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The Influence of Stride Frequency, Stride Length, and Motivation on the 1500-meter Running Ability of South Sulawesi Athletics Athletes

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ABSTRACT

The type of research in this thesis is quantitative research. This study aims to determine whether or not there is an influence of step frequency, Stride Length and Motivation on the 1500-meter Running Ability of South Sulawesi Athletics Athletes. The population in this study were South Sulawesi Athletics athletes with a sample of 35 athletes using purposive sampling techniques. The research instruments used were descriptive analysis, data normality test, linearity test, and hypothesis test with the help of SPSS version 25.00. The results of the study showed that; (1) There is a direct influence of step frequency on the motivation of South Sulawesi athletic athletes by 35.4%; (2) There is a direct influence of step length on the motivation of South Sulawesi athletic athletes by 30.3%; (3) There is a direct influence of step frequency on the 1500-meter running ability of South Sulawesi athletic athletes by 51.7%; (4) There is a direct influence of step length on the 1500-meter running speed of South Sulawesi athletic athletes by 77.3%; (5) There is a direct influence of motivation on the 1500-meter running ability of South Sulawesi athletic athletes of 37.9%; (6) There is an influence of step frequency through motivation on the 1500-meter running ability of South Sulawesi athletic athletes of 13.4%; (7) There is an influence of stride length through motivation on the 1500-meter running ability of South Sulawesi athletic athletes of 11.4%.

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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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INTRODUCTION

Athletics is a term that means a physical activity consisting of walking, running, throwing and jumping, which is done on the track and the field. Therefore, athletics is also called the mother of sports, meaning the parent of all sports. This is because almost all sports that involve large and small muscles are inseparable from walking, running, throwing and jumping activities. The word athletics originally, "Athletic" (Greek), comes from the word athlon, which means to compete or race. In this study, the author uses the word athletics to discuss problems related to walking, running, jumping and throwing (Lengkana, 2016).

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Athletics is the parent of most sports, and movements from athletics, such as walking, running, jumping, and throwing, are included in most sports. Athletics is important for improving physical fitness, skills, speed, and endurance, as well as movement reactions both in other sports and in everyday life with its various challenges (Qotimah et al., 2024). The athletic sport has many categories or race numbers, one of which is the 1500-meter run, which is categorised as a middle-distance run.

In athletics, especially in the middle distance running number, namely 1500-meters, physical conditions such as endurance are required and supported by good mastery of techniques, so as to get good results (Angreini & Endriani, 2023). Therefore, programmed, structured, and continuous physical training is very necessary in order to achieve the goal of achieving.

Middle distance running is a branch of athletics that has its technique to do it, a fairly long distance that requires a runner to be able to regulate stamina, speed and breathing while running (Laksana et al., 2022).

The 1500-meter run is a sport that requires good physical components if you want to get satisfactory results in achieving a good running time. The 1500-meter run is considered to be four different segments, with different stride speeds. The first half is passed at a fast pace, the second half is passed at a comfortable and light pace, the third half is energy saving with slow steps, and the fourth lung with a short speed boost (Novinda & Pitnawati, 2019).

According to Eddy Purnomo (Sigid, 2022), running speed is influenced by stride length and stride frequency. Stride frequency is influenced by strength. Stride length is influenced by leg length. This coordination is always related to other biomotor abilities, including strength. All of these aspects need to be prepared thoroughly because one aspect will determine the other aspects. Physical quality is the basis of an athlete's achievements, because technique, tactics and mentality can be developed well if they have good physical quality.

Stride frequency is the ability to make several step movements in a unit of time (per second). The frequency of steps when running is good to use when the runner balances his body, where the runner, when leaving the start, moves his body in a low position, so that foot speed is needed. The frequency of steps can make a big contribution to running. If a runner can do a good and maximum frequency of steps in running, then the travel time can be shortened. The correct technique can help achieve a good frequency of steps in running. Many biomotor components can be considered, including coordination, flexibility, power or explosive power, strength, and agility (Rudianto et al., 2020).

According to Hartono & Andri (Firmansyah & Rumini, 2022) explains that running speed is determined by stride length and stride frequency; therefore, runners must be able to increase one or both. So, to increase the length of the steps and the frequency of the steps, it is necessary to do what is called training.

Stride length is one of the elements that can make a big contribution to the speed of running 1500-meters. Stride length is closely related to a person's height, meaning that someone taller will have a longer stride length compared to someone shorter (Sujiono, 2021).

