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THE INFLUENCE OF PLYOMETRIC AND LOWER LIMB POWER TRAINING ON SQUAT JUMP IN PARTICIPANTS OF ATHLETICS EXTRACURRICULAR AT SMP NEGERI 2 ABANG

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ABSTRAK: This study aims to analyze: (1) The differences in the influence of squat jump style on participants of athletics extracurricular who undergo alternate leg bound plyometric training and double leg bound plyometric training. (2) The interaction between plyometric training and lower limb power on squat jump style. (3) The differences in squat jump style results between alternate leg bound plyometric training and double leg bound plyometric training for participants with high lower limb power. (4) The differences in squat jump style results between alternate leg bound plyometric training and double leg bound plyometric training for participants with low lower limb power. The research method used is a quasi-experimental design with a 2x2 treatment by level factor design. The sample size used was 40 individuals determined from the categories of high lower limb power and low lower limb power. The instruments used were standing broad jump to measure lower limb power and squat jump. Data analysis technique used a two-way ANOVA with a significance level of 0.05. The results of this study show differences in the influence of squat jump style among extracurricular participants undergoing alternate leg bound plyometric training and double leg bound plyometric training. There is an interaction between plyometric training and lower limb power on squat jump style. Recommendations for extracurricular instructors include considering alternate leg bound plyometric training as an alternative method to improve squat jump style.

Keywords: Pliometric Training, Limb Power, And Squat Style Long Jump

INTRODUCTION

Athletics is a sport that is referred to as the parent of all sports branches. Athletics originates from the Greek word "Athlon," which means contest. The main athletic organization in Indonesia is PASI (Persatuan Atletik Seluruh Indonesia or the Indonesian Athletics Association). The sport of athletics consists of running, jumping, throwing, hurdling, heaving, and walking events. In the modern era, sports have gained popularity among people, both as a competitive activity and for health reasons. Sports contribute significantly to physical and mental well-being, as well as the development of personality, discipline, and high sportsmanship. Facts show an increase in performance levels in the world of sports, from regional to

national and even international levels. Performance improvement can be observed through record-breaking achievements, particularly in athletics.

The stages of becoming a successful athlete in athletics begin at the elementary school level, followed by middle school and high school. According to Bompa (as cited in Fenanlampir, 2020:47), the ideal age for training in athletics is 10-12 years for introducing sports training, followed by a specialization phase around 13-14 years, and the peak performance age ranging from 18-23 years. Based on the above opinions, it can be concluded that athlete performance improvement must be conducted in accordance with training stages and the athletes' age. The ages of 12 to 16 years (youth) are suitable for determining the specialization in a sports branch and developing training programs led by coaches.

A coach is someone who guides and supervises athletes to achieve high performance. Athletes and coaches are closely intertwined because a coach can easily identify errors made by athletes, and athletes should be able to listen and correct their mistakes (Harsono, 2018:4). Training plays a crucial role in athlete performance. Therefore, before undergoing further training, a comprehensive assessment of the athlete's physical condition should be considered. Good physical condition greatly assists athletes in executing complex techniques (Bafirman & Wahyuri, 2019:5).

Long jump is often contested in various sports events, both at national and international levels (Izzullaq et al., 2022:149). The long jump involves a sequence of actions, beginning with a run, followed by takeoff from a jumping board, a mid-air floating movement, and concluding with a landing in the sandpit (Oktaviani et al., 2019:88). Optimal performance in the long jump requires coordinated movements in takeoff, flight, and landing to achieve the longest possible jump. A single-foot takeoff is performed with the stronger leg, and the jump distance is measured from the nearest body part to the takeoff board. There are three styles used in the long jump (Irwandi et al., 2022:18): the squat jump style, hanging style, and walking style in the air. The difference between these styles lies in the body posture in the air, while the principles remain consistent in takeoff, propulsion, and landing.

The ability to long jump depends on physical attributes, particularly speed and lower limb power. Speed involves physical activities performed in a short period (Triono et al., 2022:115). Speed is crucial during the initial run-up phase. A good run-up is essential for a successful jump. Speed is employed before takeoff from the jumping board, and lower limb power is necessary for the takeoff phase, using one's strongest leg to transform horizontal speed into vertical force (Yusuf et al. as cited in Irwandi et al., 2020:18). Lower limb power refers to the maximal force exerted by the leg muscles in the shortest amount of time.

If a long jump athlete possesses strong lower limb power, the jump from the takeoff board to the landing pit will cover a greater distance compared to those with lower lower limb power.

Bernhard, as cited in Aziz & Yudi (2019:1240), states that achieving optimal results in the long jump requires: 1) the factors of physical conditions such as speed and jumping power, and 2) the factors of technique in takeoff or preparatory phase, preparation, mid-air transition, and landing. The takeoff technique involves running to gain horizontal speed, which aids in generating upward and forward propulsion. To achieve a powerful takeoff, the approach run should be steady and forceful. The conclusion drawn by experts is that speed and lower limb power play a crucial role in long jump results, thus requiring attention from coaches, educators, and athletes as it forms the foundation for achieving optimal outcomes. Optimal results are indicated by improved basic techniques in long jump ability.

Introducing long jump to young athletes is a challenging task for coaches. The development of young athletes is often carried out through extracurricular activities in schools. Extracurricular activities assist young athletes in nurturing their talents, gaining experience, and evaluating each competition to enhance their skills. Extracurricular activities serve as a platform for schools to foster talents and interests, as well as to identify promising athletes who can bring glory to the institution.

SMP Negeri 2 Abang is one of the junior high schools located in the Abang District, Karangasem Regency, Bali. SMP Negeri 2 Abang places a strong emphasis on achievements, as evidenced by numerous awards received from 2022 to 2023 in both academic and non-academic fields. Non-academic extracurricular activities in the sports category include volleyball, karate, and athletics.

