



The ability to punch in the front for students of pencak silat uns achievement (Correlational Study Viewed from Eye-Hand Coordination, Arm Length and Arm Power)

Bahrul Ulum Muhammad¹, Agus Kristiyanto², Slamet Riyadi³

¹²³Sebelas Maret University, Indonesia

DOI: <https://doi.org/10.34142/HSR.2020.06.03.04>

Abstract

The aim of this study was to determine the interaction of eye-hand coordination, arm length and arm power with the ability to punch in front of the students of UNS Pencak Silat achievement coaching.

Material and methods. The design or research design used is to use descriptive methods with correlational study techniques (correlation design). This research will describe the relationship and the amount of contribution between eye-hand coordination, arm length and arm power with the ability to punch ahead in the Pencak Silat sport. The population in this study were all students of UNS pencak silat achievement coaching which included fostering the achievements of the Faculty of sport, Tapak Suci student activity units, PSHT student activity units, Merpati Putih student activity units and student self-defense units.

Results. Based on the results of research and the results of data analysis that has been done, the following conclusions can be obtained: There is a significant relationship between eye-hand coordination, arm length and arm power with the ability to punch in front of pencak silat with a significant value $F_{count} = 64,99 > F_{table} = 2,81$.

Conclusions. Contribution of eye-hand coordination is the variable that has the most dominant contribution, then followed by the arm power variable and the smallest contribution is the arm length variable. Meanwhile the remaining 19.1% is contributed by factors other than those represented by independent variables. Predictions from researchers of these other factors could have been influenced by training factors or other physical condition factors that also supported the ability to punch in front of pencak silat.

Keywords: Ability, Punch, Pencak Silat

Анотація

Бахрул У.М., Агрус К., Сламет Р. Ударні здібності студентів, що займаються пенчак сілатом (Кореляційне долідження сили удару, координації «глаз-рука», длини руки і силою руки)

Метою цього дослідження було визначення взаємозв'язку між координацією «око-рука», довжиною руки та сили руки з ударними можливостями студентів, що займаються пінчак сілатом.

Матеріал і методи. Дизайн дослідження полягав у поєднанні описових методів із кореляційними методами (кореляційний аналіз). Описано взаємозв'язок та величину внеску координації «око-рука», довжини руки та сили руки у ударні здібності студентів, що займаються пінчак сілатом. Учасниками в цьому дослідженні були всі студенти UNS pencak silat, які представляли факультет спорту, підрозділи студентської діяльності Tarak Suci, підрозділи студентської діяльності PSHT, підрозділи студентської діяльності Мерпаті Путіха та підрозділів самооборони студентів.

Результати. На основі результатів досліджень та результатів проведеного аналізу даних можна зробити наступні висновки: Існує значна залежність між координацією «око-рука», довжиною руки та силою руки з можливістю пробивати спереду. сирусу пенкака зі значущим значенням $F_{count} = 64,99 > F_{tabl} = 2,81$.

Висновки. Загальний ефективний внесок трьох змінних у силові здібності становить 80,9%. Це показує, що координація «око – рука» - це змінна, яка має найбільш домінуючий внесок в ударні можливості, потім слідує сила руки, а найменший внесок - довжина руки. Тим часом, решта 19,1% сприяють інші фактори, ніж ті, що представлені незалежними змінними. Це фактори тренувань або інші фактори фізичного стану, які також обумовлюють ударні можливості.

Ключові слова: Здібність, Удар, Пенчак Силат

Аннотация

Бахрул У.М., Агрус К., Сламет Р. Ударные способности студентов, занимающихся пенчак силатом (Корреляционное исследование между силой удара, координацией «глаз-рука», длиной руки и силой руки)

Цель этого исследования состояла в том, чтобы определить взаимосвязь между координацией глаз и рук, длиной руки и силой руки с силой удара у студентов, занимающихся пенчак-силатом.

Материал и методы. Дизайн исследования состоял в применении описательных методов в сочетании с методами корреляционного анализа (дизайн корреляции). Была проанализирована взаимосвязь координации «глаз-рука», длиной руки и силой руки с ударными возможностями спортсменов, занимающихся силатом. Также был проведен многофакторный дисперсионный анализ данных показателей для определения и относительного вклада каждого из них в силу удара. Все участники этого исследования были студентами UNS pencak silat, который включал в себя поддержку достижений факультета спорта, групп студенческой активности Tarak Suci, блоков студенческой активности PSHT, групп студенческой активности Merpati Putih и групп самообороны студентов

Результаты. На основании результатов исследований и анализа данных можно сделать следующие выводы: Существует значительная связь между координацией «глаз-рука», длиной руки, силой руки и возможностью удара вперед в пенчак-силате со значительным значением $F_{count} = 64,99 > F_{table} = 2,81$.

Выводы. Вклад в силу удара координация «глаз-рука» является переменной, которая имеет наиболее значение, затем идет переменная «мощности руки», а наименьший вклад вносит переменная длины руки. Между тем, оставшиеся 19,1% обусловлены другими факторами, чем те, которые представлены независимыми переменными. В качестве других факторов могут выступать тренировочные факторы или другие факторы физического состояния, которые также поддерживали способность пробивать пенчак силат.

