

Contribution of Leg Explosive Power and Reaction Speed to 100-meter Running Speed

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Authors' contribution:

A. Conception and design of the study; **B.** Acquisition of data; **C.** Analysis and interpretation of data; **D.** Manuscript preparation; **E.** Obtaining funding

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ABSTRACT

This research is descriptive research with a correlational design. This study aims to find out: (1). Is there a contribution of leg explosive power to the ability to run 100 meters in students of SMP Negeri 24 Makassar, (2). Is there a contribution of foot reaction speed to 100-meter running ability, (3). Is there a contribution of leg explosive power and foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar? The population is students of SMP Negeri 24 Makassar, the number of samples is 30 people using random sampling techniques. The analysis technique used is regression and correlation analysis through the SPSS application program version 22.00 with a significant level of 0.05 α . The results showed that: (1) There was a significant contribution of leg explosive power to the ability to run 100 meters in students of SMP Negeri 24 Makassar, amounting to 55.7%. (2) There was a significant contribution of foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar, amounting to 51.7%. (3) There is a significant contribution of leg explosive power and foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar, amounting to 64.5%.

Keyword: Explosive Power; Reaction Speed; 100-Meter Running; Speed

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INTRODUCTION

Athletics is one of the most important sports in the implementation *Olympic Games* Modern (Rusli, 2017). Athletics is practiced in all countries because the educational values contained therein, play a very important role in the development of physical condition, often also become the main basis for the development or improvement of optimal performance for other sports and can even be counted as a measure of progress of a country (Giyatno, 2017).



Short-distance running (Sprint) is any type of running that since Start and finishes at maximum speed (Hilman, 2014). Run Sprint takes 10-15 seconds and includes exercise classified as anaerobic (Taufik Hidayat, Ramadi, 2016), because the higher the speed the greater the source of aerobic energy (Pristiwan, 2016). Short-distance running (sprint) is a way to run where one must cover the entire distance at maximum speed (Muhtar, 2011). Sprint or Sprint are all running races where participants run at maximum speed throughout the distance that must be traveled, up to a distance of 400 meters can still be classified as sprinting (Bagia, 2015). Sprint or sprint, which is a running race where participants run at full speed covering distances of 100 m, 200 m, and 400 m (Umah et al., 2016). A relatively important need for running Sprint varies greatly depending on age category (Muhajir, 2004). Sprint A good one requires a quick reaction, good acceleration (Kardiyono, 2017), and an efficient type of running. Sprinters should also develop Start Sprint which is good and maintains top speed as best it can (Hermansah, 2016). In the run, Sprint must pay attention to the energy system used because athletes use stored energy supplies or an an-aerobic capacity (Khomsin, 2011).

In sports activities, one of the factors of physical condition that is very important and absolute to improve or enhance achievement is the explosive power factor of the legs (Shahida, 2015). Athletics is a sport that involves all legs and requires a physical component to be able to perform movements explosively, especially for short-distance running numbers (Faizah, 2016). What is needed in short-distance running is not only strength but strength accompanied by an element of speed called explosive power. Explosive power is the product between power and speed (Sukdiyanto, 2005). Explosive power is the result of power and speed. Individuals who have explosive power are people who have high muscle strength, high degrees of speed, and high degrees of skill combining speed and strength (Harsono, 1988). Explosive power is the ability of muscles to exert maximum force in a very fast time (Tite Juliantine, et al. 2007).

Leg explosive power is something that concerns the strength and speed of dynamic muscle contraction and involves the maximum expenditure of muscle strength in the fastest possible time (Ismayati, 2008). Leg explosive power is the ability to combine strength and speed that is realized in the form of the ability of muscles to cope with loads with high contractions (Syarifuddin, 2011). Leg explosive power is the ability to display or expend force explosively or quickly (Arsil, 2010). Explosive power is the ability of a muscle or group of muscles of a person to use maximum force deployed in the shortest or shortest time. (Novita, 2010).