Observations conducted by the researcher within the athletics extracurricular branch of long jump revealed that in the 2023 Sub-District Student Sports and Arts Week (Porsenijar) held by the Abang District, male long jump participants from SMP 2 Abang were unable to secure the championship. Direct observations of SMP Negeri 2 Abang athletes led to the conclusion that the athletes' running speed was suboptimal, and their transition from a horizontal to a vertical motion during takeoff from the board was weak, consequently affecting their long jump results.

Based on direct observations, a measurement test involving 20 athletics extracurricular participants was conducted. In the 30-meter sprint test, the results were categorized as excellent 0%, good 25%, satisfactory 30%, and insufficient 45%. For the long jump, the results were excellent 0%, good 10%, satisfactory 38%, and insufficient 52%. An interview with the athletics

extracurricular supervisor on February 10, 2023, at the SMP Negeri 2 Abang field revealed that the main weakness in the long jump event was inadequate training to enhance lower limb power, consequently affecting the long jump results. If running speed remains weak, the takeoff may not be executed optimally, leading to shorter jump distances.

The fundamental issues in the long jump within SMP Negeri 2 Abang's athletics extracurricular participants are running speed and lower limb power, which influence long jump results. Training has been provided to address these weaknesses, but it remains insufficient due to limitations in terms of time, facilities, and resources. Enhancing speed and squat jump results requires varied training methods.

To address the aforementioned challenges, a training solution is proposed to improve squat jump results. This comprehensive training solution covers all the aspects mentioned and involves plyometric training. Plyometric training aims to develop muscle strength to work maximally in the shortest possible time, ultimately enhancing explosive power (Gusnelia et al., 2022:83). Kusuma & Ramadhan (2021:58) describe plyometric training as a combination of speed and strength exercises to enhance explosive power.

Plyometric training is divided into three categories: lower limb training, core body training, and upper limb training. Therefore, the appropriate type of plyometric training to enhance lower limb power in the squat jump style long jump is lower limb training targeting hip and lower limb muscles. Improving explosive power in the lower limbs can be achieved using bounding, hopping, jumping, leaping, skipping, and ricochet exercises (Suratmin, 2018:220).

Bounding is one of the plyometric training methods to enhance explosive power in the lower limbs. Bounding focuses on achieving maximum height and horizontal distance, and it includes exercises such as double leg bound, alternate leg bound, incline bound, and lateral leg bound, according to Javer as cited in Suratmin (2018:220). Therefore, from the mentioned forms of bounding exercises, the researcher selected alternate leg bound and double leg bound plyometric training.

Alternate leg bound plyometric training involves leaping forward or upward using one leg at a time, with both arms swinging from front to back. Double leg bound plyometric training involves leaping upward using both legs and landing as far as possible, accompanied by arm swings from top to bottom (Sardiman & Sukrawan, 2020:86). The muscles engaged in both forms of training include the Sartorius, iliacus, gracilis, biceps femoris, semitendinosus, semimembranosus, gluteus maximus, and gluteus minimus.

The addition of alternate leg bound and double leg bound plyometric training can enhance the speed and results of squat jump style long jumps for athletes from SMP Negeri 2 Abang. Thus, the incorporation of this training is

essential for both coaches and athletes, as it can serve as a valuable training resource. Notably, plyometric training methods such as alternate leg bound and double leg bound have not been previously employed to improve squat jump style long jumps. The advantages of these methods include ease of implementation, minimal contact with sports equipment reducing the risk of injuries, suitability for various locations, and alignment with the characteristics of the long jump discipline to achieve maximum lower limb power.

Based on the above explanations, the researcher is motivated to conduct a study with the title "The Influence of Plyometric Training and Lower Limb Power on Squat Jump Style Long Jump Performance in Athletics Extracurricular Participants of SMP Negeri 2 Padang"

RESEARCH METHODS

Type and Design of Research

Types of Research

This study used *quasi-experimental experiments*. Pseudo-experiments do not have strict restrictions on randomization and can simultaneously control validity threats (Sutono &; Pamungkas, 2021: 45). The basic purpose of this study is to understand the independent variable against the dependent variable where pliometric *alternate leg bound* training and double leg bound pliometric training on long jump squatting style of athletic extracurricular participants of SMP Negeri 2 Abang.

Dantes in Putu, 2022:5) *nonequivalent control group design*. Jenis rancangan ini sering menggunakan *intact group* seperti kelas, hal tersebut menyebabkan tidak bisa melakukan randomisasi. Pengukuran dalam penyetaraan kelompok sampel diberikan prates (Dantes dalam Putu, 2022:5). Berdasarkan pernyataan tersebut, populasi yang berjumlah 75 orang dari kelas VIII dan IX dengan penentuan setiap kelompok tidak menggunakan randomisasi sehingga termasuk penelitian eksperimen semu.

Research Design

The research design used was *factor design treatment by level* 2x2. This research design examines the differences A_1 and goes through and interactions between A and B through. Interaction and not compared because it describes levels that are believed to have different effects on dependent variables$A_2F_AF_{AB}B_1B_2$ (Candiasa, 2019: 167). The research *design factor design treatment by* level 2x2 can be seen in Table 1.