Ключевые слова: способность, удар, пенчак силат



Introduction

Pencak silat is a form of sport in the form of Indonesian cultural products to defend or maintain the extension (independence) and integrity of the environment / natural surroundings to achieve harmony in life, increase faith and piety in God Almighty [1]. Indonesian native martial arts have been popular not only in Indonesia, but has spread to various countries in the world, this is proven by the existence of national and international championships [2]. The parent organization of various martial arts schools in Indonesia itself is the Indonesian Pencak Silat Association or often abbreviated as IPSI [3].

Under the auspices of PB IPSI many Pencak Silat championships are held [4], starting from elementary school (SD), junior high school (SMP), senior high school / vocational school (SMA / SMK), tertiary education, and the public starting from the district level, residency, province, and nationally with different regulations between each age category [5]. In Indonesia itself, it has been very routinely carried out various junior and senior high school championships, it aims to find athletes in pencak silat seeds to continue the match at the adult level, with the holding of matches regularly at the level of youth, it can filter the seeds of martial arts athletes evenly in various classes [6]

In pencak silat competition it is divided into 4 categories [7], namely: TGR (Single, Double, Team) category, match category. Pencak silat Single category that is a fighter doing a predetermined movement and has been standardized by IPSI within 3 minutes, Double are two pesilat performs a collaboration of pencak silat movements with a time of 3 minutes, Team is three pesilat performs a predetermined and standardized movement by IPSI within 3 minutes.

Pencak silat is a match category that features two fighters from different camps and both of them face each other by using elements of defense and attack, namely defending, dodging, attacking on target [8]. The martial arts attack has been determined in the martial arts competition rules of the match category and dropped the opponent using techniques and tactics to compete, and uses the rules and patterns of steps by utilizing the wealth of technique techniques to get the most value [9].

Pencak silat techniques are quite a lot and have a variety [10], while in practice in the game not all techniques can be used because there are several attack techniques that can endanger the safety of a fighter [11]. For this reason, it is very important for a coach to understand effective and efficient techniques that can be applied in a martial arts match,

so that a coach can provide training that is not in vain [12].

Attacks allowed in the official pencak silat match are punches, kicks, and kicks / falls [13]. Blow in a Pencak Silat match is an attack using a hand [14], with a straight forward trajectory and the target is the chest or the front which is protected by Body Protector in the value of 1 in units of numbers, then the kick in the Pencak Silat match consists of a front kick, sickle kick, side kick and kick back with a trajectory according to its characteristics and the target of attacking the part of the body that is protected by the Body Protector is rated at value 2 in units of numbers [15]. While kickback / fall in Pencak Silat is an attempt to bring down an opponent rated 3 if no prefixes catch, but worth 4 if it begins with the catch process [16]. That value is not included if the fighter uses the Hindaran / evasion technique before counterattacking which is 1+ plus the value of the attack itself [17].

Judging from the analysis of attack technique skills, the Blow attack technique has the least value and is not dominant compared to the kick attack technique. In pencak silat matches, beating has several advantages including an attack that must not be captured, as the safest avoidance technique, if it is started to be evaded before making a hit then the value is proportional to the value of one kick, and is an alternative attack technique if the opponent has a block which is good for breaking down defenses before using other attack techniques.

Pencak silat has a unique characteristic when compared to other martial arts sports, namely the existence of the rules of competition [18]. An attack is declared valid if it starts with a tide attitude and the maximum attack is no more than 6 attacks and ends with a tide attitude again. An athlete at least has physical components such as: strength (strength), endurance (endurance), explosive power (musculapower), speed (Speed), coordination (coordination), flexibility (flexibility), agility (agility), balance (accuracy), accuracy (accuracy), reaction (reaction) [19].

Based on the explanation above, an athlete does not only focus on mastering basic techniques, but the main physical components need attention. The physical component most involved in the ability of the front blow attack technique is the combination of speed and power (Power) and coordination which is called eye-hand coordination. How is it possible for a fighter to strike a blow without having good coordination. For this reason, the coordination required by a fighter in conducting a hand attack is hand-eye coordination. Then the blow attack will not be assessed if it is not done quickly and is powerful and is not parried by the opponent, the speed



component is also needed. Another supporting factor seen from anthropometrics is arm length.

Then the observations related to the condition of pencak silat achievement from various results of the match or championship showed the athlete's inconsistency in using the technique of front or straight attack. When competing athletes tend to be confused and resigned when the opponent chooses to clean or in other terms try to move closer together to narrow the field of attack. In fact, if you look closely at this distance before the occurrence of clean UNS martial arts athletes can enter a blow attack with a landslide. In other cases athletes who have long arms actually choose to make clean moves before making a shot, but if analyzed more deeply the athlete should be able to do a blow attack technique first before doing clean to secure the points achieved.

Not quite right if in this day and age there is an assumption that in the martial arts sport that must be mastered only basic skills without the component elements of physical conditions. Therefore, to prove this statement, the writer is interested in conducting research on the front stroke in the martial arts competition in terms of eye-hand coordination, arm length and arm power together.

Material and methods

The design or research design used is to use descriptive methods with correlational study techniques (correlation design). This research will describe the relationship and the amount of contribution between eye-hand coordination, arm length and arm power with the ability to punch ahead in the Pencak Silat sport.

The population in this study were all students of UNS pencak silat achievement coaching which included fostering the achievements of the Faculty of sport, Tapak Suci student activity units, PSHT student activity units, Merpati Putih student activity units and student self-defense units.