Reaction speed is the ability to perform the same activity over and over again and continuously for a short time (Ariyantinin et al., 2016), while the reaction is the ability of the legs to react as quickly as possible when there is a stimulus received by receptomatic, kinetic or Vestibular (Toho Cholik Mutohir and Ali Maksun, 2007). Speed is the ability of a muscle or group of muscles to respond to stimuli in a fast or short time (Sukadiyanto, 2005). Speed is the ability to run and move very quickly (Tangkudung and Wahyuningtyas Puspitorini, 2012). Speed is a person's ability to move in the shortest time (Andi Suhendro, 2007). Speed is the ability to perform similar movements consecutively in the shortest time or the ability to cover a distance in a fast time (Harsono, 2001). Speed is the ability to perform continuous movements in the same form in the shortest possible time (Moch. Sajoto, 1988). (Sukadiyanto, 2005) various speeds are divided into two kinds of speeds, namely reaction speed and motion speed (Rahadian, 2018). Reaction speed is a person's ability to answer a stimulus in a short time (Leyva et al., 2017). Reaction speed is differentiated into single reaction and compound reaction. Single reaction speed is a person's ability to respond to stimuli that have known directions and objectives in a short

time (Satun, 2018). This means that before making movements in the athlete's mind, there is already a perception direction and target of the motor plan to be carried out so that the condition of stimulation can be predicted before the movement is carried out (Kusuma, 2019), Example: The athlete moves according to the coach's direction using a spray (Hidayat, 2019). The speed of multiple reactions is a person's ability to answer stimuli that have not been known direction and target in a short time (Dwi et al., 2018). This means that before making movements in the athlete's mind, there is already a perception, but it is not yet known the direction and target of the motion to be carried out.

METHODS

The research method or method used in this study is a descriptive research method with regression and correlation techniques, which aims to determine whether there is a contribution of leg explosive power and foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar. In this study there are two variables, namely: a) Independent variables, namely: Leg explosive power (X1) and foot reaction speed (X2); b. The dependent variables are: 100 meters (Y) running ability

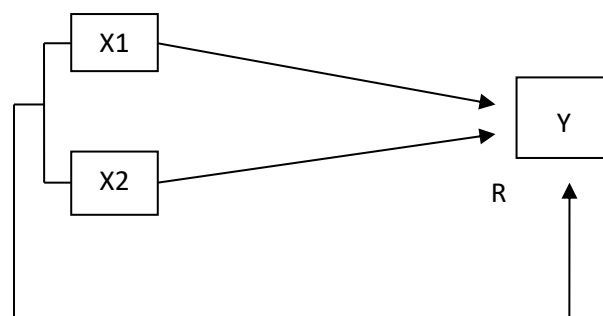


Figure 1.
Research design model

Information:

X1 = Leg explosive power

X2 = Foot reaction speed

Y = 100-meter running ability

R = Contribution

The Operational Definition of Variables is: 1) Leg explosive power, The explosive power of the legs in question is the ability of a person's legs to perform a movement with maximum strength and speed in a relatively short time. To determine the explosive power of a person's legs, this study will use a standing long jump test or broad jump; 2) Foot reaction speed, The foot reaction speed in question is the ability of a person's feet to make movements in a short time after there is a stimulus (stimulus), so in this study, researchers will use a foot reaction speed test (Foot Reaction Test); 3) The ability to run 100 meters, The ability to run 100 meters in question is a person's ability to run at full speed along the distance that must be travelled starting from the beginning of the line (start) to the end of the line (finish). So in this study, researchers will test the ability to run 100 meters on students of SMP Negeri 24 Makassar.