Table 1. Research Design factor *design treatment by level* 2x2

Power Limbs (B)	Training (A)	
	Pliometric *Training Alternate Leg Bound* (A1)	Double Leg Bound *Pliometric Training* (A2)
High (B1)	A1B1	A2B1
Low (B2)	A1B2	A2B2

Keterangan:

A1	:	Pliometric training *alternate leg bound*
A2	:	Pliometric training *double leg bound*
B1	:	High limb power
B2	:	Low limb power
A1B1	:	Samples with high limb power were given pliometric training *alternate leg bound*
A1B2	:	Samples with low limb power were given pliometric training *alternate leg bound*
A2B1	:	Samples with high limb power were given pliometric training *double leg bound*.
A2B2	:	Samples with low limb power were given pliometric training *double leg bound*

Population and Sample

Population

This study used a population of 75 boys from grades VIII and IX extracurricular athletics at SMP Negeri 2 Abang with an age range of 14-15 years.

Sample

A set of data taken from a population is called a sample. *Purposive sampling is* a sampling technique in this study. *Purposive* sampling is a sampling technique determined by researchers based on specified characteristics or characteristics (Dantes, 2012: 46). The population of 75 people was measured using a limb muscle power test using the *standing broad jump test*. The results of *standing broad jump* measurements are then used to group samples that have high leg power and samples that have *low leg power*. The results that have been recorded are then sorted or ranked from the muscle power of the high, medium, and low limbs. The ranking taken was 27% order from the top of the group that had high leg power *and 27% order from the bottom of the* group that had low leg power, while the group that had *medium leg power was not used because it was not known to have* high or low leg power. The samples in this study are as follows:

Table 2. Number of Members of the Research Sample

Power Tungkai (B)	Pelatihan (A)		**Jumlah**
	Pelatihan Pliometrik *Alternate Leg Bound* (A1)	Pelatihan Pliometrik *Double Leg Bound* (A2)	
Tinggi (B1)	10	10	**20**
Rendah (B2)	10	10	**20**
Jumlah	**20**	**20**	**40**

The sample size used was 40 people consisting of 20 people having high leg power and 20 people having low leg *power* with 10 people each in

each group. The division of each group uses the *ordinal pairing* method so that each group has the ability of its physical condition equally. After the group division, there were two alternate *leg bound plyometric training groups that had high leg power results and low leg power results and also two double leg bound plyometric training groups* that had *high leg power results and* low *leg* power *results*. So this study is divided into four groups.

Data Collection Methods and Instruments

Data Collection Techniques

Data collection techniques are stages to obtain results from research. This study used tests and measurements. Tests (Sepdanius et al., 2019: 2) are tools used to measure in finding information about individuals, while measurement is a process in conducting research from the preparation of test equipment, implementation and test results quantitative data processed statistically. The purpose of tests and measurements for data delivery is then processed statistically so as to produce research that has been carried out.

Tests and measurements to determine the increase in speed and squatting style long jump results in athletic extracurricular participants of SMP Negeri 2 Abang. Tests and measurements are carried out twice, namely *pre-test and* post-test. The implementation of training started from *the pre-test and then pliometric alternate leg bound training and double* leg bound *pliometric training* for 24 meetings, then a second test called *post-test, then analyzed the results of* the pre-test *and* post-test. The total number of training was 26 meetings.

Research Instruments

Research instruments are any kind of equipment for obtaining data used by researchers. Research data collection is carried out first to check validity and reliability. Validity is a measure that determines the instrument for data retrieval. Reliability is the degree of success of the results of a measuring instrument by producing a stable score despite repeated tests (Sepdanius et al., 2019: 11). This study used three instruments, namely a test instrument to measure leg *power* and an instrument to measure the results of long jump squatting style.

The limb *power* test instrument to measure the high and low physical condition of extracurricular athletic participants is a long jump test without a prefix with validity of 0.607 and reliability of 0.963 (Nurhasan Cholil in Sina &; Pelariyanto, 2020: 181). Squat-style long jump instrument is long jump using a steel meter.

Data Analysis Methods

The requirements for data analysis are normality test and variance homogeneity test.

Prerequisite Test

Normality Test

The data normality test is a data derived from a normally distributed population (Candiasa, 2019: 54). Data

calculations were carried out with the help of SPSS 25, with normality tests using *Shapiro-wilk*. Using the *Shapiro-wilk* test because the population has less than 50 data. The test method using SPSS 25 is as follows:

a. Open the file provided earlier.
b. Select *analyze,* highlight *descriptive statistics, then click* explore*, then a dialog box appears*.
c. Enter variables into the contact *dependent list* by clicking the arrow and clicking *plots*.
d. In the contact *boxplots, click* factor levels together, *under* the descriptive *contact check* the histogram *and then click* Normality plots with test.
e. Click *Continue*.
f. click *Ok*

The significance level of the *Shapiro Wilk* test is $\alpha = 0{,}05$, with the provisions of sig < α (not normally distributed) and sig > α (normally distributed).

1. Homogeneity Test of Variance

A test that shows two or more groups of data that have the same population of variance is called the variance *homogeneity test*. The *homogeneity test of variance* chosen is the Levene test using the help of SPSS 25 and the level of significance α = 0.05. The test method using SPSS 25 is as follows:

a. The data on the results of speed or the results of the long jump squatting style put one variable named variable Y, then for group Y a new variable was created named K with the label training method. K is made with numerical type with codes 1 (pliometric training alternate leg bound*) and 2 (pliometric* training double leg bound).
b. Click *analyze* and highlight *general linear* and then click *univariate*.
c. Variables are included in *the dependent list* and *factor list*.
d. Click *options* then check the contact *homogeneity of variance test*
e. Click *continue* and *ok*.

Homogeneous data with > α significance value criteria, inhomogeneous data with < α significance value criteria (Candiasa, 2019: 73).