The sample is part of the population that has certain characteristics or circumstances to be examined. A good sample is one that represents the population. Determination of the sample by limiting and categorizing students with male / male gender, then the sample that can represent the population are 10 students from FKOR achievements, 10 Tapak Suci UKM students, 10 PSHT UKM students, 10 Merpati Putih UKM students and 10 UKM students Self Shield with a total sample of 50 male students.

Data collection techniques used in this study were tests and measurements. The types of tests used in this study are as follows:

1. Eye-hand coordination test.

Eye-hand coordination is the ability of a person to perform harmony in hand movement activities which is supported by the assistance of eye sight.

2. Arm power test

Arm power is the ability to exert strength and speed together on the arm. Medicine Ball as a ball-like device used to help increase arm power, push is a forward pushing movement that starts from the front of the chest. In this study arm power was measured using medicine ball push in meters.

3. Measurement of arm length

Arm length is the distance measured through the acromion point on the humerus to the styloid point on the ulna. An instrument used to measure arm length using an anthropometer.

4. Pencak silat ability test

Pencak Silat is a blow that is in accordance with the rules set by the big management of the Indonesian Pencak Silat Association.

Data analysis in this study used correlation analysis techniques, partial correlation and multiple regression. Correlation analysis technique in question is a statistical analysis to determine whether there is a relationship between the independent variables and the dependent variable in the study, then the correlation analysis of each predictor with the criterion using product moment analysis. Partial correlation analysis is intended as a parametric statistic used to test the degree of relationship between the independent variable and the dependent variable on the condition of the other independent variables as variables whose function is to purify the relationship between the independent variable and the dependent variable.

Multiple regression analysis is the development of simple analysis. Its usefulness is to practice the value of the dependent variable if the independent variable is at least 2 or more. Multiple regression analysis is used to examine the relationship between two or more variables, especially to explore patterns of relationships whose model is not yet fully known, or to find out how variations of various independent variables affect the dependent variable in a complex phenomenon [20]. The steps taken in this study are:

1. Test Prerequisite Analysis

Before the data is further analyzed, a number of statistical prerequisite tests are carried out as follows:

- a. Normality test
- b. Linearity Test

2. Hypothesis Testing

Hypothesis testing in this study was done by calculating the correlation coefficient of each predictor to the criterion, the partial correlation



coefficient and calculating the multiple correlation between the predictor and the criterion. The calculations in hypothesis testing are as follows:

- a. Calculate the correlation coefficient of each predictor
- b. Calculates the partial correlation coefficient
- c. Calculate multiple correlation coefficients
- d. Look for the correlation coefficients of the three predictors

- e. Perform a regression significance test
- f. Look for contributions from each predictor

Results

Data obtained from each of these variables are then grouped and analyzed with statistics as follows:

Table 1

Description of data on the results of eye-hand coordination test, arm length, arm power and the ability to punch in front of the students for UNS pencak silat achievement

Variable	N	Mean	SD	Max	Min
Hand-eye coordination	50	14,8	0,99	17	14
Arm length	50	73,36	0,94	75	72
Power arm	50	4,11	0,14	4,4	4
Pencak silat front punch ability	50	48,24	71,36	50	46

Based on the above research data description table, information can be obtained: data description for eye-hand coordination variables based on the results of the study with a sample of 50 male students guiding UNS martial arts achievement obtained an average eye-hand coordination of 14.8 with a standard deviation of 0,99 highest score of 17 and lowest score of 14 Description of the data for arm length variables based on the results of the study with a sample of 50 male students guiding UNS martial arts achievements obtained an average arm length of 73.36 with a standard deviation of 0.94 the highest score of 75 and the lowest score of 72. Description of the data for the arm power variable based on the results of the study with a sample of 50 male students who are fostering achievement pencak silat UNS obtained an average arm power of 4.11 with a

standard deviation of 0.14 the highest score of 4.4 and the lowest score of 4. Description of the data for the ability of pencak silat front punch based on the results of research with a sample of 50 male students guiding UNS pencak silat achievements obtained an average front punch ability of 48.24 with a standard deviation of 1.36 the highest score of 50 and the lowest score of 46.

1. Normality Test

Data normality test in this study uses the Liliefors test. As for the results of the normality test conducted on the results of eye-hand coordination test (X1), arm length (X2), arm power (X3) and the ability to punch in front of the martial arts students to foster the achievement of martial arts UNS (Y) in this study as follows:

Table 2

Summary of data normality test results

Variable	N	Mean	SD	L count	L table
Hand-eye coordination	50	14,8	0,99	0,013	0,125
Arm length	50	73,36	0,94	0,041	0,125
Power arm	50	4,11	0,14	0,023	0,125
Punch Ability	50	48,24	71,36	0,030	0,125

Based on the results of the normality test conducted on each of these variables it can be seen that the value of L count the hand-eye coordination variable (X1) is 0.013, arm length (X2) is 0.041, arm power (X3) is 0.023 and the ability to punch in front of pencak silat (Y) amounting to 0.030. The results of the L value calculated for each of these variables are smaller than the L value of table 0.05 of 0.125, thus the null hypothesis of each variable is accepted. These results indicate that both eye-hand coordination test data (X1), arm length (X2), arm

power (X3) and the ability to punch in front of pencak silat (Y) are included in normal distribution.