The population of this study is students of SMP Negeri 24 Makassar. The first step taken by researchers is to collect student activity data. Second, arrange the names. Third, determine the number of samples to be taken, which is as many as 30 students. Fourth, draw samples. Furthermore, researchers will draw students of SMP Negeri 24 Makassar

consisting of 4 classes. And of these 4 classes, the researcher only took a few students as representatives of each class. For class A, researchers will take samples of 8 people, class B 8 people, class C 9 people, and class D 5 people.

Research instruments are tools used by researchers to collect research data as follows: 1) Long jump test without prefix (*standing long jump test*) or *broad jump* (Nur Ichsan Halim, 2011); 2) Foot reaction speed test (*foot reaction test*) (Nur Ichsan Halim, 2011); 3. 100-meter running ability test.

RESULTS AND DISCUSSION

Result

Table 1.
Data correlation test results

Variable	Pearson correlation	P	α	Information
Leg explosive power (X1) 100-meter running ability (Y)	-0.747	0.000	0.05	Significant
Foot reaction speed (X2) 100-meter running ability (Y)	0.719	0.000	0.05	Significant

In the correlation test of leg explosive power data, a probability value (P) of 0.000 is obtained smaller than the value of α : 0.05. Thus, it can be stated that the explosive power of the legs to the ability to run 100 meters has a significant relationship and likewise with the reaction speed of the legs obtained a probability value (P) of 0.000 is smaller than the value of α : 0.05. Thus it can be stated that the speed of reaction of the foot to the ability to run 100 meters is a significant relationship.

In testing the correlation of leg explosive data to the ability to run 100 meters, a Pearson correlation test value of -0.747 was obtained. Thus it can be stated that there is a very strong relationship seen from the value of the correlation coefficient greater than the value of α : 0.05, and likewise with the speed of the reaction of the foot to the ability to run 100 meters obtained the value of Pearson correlation test 0.719. Thus it can be stated that there is a strong relationship seen from the value of the correlation coefficient greater than the value of α : 0.05.

In testing the correlation of leg explosive data to the ability to run 100 meters to determine the direction of the relationship, a *Pearson correlation test value of -0.747* was obtained. Thus, it can be stated that the explosive power of the legs has a positive relationship with the ability to run 100 meters and so does the reaction speed of the feet

Table 2.
Results of correlation and regression analysis for the first hypothesis

Variable	B	Rs	F	t	Sig
Leg explosive power (X1) 100-meter running ability (Y)	-0.747	0.557	35.266	-5.939	0.000

Based on the results of the correlation analysis test and regression data between the explosive power of the legs to the ability to run 100 meters, a correlation value of -0.747 was obtained with a probability level ($0.000 < \alpha < 0.05$), for the R-squared value (coefficient of determination) 0.557. This translates to 55.7% of the contribution or contribution of the explosive power of the legs to the ability to run 100 meters. From the ANOVA test or F/t-test, the F/t count is 35.266 with a significance level of 0.000. Because the probability value (0.000) is much smaller than α :0.05, regression models can be used to predict the contribution of leg explosive power to the ability to run 100 meters (applicable to the

population in which the sample was taken). The t-test obtained -5.939 with a significance level of 0.000. Therefore the probability value (0.000) is much smaller than $\alpha:0.05$. Then The explosive power of the legs has a significant effect on the ability to run 100 meters.

Table 3.

Results of correlation and regression analysis for the second hypothesis

Variable	B	Rs	F	T	Sig
Foot reaction speed (X2) 100-meter running ability (Y)	0.719	0.517	29.950	5.473	0.000

Based on the results of testing correlation analysis and regression data between the reaction speed of the legs to the ability to run 100 meters, a correlation value of 0.719 was obtained with a probability level ($0.000 < \alpha: 0.05$), for the R-squared value (coefficient determination) of 0.517. This translates to 51.7% of the foot's reaction speed to the ability to run 100 meters. From the ANOVA test or F/t-test, the F/t count is 29.950 with a significance level of 0.000. Since the probability value (0.000) is much smaller than $\alpha:0.05$, regression models can be used to predict the contribution of foot reaction speed to the ability to run 100 meters (applicable to the population in which the sample was taken). From the t-test obtained 5,473 with a significance level of 0.000. Because the probability value (0.000) is much smaller than $\alpha:0.05$, there is a significant contribution of foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar.