Test the hypothesis

The hypothesis test uses a two-track analysis test (ANAVA) which examines the effect of two independent variables on one dependent variable. The test was carried out with the help of SPSS 25 with the criteria of the accepted hypothesis of a sig of < 0.05 (a sig value smaller than α) and a rejected hypothesis of a sig of > 0.05 (a sig value greater than α) (Candiasa, 2019: 179). How to test using SPSS 25 as follows:

1. The data from the squat style long jump put one variable named variable Y, then for group Y a new variable named K was created with a

pliometric training label. K is made with numerical type with code 1 (pliometric training alternate leg bound*) and code 2 (pliometric* training double leg bound). Create a new variable named P with numeric type with code 1 (high leg power) and code 2 (*low leg power).*

2. Select *analyze* and highlight *the general linear model*, click *univariate*.
3. Variables are included in *the dependent list* and *factor list*.
4. click *plosts* then move variable K to *horizontal axis* and variable P to *separate line* then select *add* and continue select *continue*.
5. Click *Options* then *check the list* on the *Descriptive Statistics* and *Homogeneity Test items*.
6. Click *continue* and ok.

If the results of the data values are different, then a tukey test is performed. The Tukey test is used to determine the interaction between the first hypothesis and the second hypothesis. The criteria of the Tukey test is if there is an interaction between the two hypotheses the significance value is greater than α (sig > 0.05), while there can be no interaction between the two hypotheses when the significance value is smaller than α (sig < 0.05). As for how to test using SPSS 25 as follows:

1. Click *analyze* and highlight the *general linear model*. Click *univariate* and analog contacts appear.
2. Move variables.
3. Click *post hoc* and an analog box appears.
4. Then move the variable from contact *factor (S)* to the *post hoc tests for box,* then check the box tukey followed click *continue and ok*.

RESULT AND DISCUSSION

RESULT

The results of the study on the effect of pliometric training *and leg power* on squatting style long jump in extracurricular athletic participants of SMP Negeri 2 Abang were carried out from June 10, 2023 to July 23, 2023 at the Gajah Wea field and the upper field of SMP Negeri 2 Abang are described as follows:

Description of Research Data Results of Pliometric Training Group *Alternate Leg Bound against* Long Jump Squatting Style (A1)

The data from the study used pre-test *data and* post-test *data* in the alternate leg bound pliometric training group against squatting style long jump. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data. Description of the results of *gain score data* on the improvement of squat style

long jump through alternate leg bound pliometric training with a research sample of 20 athletic extracurricular participants. The *gain score results* in the long jump squatting style data *mean 0.36,* median *0.37,* mode 0.40, *standard deviation* 0.06, minimum *0.26, and* maximum *0.48*. Description of the results of the study in the pliometric *alternate leg bound* training group against squat style long jump can be seen in Table 3.

Table 3. Results of the Pliometric Alternate *Leg Bound Training Group* on Squatting Style Long Jump (A1)

Lompat Jauh Gaya Jongkok		A1
N	*Valid*	20
	Missing	20
Mean		0,36
Median		0,37
Mode		0,40
Std. Deviation		0,06
Minimum		0,26
Maximum		0,48

The distribution of group A1 data in the form of a histogram in Figure 4.1 obtained the average result of long jump squatting style of 0.36 with a sample of 20 extracurricular athletic participants.

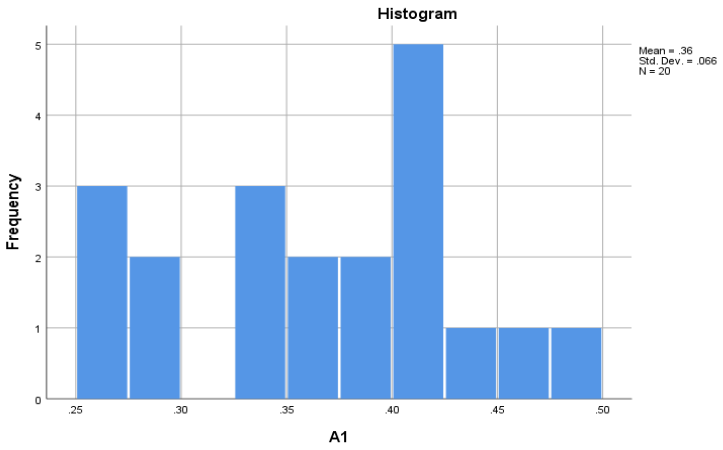

Figure 1
Histogram Data Results of Pliometric Training Group *Alternate Leg Bound against* Long Jump Squatting Style (A1)

Description of Research Data from Double Leg Bound Pliometric Training Group against Squatting Style Long Jump (A2)

The data from the study used pre-test *data and* post-test *data* in the double leg bound pliometric training group against squat style long jump. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results of *gain score data* on increasing speed and squatting style long jump results through double leg bound pliometric training with a research sample of 20 athletic extracurricular participants. The *gain score* results in the long jump squatting style data *mean 0.19,* median 0.18, *mode 0.17,* standard deviation *0.05,* minimum *0.11, and* maximum *0.27*. Description of the results of the study in the double leg bound pliometric training group against squat style long jump can be seen in Table 4.

Table 4. Results of Double Leg Bound *Pliometric Training Group on* Long Jump Squatting Style (A2)

Lompat Jauh Gaya Jongkok		A2
N	*Valid*	20
	Missing	20
Mean		0,19
Median		0,18
Mode		0,17
Std. Deviation		0,05
Minimum		0,11
Maximum		0,27

The distribution of group A2 data in the form of a histogram in Figure 4.2 obtained the average result of long jump squatting style of 0.19 with a sample of 20 athletic extracurricular participants.