2. Linearity Test

Linearity test of the relationship between each predictor, namely: Eye-hand coordination (X1), arm length (X2), arm power (X3) and front punch ability of students guiding pencak silat achievement (Y) is done with the help of the SPSS application, namely with the function "Compare Means". The linearity test results are presented in tabular form as follows:



Table 3

Summary of linearity test results

Variable	Significant	Significant Level	Conclusion
X1Y	0,00	0,05	Linier
X2Y	0,00	0,05	Linier
X3Y	0,00	0,05	Linier

Based on the results of the linearity test, the linearity of eye-hand coordination (X1) with the front punch ability of students in the pencak silat achievement (Y) is equal to 0.00, the length of the arm (X2) with the front punch ability of students in the pencak silat achievement (Y) with 0.00 and power arm (X3) with the ability to punch a student in front of the pencak silat (Y) achievement equal to 0.00. The results of the three values of eye-hand coordination variable (X1), arm length (X2), arm power (X3) are smaller than the significance level of 0.05. Thus the null hypothesis of each variable is accepted. These results indicate that there is a

significant linear correlation both in the results of eye-hand coordination (X1), arm length (X2), arm power (X3) with the ability to punch in front of students in the development of pencak silat achievements (Y).

3. Hypothesis test

Hypothesis testing is carried out using SPSS version 20. The results of the analysis, correlation, partial correlation and regression analysis between eye-hand coordination test data (X1), arm length (X2), arm power (X3) and front punch ability of student coaching achievements pencak silat (Y) in this study as follows:

Table 4

Correlation analysis of each predictor

		Correlations			
		Coordination	Long	Power	Blow
Coordination	Pearson Correlation	1	,538**	,604**	,838**
	Sig. (2-tailed)		,000	,000	,000
	N	50	50	50	50
Long	Pearson Correlation	,538**	1	,414**	,551**
	Sig. (2-tailed)	,000		,003	,000
	N	50	50	50	50
Power	Pearson Correlation	,604**	,414**	1	,760**
	Sig. (2-tailed)	,000	,003		,000
	N	50	50	50	50
Blow	Pearson Correlation	,838**	,551**	,760**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	50	50	50	50

** . Correlation is significant at the 0.01 level (2-tailed).

The results of the correlation analysis of each of the predictors. As follows:

a. Based on the correlation analysis between eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y), obtained a correlation coefficient of 0.838. With N = 50, the r value of the table is 5% = 0.278. It turns out that $r \text{ count} = 0.838 > r \text{ table } 5\% = 0.278$. This shows that there

is a significant relationship between eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y).

b. Based on the analysis of the correlation between arm length (X2) with the ability to punch in front of pencak silat (Y), obtained an inverse correlation coefficient of 0.551. With N = 50, the value of r table 5% = 0.278 It turns out that r count



= 0.551 > r table 5% = 0.278. This shows that there is a significant relationship between arm length (X2) and the ability to punch in front of pencak silat (Y).

- c. Based on the correlation analysis between arm power (X3) with the ability to punch in front of pencak silat (Y), obtained a correlation coefficient

of 0.760. With N = 50, the value of r table is 5% = 0.278. It turns out that r count = 0.760 > r table 5% = 0.278. This shows that there is a significant relationship between arm power (X3) with the ability to punch in front of pencak silat (Y).

Table 5

Analysis of multiple correlations

Variable	N	r count	r table
X1 and X2 with Y	50	0,846	0,278
X1 and X3 with Y	50	0,896	0,278
X2 and X3 with Y	50	0,803	0,278
X1, X2 and X3 with Y	50	0,900	0,278

The results of the multiple correlation analysis are as follows:

- a. Based on the correlation analysis between eye-hand coordination (X1) and arm length (X2) with the ability to punch in front of pencak silat (Y), obtained a correlation coefficient of 0.846. With N = 50, the value of r table is 5% = 0.278. Counted r count = 0.846 > r table 5% = 0.278. This shows that there is a significant relationship between eye-hand coordination (X1) and arm length (X2) with the ability to punch in front of pencak silat (Y).
- b. Based on the correlation analysis between eye-hand coordination (X1) and arm power (X3) with the ability to punch in front of pencak silat (Y), obtained a correlation coefficient of 0.896 with N

= 50, the value of r table 5% = 0.278. It turns out that r count = 0.896 > r table 5% = 0.278. This shows that there is a significant relationship between eye-hand coordination (X1) and arm power (X2) with the ability to punch in front of pencak silat (Y).

- c. Based on the correlation analysis between arm length (X2) and arm power (X3) with the ability to punch in front of pencak silat (Y), obtained a correlation coefficient of 0.803 with N = 50, r table value of 5% = 0.278. It turns out that r count = 0.803 > r table 5% = 0.278. This shows that there is a significant relationship between arm length (X2) and arm power (X3) with the ability to punch in front of pencak silat (Y).

Table 6

Partial correlation analysis

Control variable		Df	r count	r table
X2	X1 Y	47	0,769	0,278
X3	X1 Y	47	0,731	0,278
X1	X2 Y	47	0,217	0,278
X3	X2 Y	47	0,399	0,278
X1	X3 Y	47	0,583	0,278
X2	X3 Y	47	0,700	0,278
X2	X1 X3	47	0,497	0,278
X1	X3 X2	47	0,132	0,278
X3	X2 X1	47	0,397	0,278
X2 and X3	X1 Y	46	0,680	0,278
X1 and X3	X2 Y	46	0,174	0,278
X1 and X2	X3 Y	46	0,573	0,278

- d. Based on the calculation of the double correlation of eye-hand coordination (X1), arm length (X2) and arm power (X3) with the ability to punch in front of pencak silat (Y), a correlation coefficient of 0.900 is obtained. With N = 50, the value of r

table is 5% = 0.278. It turns out that r count = 0.900 > r table 5% = 0.278. This shows that there is a significant relationship between eye-hand coordination (X1), arm length (X2) and arm



power (X3) with the ability to punch in front of pencak silat (Y).