Table 4.

Results of regression and correlation analysis for the third hypothesis

Variable	R	Rs	F	T	Sig
Leg explosive power (X1) Foot reaction speed(X2) 100-meter running ability (Y)	0.803	0.645	24.488	6.209	0.000

Based on the results of regression analysis testing and data correlation between leg explosive power and foot reaction speed to 100-meter running ability, a regression value of 0.803 was obtained with a probability level ($0.000 < \alpha: 0.05$), for a square R-value (coefficient determination) of 0.645, this means 64.5% contribution or contribution from leg explosive power and foot reaction speed to the ability to run 100 meters. From the ANOVA test or F test, the F count is 24.488 with a significance level of 0.000. Since the probability value (0.000) is much smaller than the value of $\alpha:0.05$, regression models can be used to predict the contribution of leg explosive power and foot reaction speed to the ability to run 100 meters (applicable to the population in which the sample was taken). The t-test obtained 6.209 with a significance level of 0.000. Because the probability value (0.000) is much smaller than $\alpha:0.05$. Then there is a significant contribution of leg explosive power and the speed of foot reaction to the ability to run 100 meters in students of SMP Negeri 24 Makassar.

Based on several theories that say that the element that is needed in sprinting is the element of a combination of strength and speed known as power, here is an explanation of power; (1). Power is the product between power and speed (Sukadiyanto, 2005). (2). Individuals who have power are people who have a high degree of muscle strength, a high degree of speed, and a high degree of skill combining speed and strength (Harsono, 1988). (3). Power is the ability of muscles to exert maximum force in a very fast time (Tite Juliantine, et al. 2007). From some of the opinions above, the author strongly agrees with some of the theories described above, so the author can conclude that power is a person's ability to expend leg muscle power in a fast and short time. The ability to run 100 meters requires leg explosive power which is a physical component that has a very important role.



Based on the theory that says that; Reaction speed is the movement made by the body to answer as soon as possible shortly after getting a stimulus. Reaction speed is a person's ability to answer a stimulus in a short time. Reaction speed is the time it takes to give a kinetic response after receiving a stimulus. So the author can conclude that the reaction speed is the speed of answering stimuli and the speed of moving after stimuli and providing a kinetic response in a short time. The element of foot reaction speed also has an important role in the ability to run 100 meters.

The explosive power of the legs and the reaction speed of the feet are both physical elements that are needed in sprints because running 100 meters requires short movements in the process. Everything that is done with high activity requires good physical condition, thus the process of carrying out the 100-meter running ability test certainly requires physical components such as leg explosive power and good foot reaction speed to help the movement of the ability to run 100 meters.

CONCLUSION

Based on the results of research and discussion that have been proposed, a conclusion can be drawn as follows: (1). There is a significant contribution of leg explosive power to the ability to run 100 meters in students of SMP Negeri 24 Makassar, amounting to 55.7%. (2). There was a significant contribution of foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar, amounting to 51.7%. (3). There is a significant contribution of leg explosive power and foot reaction speed to the ability to run 100 meters in students of SMP Negeri 24 Makassar, amounting to 64.5%.

Based on the results of data research and conclusions, the following suggestions can be put forward: 1) For coaches and coaches and physical education teachers, it is recommended that to improve the 100 Meter run, it should be necessary to pay attention to the elements of physical ability that can support, leg explosive power and foot reaction speed; 2) For 100 meter runners, it is recommended that athletes need to equip themselves with knowledge about the importance of developing physical abilities such as leg explosive power and foot reaction speed; 3) For students interested in conducting further research, it is recommended to involve other variables relevant to the study as well as with the wider population and sample.

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