with Tukey's further test showed that there were 6 pairs significantly different, namely: (1)A1B1-A2B1, (2) A1B1-A1B2, (3) A1B1-A2B2, (4) A2B1-A1B2, (5) A2B1-A2B2, and (6) A2B2-A1B2.

Differences in Effect of Training Static and Dynamic Target on Kuda Service Accuracy Results

The static and the dynamic target training model have a significant effect on the accuracy of the kuda serve. Dynamic target training is higher (good) compared to static target training. The dynamic target training model is a service training model that aims to train timing chain on ball hits where the dynamic ball condition and the ball that is bounced also varies in the air with the help of friends and own bounces. According to the opinion, exercise in which there is repetition of keywords of the same skill during several treatments or experiments is trained (Vainikka et al., 2011).

The training model that is more effective in improving the accuracy of serving horses is the dynamic target training category, when compared to the static target training category, because the kuda service training model with dynamic targets is more applicable in the game of sepak takraw or the same as the actual training. Through dynamic target training with changing ball conditions, athletes can practice timing in favor of the ball when serving, providing opportunities for enrichment information of the movement skills being trained.

It is strengthened by the results of the research below entitled: “The Influence of Static and Dynamic Training Method and Eye-Hand Coordination Training Method toward the Float Serve Accuracy”. Dynamic target training has a better effect than static target training on float serve accuracy, as seen from the average dynamic target training result which is higher than the average static target training result. This means that the average dynamic target training group is better for me, because the average results are more than the average results of static target training (Adam, 2014).

This paper is based on adaption processes explained under the theory of allostasis and the general adaption syndrome and shares the background of the Dynamic Systems Theory, to propose the concept of practice load as a useful tool to quantify changeability of practice in motor learning. From this standpoint, the conditions of variable practice are reviewed to be a stimulus in an adequate magnitude and direction to take the learner to a higher level of performance and hence to optimize motor learning (Morillo-Baro et al., 2015).

Movement skills are the ability to perform movements efficiently and effectively, this is in the process of forming the motion that does not occur automatically, but is an accumulation of the process of learning and practicing, namely by understanding the movement and performing repetitive movements accompanied by consciousness of the movements performed. (Susana, 2013). Another thing explains that motor learning is a series of processes related to practice or experience that lead to relatively permanent gains in abilities for skilled performance (Raiola, 2017).

In practicing a skill, one will not necessarily master the technique in an instant. In mastering a technique that is learned a person will go through several stages such as the cognitive learning stage (cognitive stage), associative learning stage (Associative stage), automation stage (autonomous stage). In this case, the pecing pad service and the friend's bounce are designed to be able to serve as expected.

Based on the above opinion, it can be concluded that, the increase in the accuracy of the kuda service ability in sepak takraw that occurs due to the association of knowledge obtained by the child at

the previous meeting with new knowledge and the association is stronger when it is done repeatedly, so that the service movement is increasingly mastered. and there will be of movement which has an impact on increasing the accuracy of the kuda servicing ability.

Differences in the Influence of Athletes with Long and Short Legs on the Accuracy of Kuda Service in Athletes of Young Men Sepak takraw

Leg length is the vertical distance between the soles of the feet to the groin measured by standing upright (Nasirudin, 2015). Leg length as one of the lower limbs has an important role in sports performance. As a lower limb, the length of the leg serves as a support for the motion of the upper limb, as well as a determinant of movement both in walking, running, jumping, and kicking. Someone who has a longer leg length than the other will likely have a better kick because it is wider in range especially in a tekong sepak takraw.

The form Basically of kick in the back service technique is in a circle, so the speed of the ball (V ball) kicking depends on the angular velocity produced by the rotation of the foot used for kicking. In a rotational motion, the point of matter that follows the motion, its linear velocity is directly proportional to its radius, so if r gets bigger, the velocity (v) gets bigger too, and if r gets smaller, the velocity (v) gets smaller too (Hidayat et al., 2020)

Based on the formula for calculating Moment of Inertia (I) = m.r2, in this case, it can be determined the mechanical factors that affect the Force (F), Momentum (L), Kinetic Energy (KE) Work-Energy (WE) at service kick technique. The greater the moment of inertia, the greater the force, momentum, and KE produced. Likewise, the required WE is also getting bigger. So if a service wants to produce a service with a ball that is fast, strong, and directed, he must also pay attention to the momentum of inertia he produces, namely by increasing it. Thus, because Moment of Inertia (I) = m.r2 in this case m = mass of the leg, r = length of the leg. In the training process, what needs to be done is to increase the mass of the legs by giving weight training, so that the strength of the legs increases. Likewise, with weight training, muscle and bone mass will also increase as a result of hypertrophy and bone density. Speed training must also be done because, with strong and fast muscles, it can produce power (P), momentum, and angular velocity.