Based on the table above, information can be obtained as follows:

- a. Partial correlation coefficient eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y) controlling arm length (X2), obtained a partial correlation coefficient of 0.769. It turns out that $r_{\text{count}} = 0.769 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y) at a certain level of arm length (X2).
- b. Partial correlation coefficient eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y) controlling arm power (X3), obtained a partial correlation coefficient of 0.731. It turns out that $r_{\text{count}} = 0.731 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y) at a certain level of arm power (X3).
- c. Partial correlation coefficient of arm length (X2) with the ability to punch in front of pencak silat (Y) controlling eye-hand coordination (X1), obtained a partial correlation coefficient of 0.217. It turns out that $r_{\text{count}} = 0.217 < r_{\text{table } 5\%} = 0.278$. This shows that there is no significant relationship between the length of the arm (X2) with the ability to punch in front of pencak silat (Y) at a certain level of eye-hand coordination (X1).
- d. Partial correlation coefficient of arm length (X2) with the ability to punch in front of pencak silat (Y) controlling arm power (X3), obtained a partial correlation coefficient of 0.399. It turns out that $r_{\text{count}} = 0.399 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between arm length (X2) with the ability to punch in front of pencak silat (Y) at a certain level of arm power (X3).
- e. The partial correlation coefficient of arm power (X3) with the ability to punch in front of pencak silat (Y) controlling eye-hand coordination (X1), obtained a partial coefficient of 0.583. Turns out $r_{\text{count}} = 0.583 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between arm power (X3) with the ability to punch in front of pencak silat (Y) at the level of eye-hand coordination (X1).
- f. The partial correlation coefficient of arm power (X3) with the ability to punch in front of pencak silat (Y) controlling arm length (X2), obtained a partial correlation coefficient of 0.700. It turns out that $r_{\text{count}} = 0.700 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship significant between arm power (X3) with the ability to punch

in front of pencak silat (Y) at a certain level of arm length (X2).

- g. Partial correlation coefficient eye-hand coordination (X1) with arm power (X3) controlling arm length (X2), obtained a partial correlation coefficient of 0.497. It turns out that $r_{\text{count}} = 0.497 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between eye-hand coordination (X1) and arm power (X3) at a certain arm length (X2).
- h. The partial correlation coefficient of arm power (X3) with arm length (X2) controlling eye-hand coordination (X1), obtained a partial correlation coefficient of 0.132. It turns out that $r_{\text{count}} = 0.132 < r_{\text{table } 5\%} = 0.278$. This shows that there is no significant relationship between arm power (X3) with arm length (X2) at a certain eye-hand coordination level (X1).
- i. Partial correlation coefficient of arm length (X2) with eye-hand coordination (X1) controlling arm power (X3) obtained partial correlation coefficient of 0.397. It turns out that $r_{\text{count}} = 0.397 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between arm length (X2) and eye-hand coordination (X1) at a certain level of arm power (X3).
- j. The partial correlation coefficient of hand-eye coordination (X1) with the ability to punch in front of pencak silat (Y) controlling arm length (X2) and arm power (X3), obtained partial correlation coefficient of 0.680. It turns out that $r_{\text{count}} = 0.680 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between eye-hand coordination (X1) with the ability to punch in front of pencak silat (Y) at the level of arm length (X2) and arm power (X3).
- k. Partial correlation coefficient of arm length (X2) with the ability to punch in front of pencak silat (Y) controlling eye-hand coordination (X1) and arm power (X3), obtained a partial correlation coefficient of 0.174. It turns out that $r_{\text{count}} = 0.174 < r_{\text{table } 5\%} = 0.278$. This shows that there is no significant relationship between the length of the arm (X2) with the ability to punch in front of pencak silat (Y) at the level of eye-hand coordination (X1) and power of the arm (X3).
- l. The partial correlation coefficient of arm power (X3) with the ability to punch in front of pencak silat (Y) controlling eye-hand coordination (X1) and arm length (X2), obtained a partial correlation coefficient of 0.573. It turns out that $r_{\text{count}} = 0.573 > r_{\text{table } 5\%} = 0.278$. This shows that there is a significant relationship between arm power (X3) with the ability to punch in front of pencak silat (Y) at the level of eye-hand coordination (X1) and arm length (X2).



Table 7

Summary of the results of the regression analysis

Variable	Regression line			Significance test		
	Y	R _{1,2,3}	R ²	Db	F	F table
(Constant)	11.836					
Hand-eye coordination	.764	.900	.809	3 46	64.992	2.81
Arm length	.134					
Power arm	3.717					

Based on the results of the regression analysis summarized in the above table, the following information can be obtained:

- The equation of the regression line is:

$$y^{\wedge} = 11.836 + 0.764 X_1 + 0.134 X_2 + 3.717 X_3$$
- The correlation coefficient and determination between predictors and criteria:

$$R_{\{1,2,3\}} = 0.900$$

$$R^2 = 0.809$$

From the table it can be obtained that the simultaneous correlation coefficient is 0.900. This

value indicates that the relationship between all independent variables with the dependent variable is near perfect. In addition, information on the coefficient of determination is also obtained by $R^2 \times 100\% = 80.9\%$. This value indicates that the contribution of all independent variables to the dependent variable simultaneously is 80.9%. Meanwhile the remaining 19.1% is contributed by factors other than the factors represented by independent variables.

