

## The Influence of Plyometrics Training and Reaction Time on *Serang – Hindar* Ability on Pesilat

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### Abstract

The background of the problem is the low *serang - hindar* ability of the fighter, the purpose of this study is to determine and analyze the effect of plyometrics training, namely single leg bounding and double leg speed hops, analyze the effect of high and low reaction time, analyze the effect of plyometrics training with reaction time and analyze the interaction between plyometrics training and reaction time on the attack-avoidance ability of the fighter. This study uses an experimental method with a 2x2 factorial design, the data analysis technique uses Analysis of Variance (Anova) at a significant level of (0.005). The population in this study were 24 fighters. The sampling technique used total sampling with a sample of 24 fighters. The results of this study: 1. To analyze between single leg bounding and double leg speed hop exercises with a significant value of  $\text{sig} (0.000) < (0.005)$  and a value of  $F_{\text{count}} 18.730 > F_{\text{table}} 0.250$ . 2. To analyze between high and low reaction times on the ability to attack - hinder the fighter with an average value of  $\text{sig} (0.000) < (0.005)$  and a value of  $F_{\text{count}} 12.992 > F_{\text{table}} 0.250$ . 3. To analyze the single leg bounding exercise with high and low reaction times on the attack-avoidance abilities of the fighter with an average pre-test score of  $55.83 > 49.58$  and post-test  $73.42 > 64.00$ . 4. To analyze the double leg speed hop exercise with high and low reaction times on the *serang - hindar* ability of the fighter with an average pre-test value of  $47.08 > 37.08$  and post test  $78.33 > 67.92$ . 5. To analyze the interaction between plyometrics training and reaction time on the *serang - hindar* ability of the fighter with a value of  $\text{sig} (0.915) > (0.005)$  and an  $F_{\text{count}}$  of  $0.552 > F_{\text{table}} 0.250$ . Based on this research, plyometric exercises, namely single leg bounding and double leg speed hop exercises can improve *serang - hindar* abilities, high reaction times are better than fighters with low reaction times.

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## INTRODUCTION

Pencak silat is a martial art created by the culture of the Indonesian nation to defend itself from the dangers that threaten its safety and survival, pencak silat is strongly influenced by the philosophy, culture and personality of the Indonesian nation. In Indonesia, the term pencak silat only began to be used after the founding of the IPSI (Indonesian Pencak Silat Association) pencak silat organization, previously in Sumatra it was better known as silat, while in Java it was known as pencak only. The pencak silat organization in Indonesia called the Indonesian Pencak Silat Association or IPSI was founded on May 18, 1948 in Surakarta, which was initiated by Wongsonegoro, who at that time served as Chairman of the Cultural Center of Kedu (Lubis and Wardoyo 2014).

Self-defense has basic techniques that can be used such as punches, kicks, locks, slams, cuts and it is determined how to do attack and dodge techniques (Lubis & Wardoyo, 2014). The techniques in pencak silat are quite diverse Saputro & Siswantoyo, (2018), while in practice not all techniques can be used, because there are several attack techniques that can endanger the safety of the fighter (Widiastuti and Fhitriani 2017).

The Sumlili Village Branch is a branch located in Sumlili Village. The field used for training is at the Sumlili Village Office. Practice schedule every Tuesday, Thursday, and Saturday. The level group is red belt and black belt (basic level II and Cakel). The Sumlilli Village Branch was born due to the factor of wanting to develop the ability to *serang - hindar* on the fighter from Sumlili Village Branch.

Based on the results of observations on March 25 and interviews with coaches that there are still many fighters who have not mastered the ability to *serang - hindar*, then this is due to a lack of understanding of techniques in *serang - hindar*. Considering the importance of mastering the *serang - hindar* ability of the fighter.

The Sumlili Village Branch has experienced several factors that affect the ability

to *serang - hindar*, namely the pattern of steps, the movement process that is not yet on target in carrying out *serang - hindar* by fighters. Thus making the fighter of the Sumlili Branch of the Village still lacking in the ability to *serang - hindar* with other branches. Therefore, the researchers took *serang - hindar* skills training to be improved on the Sumlili Village Branch.

There are several techniques in pencak silat related to *serang - hindar*, namely: hand parry from top to bottom, foot parry, punches, kicks. Sutantri (2018). In the ability to *serang - hindar* there are three kinds, namely: *serang - hindar* in physical form, *serang - hindar* in the form of words or writing, and *serang - hindar* in the form of spirit that is using the brain and spirit of patience.

Attack and dodge techniques consist of two forms of technical skills, namely attacking quickly and dodging sideways quickly as much as two times to dodge and two times to attack, with one cue two movements are used. The entire set of technical skills has a target direction in order to get the reflex motion, so it is called an *serang - hindar* technique skill (Anggara prabawa 2017).