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In the 1500-meter run, good technical mastery is also required, such as arm swings, step techniques, cornering techniques, and techniques for entering the finish line. In the 1500-meters, physical conditions such as endurance are required and supported by good technical mastery, so as to get good results. The 1500-meter run also requires a combination of strength, speed, and technique to be performed properly. To produce maximum speed, several factors influence it, including stride frequency and stride length (Angreini & Endriani, 2023).

The factors that influence a runner to excel include physical ability, technique, tactics, and psychology or motivation. Motivation is a necessity for every athlete, both for training and when competing, so athletes must continue to be motivated so that they can maintain their desire and will to be the best (Reza & Hardinoto, 2021). Motivation is an internal energy force that determines all aspects of an individual's behavior. It also influences how individuals think, feel, and interact with others (Blegur & Mae, 2018).

Motivation is the basis for all sports efforts and achievements. Athletes are willing and determined to improve their sports performance, including mental, self-confidence, intensity, focus, and emotions. Athletes' achievement motivation is useful in competitive sports. It is a force that moves in challenging tasks for athletes to achieve in sports. In sports themselves, athletes need motivational intervention for the training process and competitions, even though motivation is generally accepted as an important prerequisite for athletes to fulfil their potential and performance. Motivation and sports performance play an important role because the level of psychological stress increases with increasing levels of competition (Blegur & Mae, 2018).

METHODS

This type of research is quantitative descriptive research with a path analysis research design. Path analysis is part of a regression model that can be used to determine the causal relationship between one variable and another. The population in this study was 35 South Sulawesi athletes. The sampling technique was purposive sampling with several considerations, where the sample must be middle-distance and long-distance athletes, so that a sample of 20 people was obtained. The data analysis technique used was descriptive data analysis, then a prerequisite analysis test was carried out, namely a normality test, a linearity test, and then a model test and a hypothesis test were carried out.

RESULTS AND DISCUSSION

Result

Descriptive Analysis

The results of the descriptive data analysis are calculated in the table below:

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Table 1.
Results of Descriptive Data Analysis

Statistic	Stride Frequency	Stride Length	Motivation	1500-meter Running
Mean	178.65	171.85	111.90	307.8255
Median	180.00	173.00	111.50	307.4100
Mode	180	179	112[a]	276.11[a]
Std. Deviation	4.082	8.905	5.399	18.89406
Variance	16.661	79.292	29.147	356.986
Range	16	29	17	58.21
Minimum	171	157	103	276.11
Maximum	187	186	120	334.32
Sum	3573	3437	2238	6156.51

The following is a summary of the results of the descriptive analysis of the data in Table 1 above, which can be described as follows:

1. For step frequency data, from the number of samples (N) of 20, the average value is 178.65, the mean value is 180.00, the mode is 180, the standard deviation is 4.082, the variance is 16.661, the range is 16, the minimum value is 171, the maximum value is 187 and the total is 3573.
2. For step length data, from the number of samples (N) of 20, the average value is 171.85, the mean value is 173.00, the mode is 179, the standard deviation is 8.905, the variance is 79.292, the range is 29, the minimum value is 157, the maximum value is 186 and the total is 3437.
3. For motivation data, from the number of samples (N) of 20, the average value is 111.90, the median value middle 111.50, the mode is 112, the standard deviation is 5.399 variance is 29.147, the range is 17, the minimum value is 103, the maximum value is 120, and the total is 2238.
4. For the 1500-meter running ability data, from the number of samples (N) of 20, the average value was 307.8255, the median value was 307.41, the mode was 276.11, the standard deviation was 18.89406, the variance 356.986, range was 58.21, minimum value 276.11, the maximum value was 334.32, and the total was 6156.51.

Normality Test

Research data that will be analysed statistically must meet the analysis requirements. The prerequisite test is the normality test with the Kolmogorov-Smirnov Test. From the results of the Kolmogorov-Smirnov Test conducted, the results obtained are as attached. The calculation results can be seen in the following Table 2.

Table 2.
Data Normality Test Results

Variabel	Statistic	N	Sig.	α	Information
Stride Frequency	0,954	20	0,432	0,05	Normal
Stride Length	0,935		0,189		Normal
Motivation	0,943		0,271		Normal
1500-meter Running	0,942		0,263		Normal

Based on the results of the data normality test obtained in Table 4.2, the step frequency was obtained with a Kolmogorov-Smirnov value of 0.954 and a significance

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level of 0.432, greater than 0.05. The stride length obtained a Kolmogorov-Smirnov value of 0.935 and a significance level of 0.189, greater than 0.05. Motivation obtained a Kolmogorov-Smirnov value of 0.943 and a significance level of 0.271, greater than 0.05. The ability to run 1500-meters obtained a Kolmogorov-Smirnov value of 0.942 and a significance level of 0.263, greater than 0.05. Thus, it can be concluded that the data on the step frequency, stride length, and motivation towards the 1500-meter running ability of South Sulawesi athletes are normally distributed..