Table 8

The effective contribution of each independent variable to the dependent variable

Variable	Effective Donations
Hand-eye coordination	46,4 %
Arm length	5,1 %
Power arm	29,4 %
Total effective contributions	80,9 %

Based on the table it is known that hand-eye coordination contributes effectively by 46.4%, arm length 5.1% and arm power 29.4%, so the total effective contribution of the three variables to the

ability to punch in front of pencak silat is 80.9%. This shows that there are contributions from all eye-hand coordination variables, arm length and arm power.

Table 9

The relative contribution of each independent variable to the dependent variable

Variable	Relative Donations
Hand-eye coordination	57,4 %
Arm length	6,3 %
Power arm	36,4 %

Based on the table it is known that eye-hand coordination contributes a relative contribution of 57.4%, arm length 6.3% and arm power 36.4%.

deviation of 0.99 the highest score of 17 and the lowest score of 14. The arm length variable obtained an average arm length of 73.36 with a standard deviation of 0.94 the highest score of 75 and the lowest score of 72. The arm power variable obtained an average arm power of 4.11 with a standard deviation of 0.14 the highest score 4.4 and the lowest score 4. The variable ability of front punch pencak silat obtained an average ability to punch front pencak silat by 48.24 with a standard deviation of 1.36 the highest score 50 the lowest score 46.

Discussion

Based on the results of the above data analysis, can be obtained as follows:

1. Description of research data

Based on the results of descriptive analysis with a sample of 50 male students coaching martial arts achievement UNS showed the results of eye-hand coordination variable obtained an average of hand-eye coordination of 14.8 with a standard

2. Hypothesis testing

Hypothesis testing is basically a step to test the requirements stated in the hypothesis formulation



can be accepted or not. The proposed hypothesis can be accepted if empirical facts or data collected can support the hypothesis requirements. Hypothesis testing in this study used product moment correlation analysis techniques, partial correlation analysis and triple regression analysis of the three predictors. The steps of testing the hypothesis are as follows:

a. The Relationship between Eye-Hand Coordination with Pencak Silat's Front Beating Ability.

Based on the results of two data analyzes that have been conducted on eye-hand coordination data with the ability to punch in front of pencak silat; first analysis with product moment correlation analysis obtained r value of 0.838. This value is greater than the value of r table at the 5% significance level that is 0.278. Because $r_{count} > r_{table}$, the correlation value is significant. This means, the variance in the ability to punch in front of pencak silat is influenced by the element of eye-hand coordination. The second analysis with partial correlation analysis, the partial correlation coefficient of eye-hand coordination with the ability of the front punch pencak silat to control arm length and arm power, obtained a partial correlation coefficient of 0.680. With $df = 46$. It turns out that $r_{count} = 0.680 > t_{table} 5\% = 0.284$. This shows that there is a significant relationship between eye-hand coordination with the ability to punch in front of pencak silat at a certain level of arm length and arm power. The results of both analyzes show that hand-eye coordination has a significant relationship with the ability to punch in front of pencak silat. Thus the hypothesis which states, there is a relationship between eye-hand coordination with the ability to punch in front of pencak silat can be accepted as true.

b. Relationship between Arm Length and Pencak Silat Front Punch Ability.

Based on the results of two data analyzes that have been carried out on arm length data with the ability to punch in front of pencak silat; first analysis with product moment correlation analysis obtained r value of 0.551. The r value of 0.551 is greater than the value of r table of 5% significance level that is 0.278. Because the value of $r_{count} > r_{table}$, the correlation value is significant. This means, the variance in the ability of the front punch pencak silat is influenced by the element of arm length. The second analysis with partial correlation analysis, the partial correlation coefficient of arm length with the ability of the front punch pencak silat to control eye-hand coordination and arm power, obtained a partial correlation coefficient of 0.174 with $df = 46$. It turns out that $r_{count} = 0.174 < r_{table} 5\% = 0.284$. This shows that there is no significant relationship between the length of the arm with the ability to punch in front of pencak silat at the level of eye-hand

coordination and the power of a particular arm. The results of both analyzes show different conclusions, the first analysis of product moment correlation shows that there is a significant relationship between arm length and the ability to punch in front of pencak silat. Thus the hypothesis that states, there is a relationship between the length of the arm with the ability to punch in front of pencak silat can be accepted. While the second analysis of partial correlation shows that there is no significant relationship between arm length and the ability to punch in front of pencak silat when eye-hand coordination and arm power are controlled. Thus the hypothesis which states, there is a relationship between the length of the arm with the ability to punch in front of pencak silat is rejected.

c. Relationship between Arm Power and Pencak Silat's Front Punch Ability.