In carrying out attack and avoidance movements cannot be done arbitrarily because it can cause injury and must be under the supervision of the coach. Parry is a movement that makes direct contact with the opponent's attack Ihsan (2018). Reaction time is the interval between the reception of a stimulus to a conscious motor response. Reaction time is the time between giving a stimulus to someone until the first muscle reaction occurs or the first movement occurs (Megantara 2018).

Many factors can affect reaction time, including: type, stimulus, age, gender, use of the right or left hand, amount of stimulation to the stimulus, nutrition, alcohol, physical activity, exercise and fatigue Şenel and Eroğlu (2006). Reaction time is also considered a key factor determining performance in many sports (Van Biesen et al. 2017).

Everyone has different abilities, individual reaction time plays an important role in all forms of sport and is decisive in the unfolding of

a competition, where the athletes attending have achieved the same level of physical exercise. (Muraru & Turliuc, 2012).

**METHODS**

The research used in this study was a factorial design. In a factorial design, treatments are arranged in such a way that each individual can be subject to different factors at the same time and each factor consists of several levels. Factorial design is part of an experimental research consisting of two or more independent variables combined. The experiment referred to in this study is an experimental method with a pretest (pretest) and a final test (posttest).

In this study, the variable is the manipulative independent variable, namely A1: Single leg bounding exercise with a high category reaction time. A2: Single leg bounding exercise with a low reaction time category. A3: Double leg speed hop exercise with a high reaction time category. A4: Double leg speed hop exercise with low reaction time. The sample in this study amounted to twenty-four fighters and then a reaction time test will be carried out, the data can be measured using a modified ball and thrown upwards and to find out how many balls are obtained within twenty seconds. To find out the high and low ranking first, then given treatment in the initial test. The design can be seen in the table:

Table 1. Research design

| Reaction Time (B) | Plyometrics Exercise |                      |
|-------------------|----------------------|----------------------|
|                   | Single Leg Bounding  | Double Leg Speed Hop |
| High (B1)         | A1 B1                | A2 B1                |
| Low (B2)          | A1B2                 | A2B2                 |

Practice starts at 15.30 to 18.00 WIB. In this study, the variable is the manipulative independent variable, namely A1: Single leg bounding exercise with a high category reaction

time. A2: Single leg bounding exercise with a low reaction time category. A3: Double leg speed hop exercise with a high reaction time category. A4: Double leg speed hop exercise with low reaction time. The sample in this study There are twenty-four fighters and a reaction time test will be carried out, the data can be measured using a modified ball and thrown upwards and to find out how many balls are obtained in twenty seconds. To find out the high and low ranking first, then given treatment in the initial test.

Pre-Test is to measure *serang - hindar* against fighters, and *serang - hindar* data can be measured using the *serang - hindar* assessment rubric. Single leg bounding, namely to increase the reactive strength of a fighter, the implementation of single leg bounding exercises is carried out continuously and repeatedly. The less bending of the knee and the less time the foot is in contact with the ground the more effective it will be (Chu, D. A., & Meyer 2013).

The advantages of the single leg bounding exercise are: effective for building strength, speed, strength and flexibility of the legs because the movement performed is dynamic stretching which forces fast contraction of the contracting muscles, effectively increases leg muscle development and reflexes, and is effective for increasing thigh and knee extension. and legs (Fitrotul 2019).

The double leg speed hop exercise is a very effective form of jumping, bouncing exercise to increase leg muscle power Hayati and Endriani (2021).

This exercise is also useful for developing the speed and explosive power needed when taking kicks in *serang - hindar*. This exercise requires more weight for the hip, leg, and lower hip muscles, as well as the muscles that balance the knees and ankles (Johana, 2020).

Then it ends with a final test (post test) to measure the *serang - hindar* ability with the aim of seeing the effect of the training program and reaction time on the *serang - hindar* ability of the fighter. Data analysis used two-way ANOVA, homogeneity test, normality test and hypothesis testing.

Inclusion criteria are criteria where research subjects represent samples in research that have met the requirements as samples (Ganang Azhar Guntara and Kusbaryanto 2007) : 1) Pesilat (male and female). 2) Pesilats aged 14-17 years with a total of 24 fighters. 3) Willing to be a respondent to do research. 4) In good physical condition.

Exclusion criteria are criteria where the research subject cannot represent the sample, because it does not meet the requirements as a sample in the study (Ganang Azhar Guntara

and Kusbaryanto 2007) : 1) In a state of physical pain. 2) Respondents who are not willing.

**RESULTS AND DISCUSSION**

Data analysis using IBM SPSS 22 analysis of variance.