Linearity Test

Linearity is a linear relationship between variables, meaning that any change that occurs in one variable will be followed by a change with a magnitude that is parallel to the other variables. Changes in the independent variable will be followed by changes in the dependent variable. The linearity test is used to ensure linearity at least in the distribution of data. In the linearity test, the provisions apply if the F value is significant or greater than 0.05; then the relationship between the variables is declared linear.

Table 3.
Results of the Data Linearity Test

Nu	Variable	Defiation from Linearity	Sig.	Conclusion
1	Stride Frequency (X1) Motivation (Z)	0,375	0,920	Linear
2	Stride Length (X2) Motivation (Z)	1,733	0,283	Linear
3	Stride Frequency (X1) 1500-meter Running (Y)	2,236	0,123	Linear
4	Stride Length (X2) 1500-meter Running (Y)	0,471	0,873	Linear
5	Motivation (Z) 1500-meter Running (Y)	0,770	0,658	Linear

Based on the linearity test data in the table above, the F value (defiation from linearity) between the step frequency variable (X1) and motivation (Z) is 0.375 at a significance of 0.920, the F value (defiation from linearity) between the step length variable (X2) and motivation (Z) is 1.733 at a significance of 0.283, the F value (defiation from linearity) between the step frequency variable (X1) and the ability to run 1500-meters (Y) is 2.236 at a significance of 0.123, the F value (defiation from linearity) between the step length variable (X2) and the ability to run 1500-meters (Y) is 0.471 at a significance of 0.873, the F value (defiation from linearity) between the motivation variable (Z) and the ability to run 1500-meters (Y) is 0.770 at a significance of 0.658. This shows that the F value is not significant or greater than 0.05, so the relationship between the variables is stated as linear.

Model Test

Substructure 1

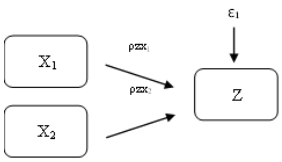

Figure 1.
Substructure Model I

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The similarities:

$Z = \rho zx_1 + \rho zx_2 + \varepsilon_1$

Table 4.

Coefficient of Determination of Substructure I

Model	R	Coefficient of Determination	Adjusted Koefisien Determinasi	Std. Error
1	0,530	0,281	0,197	4,839

Table 5.

Multivariate Regression Analysis of Substructure Model I

Model	Variable	Correlation Coefficient	T	ρ
1	Stride Frequency	0,354	1,641	0,119 > 0,05
	Stride Length	0,303	1,403	0.179 > 0,05
	Konstanta			0,000

Based on the table above, the R-Square value shows a figure of 0.530, which indicates that simultaneously the frequency of steps and the length of steps have a contribution of 53% in explaining the changes that occur in the motivation variable, while the remaining 47% is determined by other variables outside the model. In the Anova section (F test), it can be seen that simultaneously the independent variables have an insignificant effect on the motivation variable as indicated by the sig. value of 0.060> Alpha 5%.

In addition, in the Coefficients table (partial t-test), it can be seen that the step frequency variable (X1) and the step length variable (X2) statistically have no significant effect on motivation (Z) as indicated by the significant values of each greater than Alpha 5%, namely 0.119 and 0.179. To analyze how much influence other variables outside the model have on motivation (ε) can be determined as follows:

$$\varepsilon_1 = \sqrt{1 - R^2}$$
$$= \sqrt{1 - 0{,}530}$$
$$= \sqrt{0{,}0{,}470}$$
$$= 0{,}6855 = 68{,}55\%$$

So the value (ε1) of the coefficient of the other path to equilibrium is 68.55%..

Substructure 2

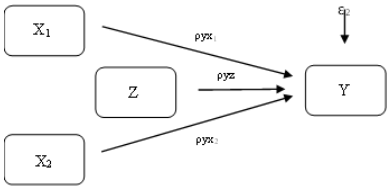

Figure 2.

Substructure Model I

The similarities:

$Y = \rho yx_1 + \rho yx_2 + \rho yz + \varepsilon_2$

Table 6.