Based on the results of two analyzes that have been carried out on the arm power data with the ability to punch in front of pencak silat; first analysis with product moment correlation analysis obtained r of 0.760. This value is greater than r table at the 5% significance level that is 0.278. Because the value of $r_{count} > r_{table}$, the correlation value is significant. This means, the variance in the ability to punch in front of pencak silat is influenced by arm power. The second analysis with partial correlation analysis, the partial correlation coefficient of arm power with the ability of the front punch pencak silat to control eye-hand coordination and arm length, obtained a partial correlation coefficient of 0.573 with $df = 46$. It turns out that $r_{count} = 0.573 > r_{table} 5\% = 0.284$. This shows that there is a significant relationship between the power of the arm with the ability to punch in front of pencak silat at the level of eye-hand coordination and a certain arm length. The results of both analyzes show that arm power has a significant relationship with the ability to punch in front of pencak silat. Thus the hypothesis that states, there is a relationship between the power of the arm with the ability to punch in front of pencak silat can be accepted.

d. The relationship between eye-hand coordination and arm length with the ability to punch in front of pencak silat.

Based on the results of an analysis of eye-hand and arm-length coordination data with the ability to punch in front of pencak silat, the r value was 0.846. This value is greater than the value of r table at the 5% significance level that is 0.278. Because the value of $r_{count} > r_{table}$, the correlation value is significant. This means, the variance in the ability to punch in front of pencak silat is influenced by eye-hand coordination and arm length. This shows that eye-hand coordination and arm length have a significant relationship with the ability to punch in



front of pencak silat. Thus the hypothesis that states, there is a relationship between eye-hand coordination and arm length with the ability to punch in front of pencak silat, can be accepted as true.

e. The relationship between eye-hand coordination and arm power with the ability to punch in front of pencak silat.

Based on the results of an analysis of eye-hand and arm power coordination data with the ability to punch in front of pencak silat, an r value of 0.896 was obtained. This value is greater than the value of r table at the 5% significance level that is 0.278. Because the value of r count $>$ r table, the correlation value is significant. This means that the variability of pencak silat's front punch ability is influenced by eye-hand coordination and arm power. This shows, eye-hand coordination and arm power have a significant relationship with the ability to punch in front of pencak silat. Thus the hypothesis which states, there is a relationship between eye-hand coordination and arm power with the ability to punch in front of pencak silat, the truth can be accepted.

f. The relationship between arm length and arm power with the ability to punch in front of pencak silat.

Based on the results of the analysis that has been done on the data of arm length and arm power with the ability to punch in front of pencak silat, the value of r is 0.803. This value is greater than the value of r table at the 5% significance level that is 0.278. Because the value of r count $>$ r table, the correlation value is significant. This means, the variance in the ability to punch in front of pencak silat is influenced by arm length and arm power. This shows, arm length and arm power have a significant relationship to the ability to punch in front of pencak silat. Thus the hypothesis that states, there is a relationship between arm length and arm power with the ability to punch in front of pencak silat, the truth is acceptable.

g. The relationship between eye-hand coordination, arm length and arm power with pencak silat's front punch ability.

To examine the relationship of eye-hand coordination, arm length and arm power with the ability to punch in front of pencak silat, multiple predictor regression analysis was performed. From the regression analysis conducted it can be seen that the calculated F value obtained is 64.99 with $df = 3$ versus 46 at a significance level of 5%, the regression F value in the table is 2.81. Because F arithmetic = 64.99 $>$ F table = 2.81. From these results it can be

concluded, there is a significant relationship between eye-hand coordination, arm length and arm power with the ability to punch in front of pencak silat. This means, the ability to punch in front of pencak silat is influenced by eye-hand coordination, arm length and arm power. Thus the hypothesis which states, there is a relationship between eye-hand coordination, arm length and arm power with the ability to punch in front of pencak silat, can be accepted as correct.

Conclusion

Based on the results of research and the results of data analysis that has been done, the following conclusions can be obtained:

1. There is a significant relationship between eye-hand coordination, arm length and arm power with the ability to punch in front of pencak silat with a significant value F count = 64,99 $>$ F table = 2,81.

2. From the data analysis, the relative contribution of each independent variable to the dependent variable is obtained, namely hand-eye coordination making a relative contribution of 57.4%, Arm length contributing a relative contribution of 6.3%, Power arm making a relative contribution of 36, 4%.

3. While the effective contribution of each independent variable to the dependent variable is as follows: Hand-eye coordination makes an effective contribution of 46.4%, Arm length gives an effective contribution of 5.1%, Power arm makes an effective contribution of 29.4%. So that the total effective contribution of the three variables to the ability to punch in front of pencak silat is 80.9%.

This shows that the contribution of eye-hand coordination is the variable that has the most dominant contribution, then followed by the arm power variable and the smallest contribution is the arm length variable. Meanwhile the remaining 19.1% is contributed by factors other than those represented by independent variables. Predictions from researchers of these other factors could have been influenced by training factors or other physical condition factors that also supported the ability to punch in front of pencak silat.

Conflict of interest

Authors state that there is no conflict of interest.