As for body size in the form of height, you will be lucky to speed of movement, because the taller a person is, the longer the legs will be. Then the long and slender muscles will allow for fast and broad gestures, because the legs with long levers are affected by the speed of movement and the speed of movement is proportional to the size of the radius, namely the length of a person's limbs. So the longer the legs, the farther the reach which will contribute when serving horses in sepak takraw.

Reinforced by the results of a study entitled, "Technique Analysis of The Kuda and Sila Serves in Sepak takraw", that the lower extremity of service longer limbs can contribute to the higher the ball's height range service, so that it will expand the target target and make it possible to perform a better service. fast and sharp at the time of release (Sujae & Koh, 2008: 86). The same thing in the results of the study, "Analysis of Upper Service Movements in Sepak takraw Game based on the Concept of Biomechanics", is that with the length of a servise limbs, some of the benefits that will be obtained are the moment of inertia (I) will be even greater, because the fingers are bigger (r), the higher the ball's height range, making it possible to serve hard, fast and the target is getting closer (Arifin, 2014: 101).

Interaction between Training Method and Leg Length on Accuracy of Kuda Service in Athletes of Young Men Sepak takraw

The results of the hypothesis test that have been put forward, that there is a significant interaction between static, dynamic targets training and leg length on the accuracy of kuda service in sepak takraw adolescent athletes.

From the results of the form of interaction, it appears that the main research factors in the form of two factors show a significant interaction. In the results of this study, the interaction means that in each cell or group there is a difference in the effect of each paired group.

Athletes who received training treatment using static and dynamic target training on kuda service accuracy. The group of athletes who received service training with dynamic targets had better kuda service accuracy, compared to the group of players who received static target training models. The practice of the accuracy of serving kuda with a static target model is a method or method of training

the accuracy of serving kuda by serving continuously. This model has a good effect on athletes because with a static or fixed target training model, athletes have the opportunity to repeat several times, so that repetition is carried out so that automatic movements occur with this model, it will be easy to adapt to the strokes being trained.

Kuda service, capability training with a dynamic target model is an exercise with a method or method to train the accuracy of the kuda service by training the timing because the target is not fixed or the condition of the ball changes or is dynamic in carrying out the exercise. This model has a positive influence on developing athletes' creativity because the dynamic target training model requires athletes to be more skilled. This training model will also allow the accuracy of the kuda serve to estimate the power, speed, and height of the ball when serving.

The short length of a person's legs greatly affects the ability of the kuda service accuracy. Long limbs play a role in reaching the ball's height when serving. Therefore, with long legs, fast and strong service movements will provide optimal results. Leg length is influenced by the proportion of a person's body based on genetics or heredity. As a support for the movement in serving long legs, it provides relatively better advantages compared to short legs. The same thing in the research results, 116 "Analysis of Upper Service Movements in Sepak Takraw Game with Biomechanics Concepts", is the leg length of a server or tekong. So some of the advantages that will be obtained are the moment of inertia (I) will be even greater, because the greater the learning- finger (r), the reach to reach the ball is getting higher, making it possible to serve hard, fast, targeted and wider targets (Zainal Arifin, 2016). Reinforced by the results of a study entitled, "Technique argument of The Kuda and Sila Servessin Sepak takraw", that the lower limbs of a tekong's longer limbs can contribute to a higher serving reach for the ball, so that it will expand the target and allow for fast service, sharp and purposeful at the time of release (Sujae et al., 2008).

CONCLUSION

There is a significant difference in the effect of static targets and dynamic targets on the accuracy of kuda service; there is a significant difference in the effect of long limbs and short limbs on the accuracy of kuda service; and there was a significant interaction between of static targets, dynamic targets and limb length (long and short) to the accuracy of kuda service in sepak takraw male players.

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