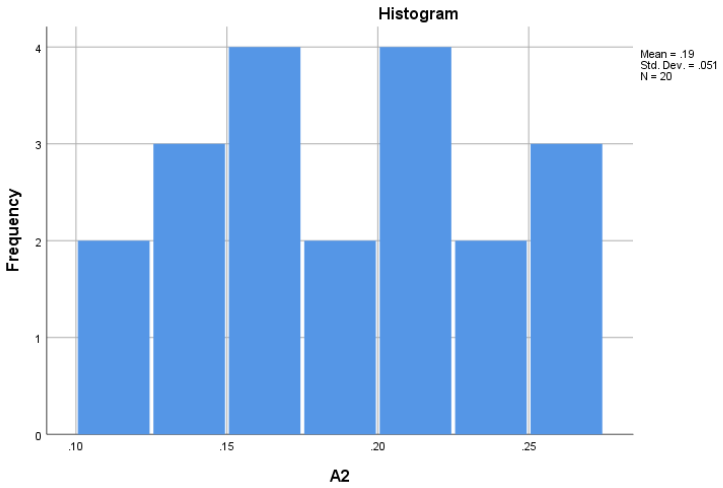

Figure 2
Histogram Data Results of *Double Leg Bound Pliometric Training Group* against Squatting Style Long Jump (A2)

Description of Data Results of the Squatting Style Long Jump Research Group Reviewed from High Limb Power (B1)

The data from this study used pre-test data and *post-test* data from he squat style long jump study in terms of high leg power. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday, Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results *of gain score* data on long jump squatting style in terms of high limb power with a research sample of 20 extracurricular athletic participants. The *gaint score of* long jump squatting style data *is mean 0.31,* median is 0.30, *mode is 0.17,* standard deviation *is 0.10,* minimum *is 0.17, and* maximum is 0.48. Description of the results of research on long jump squatting style in terms of high limb power can be seen in Table 4.3

Table 5. Results of Long Jump Group Research Squatting Style Reviewed from High Limb Power (B1)

Lompat Jauh Gaya Jongkok		B1
N	*Valid*	20
	Missing	20
Mean		0,31
Median		0,30
Mode		0,17
Std. Deviation		0,10
Minimum		0,17
Maximum		0,48

The distribution of B1 group data in the form of a histogram in Figure 4.3 obtained the average result of squatting style long jump of 0.31 with a sample of 20 athletic extracurricular participants.

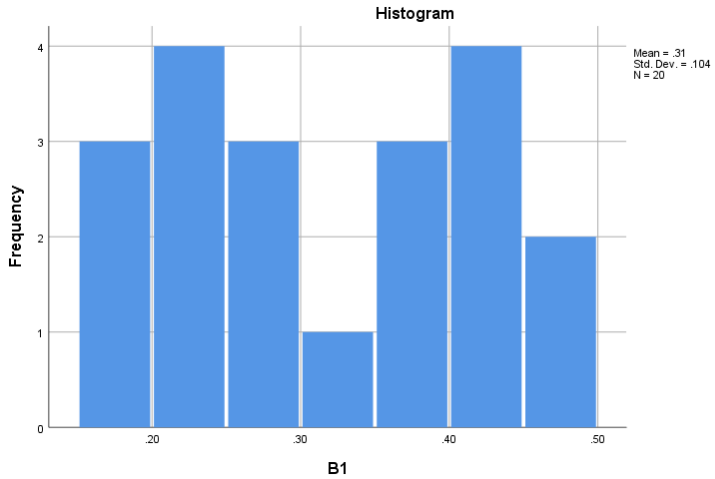

Figure 3.
Results of Long Jump Histogram Data Squatting Style Reviewed from High Limb Power (B1)

Description of Data Results of the Long Jump Research Group Squatting Style Reviewed from Low Limb Power (B2)

The data from the study used pre-test data and *post-test* data *of* squatting style long jump research in terms of low leg power. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday, and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results *of gain score* data on long jump squatting style in terms of low limb power with a research sample of 20 athletic extracurricular participants. The *gaint score of* long jump squatting style data *mean 0.24,* median 0.25, *mode* 0.29, *standard deviation* 0.091, *minimum* 0.11, and *maximum* 0.38. Description of the results of research on long jump squatting style in terms of low limb power can be seen in Table 4.4

Table 6.
Squatting Style Long Jump Group *Gaint Score* Results Reviewed from *Low Limb Power (B2)*

Lompat Jauh Gaya Jongkok	B2

N	*Valid*	20
	Missing	20
Mean		0,24
Median		0,25
Mode		0,29
Std. Deviation		0,09
Minimum		0,11
Maximum		0,38

The distribution of B2 group data in the form of a histogram in Figure 4.4 obtained the average result of long jump squatting style of 0.24 with a sample of 20 athletic extracurricular participants.

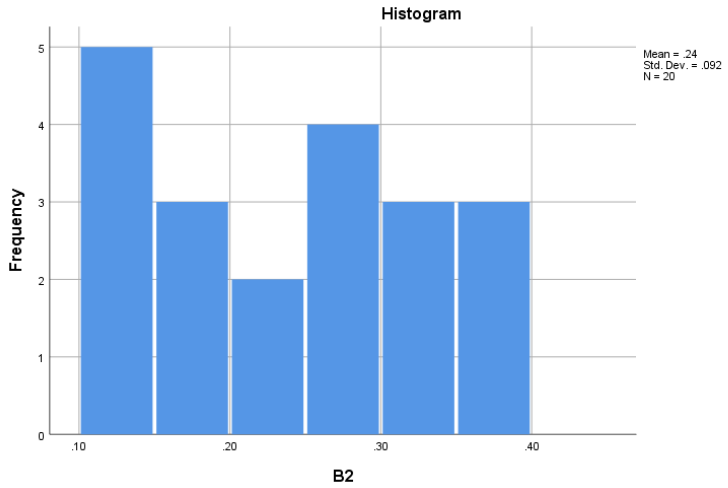

Figure 4.
Results of Long Jump Histogram Data Squatting Style Reviewed from Low Limb Power (B2)

Description of Research Data from the Pliometric Alternate Leg Bound Training Group on Long Jump Squatting Style Reviewed from High Leg Power (A1B1)

The data from the study used pre-test data *and* post-test *data of the pliometric* alternate leg bound training group against long jump squatting style in terms of high leg power. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday, and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results of *gain score* data in the pliometric *alternate leg bound* training group against squat style long jump in terms *of* high leg power with a research sample of 10 athletic extracurricular participants. The *gain score* results in the long jump squat style data *mean 0.40,* median 0.41, *mode 0.34,* standard deviation *0.04, minimum* 0.34, and *maximum 0.48.* Description of the results of the study of alternate leg bound pliometric training on long

jump squatting style in terms of high leg power can be seen in Table 7.