Substructure Determination Coefficient II

Model	R	Coefficient of Determination	Adjusted Koefisien Determinasi	Std. Error
1	0,913	0,834	0,803	8,38021

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Table 7.
Multivariate Regression Analysis of Substructure Model II

Model	Variable	Correlation Coefficient	T	ρ
1	Stride Frequency	0,517	4,499	0,000 < 0,05
	Stride Length	0,773	6,856	0,000 < 0,05
	Motivation	0,379	3,161	0,006 > 0,05
	Konstanta			0,000

Based on the table above, the R-Square value is 913, and the significance value for variables X1, X2, and Z are respectively 0.000, 0.000 0.006. Because the significance value of X1, X2, and Z <0.05, it is considered significant. To analyze how much influence other variables outside the model have on the ability to run 1500-meters (ε2) can be determined in the following way:

$$\varepsilon_2 = \sqrt{1 - R^2}$$
$$= \sqrt{1 - 0{,}913}$$
$$= \sqrt{0{,}087}$$
$$= 0{,}2949 = 29{,}49\%$$

So the value (ε2) of the coefficient of other routes on the ability to run 1500-meters is 29.49%.

After carrying out several stages of model testing by paying attention to the level of significance of each variable, two models were obtained, which were considered significant. The two models in question were substructure model 1 and substructure 2. If the two models were combined, a structure was obtained as shown in the following image.

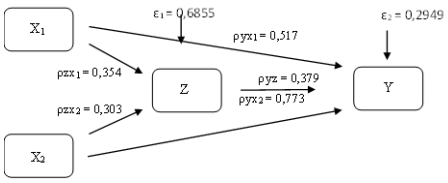

Figure 3.
Model of Test Results for Substructure I and Substructure II

Hypothesis Test

Hypothesis 1: There is a direct effect of stride frequency on the 1500-meter running ability of South Sulawesi athletes.

Based on the results of the analysis obtained in the table, it shows that the β coefficient value is negative, namely 0.354, with significance (p) = 0.000 (p <0.05), which means significant. This shows that there is a significant direct effect of stride frequency on the 1500-meter running ability of South Sulawesi athletes.

Hypothesis 2: There is a direct effect of stride length on the 1500-meter running ability of South Sulawesi athletes.

Based on the results of the analysis obtained in the table, it shows that the β coefficient value is negative, namely 0.773, with significance (p) = 0.000 (p <0.05), which

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means significant. This shows that there is a significant direct effect of stride length on the 1500-meter running ability of South Sulawesi athletes.

Hypothesis 3: There is a direct influence of motivation on the 1500-meter running ability of South Sulawesi athletes

Based on the results of the analysis obtained in the table shows a positive β coefficient value of 0.379 with a significance (p) = 0.006 (p> 0.05), which means significant. This shows that there is a significant direct influence of motivation on the 1500-meter running ability of South Sulawesi athletes.

Hypothesis 4: There is an influence of step frequency on motivation

Based on the results of the analysis obtained in the table shows that the β coefficient value is positive, namely 0.354, with a significance (p) = 0.119 (p> 0.05), which means not significant. This shows that there is an insignificant direct influence of step frequency on motivation.

Hypothesis 5: There is an effect of stride length on motivation

Based on the results of the analysis obtained in the table, it shows that the coefficient value of β is positive, namely 0.303, with significance (p) = 0.179 (p> 0.05), which means it is not significant. This shows that there is an insignificant direct effect of stride length on motivation.

Hypothesis 6: There is an effect of stride frequency through motivation on the 1500-meter running ability of South Sulawesi athletes

Based on the results of the analysis obtained in the table, the coefficient value of β and significance (p) of the stride frequency variable through motivation on the 1500-meter running ability of South Sulawesi athletic athletes is obtained from the product of the β and p values between the stride frequency variable on motivation and the β and p values between the motivation variable on the 1500-meter running ability and the correlation coefficient so that a coefficient value of 0.354 x 0.379 = 0.134 is obtained and a significance (p) of 0.000 (p <0.05) which means significant. This shows that there is a significant influence of step frequency through motivation on the 1500-meter running ability of South Sulawesi athletes.

Hypothesis 7: There is an influence of stride length through motivation on the 1500-meter running ability of South Sulawesi athletes

Based on the results of the analysis obtained in the table, it shows that the coefficient value of β and significance (p) of the stride length variable through motivation on the 1500-meter running ability of South Sulawesi athletic athletes is obtained from the product of the β and p values between the stride length variable on motivation and the β and p values between the motivation variable on the 1500-meter running ability of athletic athletes and the correlation coefficient so that the coefficient value is 0.303 x 0.379 = 0.114 and the significance so that (p) is 0.000 (p <0.05) which means significant. This shows that there is a significant influence of stride length through motivation on the 1500-meter running ability of South Sulawesi athletes.