**Description of Prerequisite Test**

Prerequisite tests carried out are normality test, homogeneity test and the following is a table of normality and homogeneity test results

**Table 2.** Normality Test

| Standardized Residual for Serang Hindar | Kolmogorov-Smirnov <sup>a</sup> |    |      | Shapiro-Wilk |    |      |
|-----------------------------------------|---------------------------------|----|------|--------------|----|------|
|                                         | Statistic                       | df | Sig. | Statistic    | df | Sig. |
|                                         | .146                            | 24 | .012 | .964         | 24 | .145 |

It can be seen from the results in each group, all the results are significant, because it is greater than 0.05 then the data is declared normally distributed.

**Table 3.** Homogeneity Test Levene's Test of Equality of Error Variances<sup>a</sup>

| F    | df1 | df2 | Sig. |
|------|-----|-----|------|
| .781 | 3   | 22  | .608 |

From the table above, the results of the significant data are more than 0.05, then the data is declared homogeneity.

**Table 4.** Hypothesis Testing Two-Factor ANOVA Table

| Source                    | F      | Sig  |
|---------------------------|--------|------|
| Reaction Time             | 18.730 | .000 |
| Plyometrics               | 12.992 | .000 |
| Reaction Time*Plyometrics | .522   | .915 |

**The effect of single leg bounding and double leg single hop exercises**

There is a difference in single leg bounding and double leg speed hop exercises on *serang - hindar* abilities, as shown by the findings of the Two-Way ANOVA Test, which shows a p-value of 0.000 < 0.005 and an Fcount of

18.730. Plyometrics exercises are more efficient in improving *serang - hindar* abilities. Plyometrics single leg bounding exercise is smaller than double leg speed hop in increasing the ability to *serang - hindar*. Plyometrics exercise single leg bounding is 73.42 and double leg speed hop is 78.33. The average increase in the ability of fighters to attack and avoid in Sumlili Village, East Nusa Tenggara.

**Effect of high and low reaction time**

There is a significant difference between high reaction time and low reaction time I. Irawan, Mahendra, and Mulyana (2019), proven from the results of the ANOVA test Fcount: 12,992 with a significant level of 0.000 < 0.005. Pesilats who have a high reaction time are better than those who have a low reaction time, but the difference is significant.

**Interaction between reaction time and plyometrics exercises**

Plyometric exercises (single leg bounding and double leg speed hops) and reaction time do not interact in improving the *serang - hindar* ability of the fighter. It is evident from the results of the ANOVA test with Fcount: 0.522 with a significance value of 0.915. With a significance level of 0.915 > 0.05, the fighter in Sumlili

Village, East Nusa Tenggara, from the statement above, it can be stated that there is no significant interaction between training (single leg bounding and double leg speed hop) and reaction time to *serang - hindar*.

In this study, it was determined that plyometrics training using a high category reaction time was better than plyometrics training using a low category reaction time to improve attack-avoidance abilities, and after being given training, there was a significant improvement, as evidenced by the results of the pre and post tests. test.

## DISCUSSION

Based on the ANOVA test results, it can be concluded that,

1. The effect of single leg bounding and double leg single hop exercises. There is a difference in single leg bounding and double leg speed hop exercises on attack-avoidance abilities, as shown by the findings of the Two-Way ANOVA Test, which shows a p-value of  $0.000 < 0.005$  and an Fcount of 18.730. Plyometrics exercises are more efficient in improving attack-avoidance abilities. Plyometrics single leg bounding exercise is smaller than double leg speed hop in increasing the ability to attack - dodge. Plyometrics exercise single leg bounding is 73.42 and double leg speed hop is 78.33. The average increase in the ability of fighters to attack and avoid in Sumlili Village, East Nusa Tenggara.

2. Effect of high and low Reaction Time. There is a significant difference between the high reaction time and the low reaction time I. Irawan, Mahendra, and Mulyana (2019), as evidenced by the results of the ANOVA test F count : 12,992 with a significant level of  $0.000 < 0.005$ . Pesilats who have a high reaction time are better than those who have a low reaction time, but the difference is significant.

3. Interaction between reaction time and plyometrics exercises. Plyometric exercises (single leg bounding and double leg speed hops) and reaction time do not interact in improving the attack-avoidance ability of the fighter. It is

evident from the results of the ANOVA test with Fcount: 0.522 with a significance value of 0.915. With a significance level of  $0.915 > 0.05$ , the fighter in Sumlili Village, East Nusa Tenggara, from the statement above, it can be stated that there is no significant interaction between training (single leg bounding and double leg speed hop) and reaction time to attack - dodge.

## CONCLUSION

In this study, it was determined that the double leg speed hop plyometrics exercise was higher than single leg bounding. There is an interaction using a high category reaction time is better than plyometrics training by using a low category reaction time to improve attack-avoidance abilities, and after being given training, there is a significant increase, as evidenced by the results of the pre test and post test.

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