Table 7
Results of the Pliometric *Alternate Leg Bound* Training Group on Long Jump Squatting Style Reviewed from High Leg Power (A1B1)

Lompat Jauh Gaya Jongkok		A1B1
N	*Valid*	10
	Missing	30
Mean		0,41
Median		0,41
Mode		0,34[a]
Std. Deviation		0,04
Minimum		0,34
Maximum		0,48

The distribution of A1B1 group data in the form of a histogram in Figure 4.5 obtained an average squatting style long jump result of 0.41 with a sample of 10 athletic extracurricular participants.

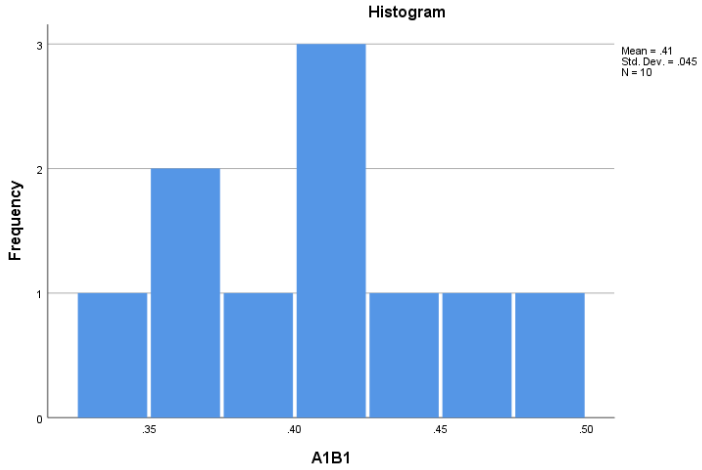

Figure 5.
Histogram Data Results of Pliometric *Alternate Leg Bound* Training Group on Long Jump Squatting Style Reviewed from High Leg Power (A1B1)

Description of Research Data Results of the Pliometric *Alternate Leg Bound* Training Group on Long Jump Squatting Style Reviewed from Low Leg Power (A1B2)

The data from the study used pre-test data *and* post-test *data of the pliometric* alternate leg bound training group against long jump squatting style in terms of low leg power. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday, and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results of *gain score data in* the alternate leg bound pliometric training group *against squat style long jump in terms* of low leg *power* with a research sample of 10 athletic extracurricular participants. The results of the *long jump long jump squat style gain mean data of 0.32,* median of 0.31, *mode of 0.29,* standard deviation *of 0.03, minimum* of 0.27, and *maximum* of *0.38.* Description of the results of the study of pliometric *alternate leg bound* training group on long jump squatting style in terms of low leg power can be seen in Table 4.6

Table 8.
Results of the Pliometric Alternate Leg Bound Training Group on Long Jump Squatting Style Reviewed from *Low Leg Power (A1B2)*

Lompat Jauh Gaya Jongkok		A1B2
N	*Valid*	10
	Missing	30
Mean		0,32
Median		0,31
Mode		0,29
Std. Deviation		0,03
Minimum		0,27
Maximum		0,38

The distribution of A1B2 group data in the form of a histogram in Figure 4.6 obtained the average result of long jump squatting style of 0.32 with a sample of 10 athletic extracurricular participants.

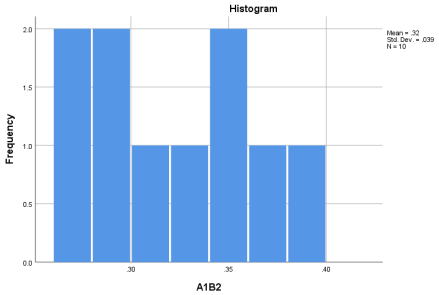

Figure 6.
Histogram Data Results of Pliometric *Alternate Leg Bound Training Group* Against Long Jump Squatting Style Reviewed from Low Limb Power (A1B2)

Description of Data from the Research Results of the Double Leg Bound Pliometric Training Group on Long Jump Squatting Style Reviewed from High Leg Power (A2B1)

The data from the study used pre-test data and *post-test* data *of* the double leg bound *pliometric training group* against long jump squatting style in terms of high leg power. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday, and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results of *gain score data in the* double leg bound *pliometric training group* against squat style long jump in terms *of* high leg power with a research sample of 10 athletic extracurricular participants. The *results of the* long jump gain score of *squat style mean data* of 0.22, median *of 0.22, mode* of 0.17, standard deviation *of 0.03, minimum* of 0.17, and maximum *of 0.27*. Description of the data from the research results of the double leg bound pliometric training group *on long jump squatting style in terms of* high leg *power* can be seen in Table 4.7

Table 9
Results of Double Leg Bound *Pliometric Training Group Research* on Long Jump Squatting Style Reviewed from *High Leg Power (A2B1)*

Lompat Jauh Gaya Jongkok		A2B1
N	*Valid*	10
	Missing	30
Mean		0,22
Median		0,22
Mode		0,17
Std. Deviation		0,03
Minimum		0,17
Maximum		0,27

The distribution of A2B1 group data in the form of a histogram in Figure 7 obtained the average result of squatting style long jump of 0.22 with a sample of 10 athletic extracurricular participants.