References

1. Setiawan A. Pencapaian prestasi olahraga melalui kegiatan ekstrakurikuler pencak silat. J Pelopor Pendidik. 2012; 4(5):23-32
2. Raynadi FB, Rachmah DN, Akbar SN. Hubungan Ketangguhan Mental Dengan Kecemasan Bertanding Pada Atlet Pencak Silat Di Banjarbaru Relationship Between Mental Toughness and Competitive Anxiety in Pencak. J Ecopsy. 2016; 4(5):23-32
3. Wilujeng WA. Hubungan Kecepatan Terhadap Kecepatan Tendangan Sabit di SMP Muhammadiyah 2 Surabaya (studi pada siswa ekstrakurikuler pencak silat tapak suci). J Pendidik Olahraga dan Kesehat. 2013; 4(5):23-32
4. Nuraida N. Pengembangan Nilai-Nilai Karakter Melalui Pendidikan Pencak Silat untuk Anak Usia Dini (Studi Kasus di Paguron Pencak Silat Galura Panglipur Bandung). Tunas Siliwangi. 2016; 4(5):23-32
5. Aziz AR, Tan B, Teh KC. Physiological responses during matches and profile of elite pencak silat exponents. J Sport Sci Med. 2002; 4(5):23-32
6. Kumaidah E. Penguatan Eksistensi Bangsa melalui Seni Bela Diri Tradisional Pencak Silat. Humanika J Ilm Kaji Hum. 2012; 4(5):23-32
7. Purbojati MM. Penguatan Olahraga Pencak Silat Sebagai Warisan Budaya Nusantara. J Budaya Nusant. 2014;1(2):141-7.
8. Adyanto SP, Mujahir, Fajriyah K. Karakteristik siswa anggota ekstrakurikuler pencak silat ditinjau dari nilai karakter. J Sinektik. 2018;1(1):46-52.
9. Haqiyah A, Mulyana M, Widiastuti W, Riyadi DN. The Effect of Intelligence, Leg Muscle Strength, and Balance Towards The Learning Outcomes of Pencak Silat with Empty-Handed Single Artistic. JETL (Journal Educ Teach Learn. 2017; 4(5):23-32
10. Saputro DP, Siswantoyo S. Penyusunan norma tes fisik pencak silat remaja kategori tanding. J Keolahragaan. 2018; 4(5):23-32
11. Widiastuti, Fhitriani I. Pengembangan Model Senam Berbasis Pencak Silat. JPD J Pendidik Dasar. 2017;8(2):51-7.
12. Putra AM. Konstruksi Identitas Sosial Perguruan Pencak Silat Pencak Organisasi Ranting Kecamatan Sidoarjo , Kabupaten Sidoarjo. 2013;(070810024):1-14.
13. Ihsan N, Yulkiffi Y, Yohandri Y. Instrumen Kecepatan Tendangan Pencak Silat Berbasis Teknologi. J Sositoteknologi. 2018;17(1):124-31.
14. Trisnowiyanto B. Latihan Peningkatan Kemampuan Biomotor (Kelincahan, Kecepatan, Keseimbangan Dan Fleksibilitas) Dengan Teknik Lari (Shuttle Run, Zig-Zag, Formasi 8) Pada Pesilat. J Keterampilan Fis. 2016;
15. Mulyana. Improving Self-Concept through Pencak Silat Learning. In: IOP Conference Series: Materials Science and Engineering. 2017.
16. Paetzold UU, Mason PH. The fighting art of pencak silat and its music: From Southeast Asian village to global movement. The Fighting Art of Pencak Silat and its Music: From Southeast Asian Village to Global Movement. 2016.
17. Soo J, Woods CT, Arjunan SP, Aziz AR, Ihsan M. Identifying the performance characteristics explanatory of fight outcome in elite Pencak Silat matches. Int J Perform Anal Sport. 2018;
18. Saputra MY, Mulyana, Komarudin, Sartono H. Optimization of Pencak Silat Athletes Coordination Through Brain Jogging. In: IOP Conference Series: Materials Science and Engineering. 2017.
19. Widiastuti. Using game approach in improving learning outcomes of pencak silat. Asian Soc Sci. 2014; 4(5):23-32
20. Prihadianto R. Hubungan Antara Power Otot Tungkai Dan Kelincahan Terhadap Kecepatan Tendangan Depan Dan T Pada Cabang Olahraga Pencak Silat. J Univ Nusant PGRI KEDIRI. 2017; 4(5):23-32

Information about the authors

Bahrul Ulum Muhammad

bahrul130913@gmail.com

<https://orcid.org/0000-0002-2670-0879>

Sebelas Maret University

Street Ir. Sutami Number 36, Ketingan, Jebres, Surakarta City, Central Java, Indonesia

Agus Kristiyanto

aguskriss@yahoo.co.id

<https://orcid.org/0000-0001-7961-4643>

Sebelas Maret University

Street Ir. Sutami Number 36, Ketingan, Jebres, Surakarta City, Central Java, Indonesia

Slamet Riyadi

slametriyadi70@staff.uns.ac.id

<https://orcid.org/0000-0002-6403-7051>

Sebelas Maret University

Street Ir. Sutami Number 36, Ketingan, Jebres, Surakarta City, Central Java, Indonesia

Received: 26.07.2020

Інформація про авторів

Бахрул Улум Мухаммад

bahrul130913@gmail.com

<https://orcid.org/0000-0002-2670-0879>

Себелійський Університет

вул.Ір. Сурамі, 36, Кентігран, Ебрес, м. Суракарта, Центральна Ява, Індонезія

Агус Христиніано

aguskriss@yahoo.co.id

<https://orcid.org/0000-0001-7961-4643>

Себелійський Університет

вул.Ір. Сурамі, 36, Кентігран, Ебрес, м. Суракарта, Центральна Ява, Індонезія

Сламет Риаді

slametriyadi70@staff.uns.ac.id

<https://orcid.org/0000-0002-6403-7051>

Себелійський Університет

вул.Ір. Сурамі, 36, Кентігран, Ебрес, м. Суракарта, Центральна Ява, Індонезія

Принята в редакцію 26.07.2020