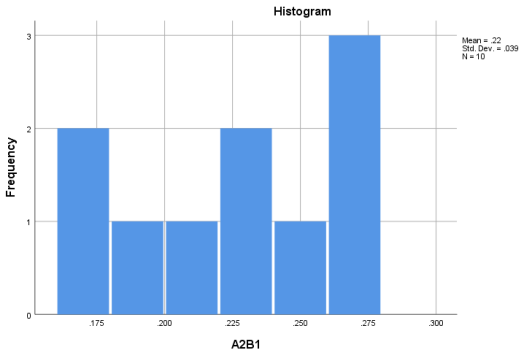

Figure 7
Histogram Data Results of Double Leg Bound Pliometric Training Group on Long Jump Squatting Style Reviewed from High Leg Power (A2B1)

Description of Data from the Research Results of the Double Leg Bound Pliometric Training Group against Long Jump Squatting Style Reviewed from Low Leg Power (A2B2)

The data from the study used pre-test data and *post-test* data *of* the double leg bound *pliometric training group* against long jump squatting style in terms of low leg power. *Pre-test data collection is carried out before samples are given training and* post-test *data collection is carried out after samples are given training* for 6 weeks on Tuesday, Thursday, Saturday, and Sunday. The overall results of the pre-test data *and* post-test *data can be seen from the* gain score data.

Description of the results of *gain score data in the* double leg bound *pliometric training group* against squat style long jump in terms *of* low leg power with a research sample of 10 athletic extracurricular participants. The *gaint score of* long jump squatting style data *is mean 0.16,* median of 0.14, *mode of 0.11,* standard deviation *of 0.040, minimum* of 0.11, and *maximum* of 0.24. The description of the data from the research of the double leg bound pliometric training group on long jump squatting style in terms of low leg power can be seen in Table 10.

Table 10
Results of Double Leg Bound *Pliometric Training Group Research* on Long Jump Squatting Style Reviewed from *Low Leg Power (A2B2)*

Lompat Jauh Gaya Jongkok		A2B2
N	*Valid*	10
	Missing	30
Mean		0,16
Median		0,14
Mode		0, 11[a]
Std. Deviation		0,040
Minimum		0,11
Maximum		0,24

The distribution of A2B2 group data in the form of a histogram in Figure 8 obtained the average result of squatting style long jump of 0.16 with a sample of 10 athletic extracurricular participants.

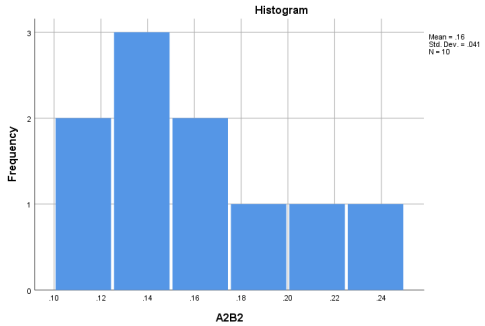

Figure 8
Histogram Data Results of Double Leg Bound Pliometric Training Group against Long Jump Squatting Style Reviewed from Low Leg Power (A2B2)

DISCUSSION

Long Jump Squatting Style in Athletic Extracurricular Participants Who Get Pliometric *Alternate Leg Bound Training is Better than* Double Leg Bound *Pliometric Training*

The results of the two-way ANOVA analysis reveal a significant difference in squat jump style long jump performance among participants of the athletic extracurricular program who underwent alternate leg bound plyometric training and those who underwent double leg bound plyometric training. The squat jump style long jump performance of participants who received alternate leg bound plyometric training was better than those who received double leg bound plyometric training.

These research findings align with the study conducted by Kusuma and Rahmadan (2021), which concluded that alternate leg bound plyometric training is superior to double leg bound plyometric training. The consistent results from alternate leg bound plyometric training can be attributed to its ease of execution, involving repeated jumps using one leg at a time. The repetitive execution of single-leg jumps contributes to the improvement of speed and squat jump style long jump performance due to the combination of vertical and horizontal motion patterns.

Alternate leg bound plyometric training focuses on developing lower limb and hip power (Radcliffe and Farentinos in Kusuma & Ramadhan, 2021:61), targeting flexor and extensor muscles of the thighs and hips by using one leg during running and jumping. The advantages of alternate leg bound plyometric training include ease of execution, reduced fatigue, significant

impact on the approach run before takeoff and during mid-air phase, as it involves jumping using one leg (alternating between right and left) with a high and far-reaching motion. However, a potential drawback of alternate leg bound plyometric training is the risk of injury if the floor or ground surface is uneven.

On the other hand, double leg bound plyometric training is designed to enhance lower limb and hip muscle power by jumping upward using both legs and landing as far forward as possible (Kusuma & Ramadhan, 2021). The benefits of double leg bound plyometric training include improved landing posture in the sand pit, leading to a balanced body position that favors proper landing. However, this training may require several days for athletes to adjust to the movements and can lead to quicker fatigue due to the full-body jumping motion.

According to Markovic G and Mikulic, as cited in Susanti et al (2021:157), plyometric training is considered to enhance the stretch-shortening cycle stimulus, thereby increasing tendon muscle activity during the eccentric phase or reducing the transition duration between eccentric and concentric phases. This notion is supported by Indrawan et al. (2021:49), who state that the essence of plyometric training lies in the contraction of muscles between eccentric (lengthening) and concentric (shortening) phases. Plyometric training enhances explosive power, focusing on strength development with lighter loads and faster movements. The plyometric training model employs the athlete's own body weight to enhance power (Utomo, 2018:21). The plyometric training program lasts for six weeks, with a frequency of four times per week or a total of 24 sessions. Over the course of eight weeks of training, neural and muscular adaptations occur, leading to improved lower body performance in terms of power and lower limb strength (Miller et al. in Zen et al., 2021:399). The increase in lower limb muscle power indirectly enhances physiological responses such as muscle hypertrophy, endurance adaptation, nervous system adaptation, and cardiovascular adaptation (Wiratama, 2021:139). Strengthening and accelerating muscles contribute to desired outcomes. Therefore, the inclusion of alternate leg bound and double leg bound plyometric training yields differing effects on squat jump style long jump performance among participants of the athletic extracurricular program at SMP Negeri 2 Abang.

There is an Interaction between Pliometric and *Power* Limb Training in Athletic Extracurricular Participants of SMP Negeri 2 Abang

From the results of the analysis, there is an influence of the interdependence relationship between pliometric training and *limb power* on extracurricular athletic participants of SMP Negeri 2 Abang. Pliometric training

increases muscle explosive power where training concentrates strength building with lighter loads and faster movements, the pliometric training model uses the athlete's own body weight in increasing *power* (Utomo, 2018: 21). The opinion of Adzar, Saichudin, and Hariyanto (in Yudi et al., 2019: 65) that pliometric training involves movements that strengthen muscle tissue and train nerve cells indirectly strengthen muscle contractions by forming certain patterns so as to produce strong contractions and short time.

According to (Kusuma & Ramadhan, 2021: 58) states that pliometric training is a movement carried out to develop explosive *power* which is a combination of speed and strength. According to Hanafi et al (2020: 29) stated that power or explosive power is the physical ability of athletes to carry out heavy training in a short time and produce maximum speed derived from high and fast muscle contractions. *Leg muscle power* is the ability of muscles to direct strength in a short time in order to provide optimal momentum to the body in *explosive* movements in achieving the desired goal (Armelia et al., 2021: 464). Pliometric training can increase leg power *, because it can be concluded that there is an interaction between pliometric training and leg* power *in athletic extracurricular participants of SMP Negeri 2 Abang* .

Long Jump Squatting Style Receiving Alternate Leg Bound Pliometric Training is Better than Double Leg *Bound* Pliometric Training *in Athletic Extracurricular Participants Who Have High Leg Power*

Alternate leg bound *pliometric* training is a form of training to increase explosive power because in doing movements it uses a lot of lower extremity muscles and is done repeatedly (Rovendra, 2020: 30). This statement is supported by (Sardiman &; Sukrawan (2020: 86) that alternate leg bound pliometric training *uses a lot of lower extremity muscles aimed at increasing jump height*. *Alternate leg bound pliometric training* is very well applied because it is done by jumping forward using one leg alternately and is not much different from the long jump number.

The conclusion from the above statement is that the *pliometric alternate* leg bound training group that has high leg power is better at squatting style long jump than the double leg bound pliometric training that has high power .

The advantage of athletic extracurricular participants who have high leg power is that it is easy to perform long jump techniques ranging from starting techniques, focusing techniques, floating techniques in the air and landing techniques. Long jump is a movement performed at a high running speed and resisting on a fulcrum for the purpose of reaching the farthest landing

point. The long jump movement is performed in the absence of a continuous movement. Participants who had high leg power greatly influenced the increase in squatting style long jump.

Long Jump Squat Style Receiving *Pliometric Alternate Leg Bound Training* is Better than Double Leg Bound Pliometric Training *in Athletic Extracurricular Participants Who Have Low Leg Power*

Alternate leg bound *pliometric training* is better for low leg power because it provides a strategic role and the ability of athletic extracurricular participants to be better at doing squat style long jumps. Pliometric training can stimulate changes in the neuromuscular system, enlarging the ability of muscle groups to respond faster and stronger to light, rapid changes. According to Durahim (2021: 38) states that pliometrics can trigger a *stretch-shortening cycle* in the muscles, which will innervate the *spindle muscle* and then continue to the spine, then a *concentric phase* occurs which will eventually produce neuromuscular adaptations so that *leg power* increases and is followed by a jump height.

Participants who were given *pliometric alternate* leg bound training and double leg bound *pliometric training* which had a low level had a difference in the influence of squatting style long jump. The training provided will provide an increase in leg power and increase long jump squatting style.

Conclusion

The results of the analysis and discussion can be concluded from this study is that there is a difference in the effect of squatting style long jump between athletic extracurricular participants who received *pliometric alternate* leg bound training and double leg bound *pliometric* training with the value of training significance on long jump squatting style is *sig.* (0.00) < α (0.05) with an F value of 10.60. There is an interaction between pliometric training and leg power on squatting style long jump in athletic extracurricular participants of SMP Negeri 2 Abang with the significance value of the interaction between pliometric training and leg *power* in the results of squatting style long jump is 0.02 so that *sig.* (0.02) < α (0.05) and an F value of 5.79. For extracurricular athletic participants who have *high leg power* with pliometric alternate *leg bound training, better long jump squatting style results can be seen and double* leg bound *pliometric training*.It can be seen from the average value of squat style long jump results of 0.41 through alternate *leg bound pliometric training which has high leg power (A1B1) better than using double leg bound pliometric training* which has high *leg* power (A2B1) the average value of squat style long jump results is 0.22. For extracurricular athletic participants who have low leg *power* with alternate leg bound pliometric training, it can be seen from the results

of long jump, better squatting style and double *leg bound* pliometric training.*It can be seen from the average value of squat style long jump results of 0.32 through* alternate leg bound pliometric training which has low leg power (*A1B2) better than by using double leg bound pliometric training* which *has low leg power (A2B2) the average value of squat style long jump results is 0.16* .

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