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Discussion

There is a Direct Influence of Step Frequency on the Motivation of South Sulawesi Athletics Athletes

Based on the results of the study, it show that there is an influence of step frequency on the motivation of South Sulawesi athletes by 35.4%. This result shows an analysis that the step frequency of an athlete is needed to increase motivation. Step frequency is the ability to make several step movements in a unit of time (per second). The step frequency when running is good when the runner balances his body, where the runner, when leaving the start, moves his body in a low position so that foot speed is needed (Rudianto et al., 2020).

Achievement motivation in this study is an encouragement for someone to do something that is best, and is an achievement that he does, so that he outperforms/exceeds others in many ways and which can provide satisfaction for himself. This achievement motivation is usually closely related to the work that is his responsibility (Efendi, 2016).

There is a Direct Influence of Stride Length on the Motivation of South Sulawesi Athletic Athletes

Based on the results of the study, it show that there is an influence of stride length on the motivation of South Sulawesi athletes by 30.3%. This result shows an analysis that the stride length of an athlete is needed to increase motivation. Stride length is the distance between two feet when they touch the ground. Stride length is closely related to a person's height, meaning that someone taller will have a longer stride length than someone shorter (Sujiono, 2021).

The role of motivation in training can be likened to fuel to drive the engine, namely the training carried out by participants, so that it is adequate and encourages participants to train seriously, so that the desired goals can be achieved. However, if the motivation is too strong, it can also hurt the participants themselves, and being able to generate motivation in participants is one of the tasks of the coaches (Daya, 2015).

There is a Direct Influence of Step Frequency on the 1500-meter Running Ability of South Sulawesi Athletics Athletes.

Based on the results of the study, it show that there is an influence of step frequency on the 1500-meter running ability of South Sulawesi athletes by 51.7%. This result shows an analysis that the step frequency of an athlete is needed to improve the ability to run 1500-meters. According to Eddy Purnomo (Sigid, 2022), running speed is influenced by stride length and stride frequency. Step frequency is influenced by strength. Stride length is influenced by leg length. This coordination is always related to other biomotor abilities, including strength. All of these aspects need to be prepared thoroughly because one aspect will determine the other aspects. Physical quality is the basis of an athlete's achievement, because technique, tactics and mentality can be developed properly if they have good physical quality.

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Step frequency is the number of steps that can be taken by a runner over a certain distance. Fast travel time over a distance will be determined by the number of step frequencies supported by the speed of leg movement (Sujiono, 2021).

There is a Direct Influence of Stride Length on the 1500-meter Running Ability of South Sulawesi Athletics Athletes.

Based on the results of the study it shows that there is an influence of stride length on the 1500-meter running ability of South Sulawesi athletics athletes by 77.3%. This result shows an analysis that the stride length of an athlete is needed to improve the ability to run 1500-meters.

According to Hartono & Andri (Firmansyah & Rumini, 2022) explains that running speed is determined by stride length and stride frequency; therefore, runners must be able to increase one or both. So, to increase the stride length and stride frequency, it is necessary to do what is called training.

Stride length is one of the elements that can make a major contribution to the speed of running 1500-meters. Stride length is closely related to a person's height, meaning that someone taller will have a longer stride length compared to someone shorter (Sujiono, 2021).

There is a Direct Influence of Motivation on the 1500-meter Running Ability of South Sulawesi Athletics Athletes.

Based on the results of the study, it shows that there is an influence of motivation on the 1500-meter running ability of South Sulawesi athletics athletes by 37.9%. This result shows the analysis that the motivation of an athlete is needed to improve the ability to run 1500-meters. According to Dr. Ali Maksum (Kuspriyani & Setyawati, 2014), motivation is "a driver or motivator for someone to do something that has direction and intensity". Then, according to Adisasmito, motivation is "the unity of desire and purpose that drives behaviour".

(Guzel et al., 2020) Supports the idea that fitness contributes to individuals both physically and spiritually, and it can cause individuals to feel better motivated through training in their mental well-being. It can be said that motivation to succeed in sports is a force that can drive athletes to succeed, especially in order to realise the goals, hopes and even dreams of amateur and professional athletes, and can have a significant effect on the level of achievement.

There is an Influence of Step Frequency on the Ability to Run 1500-meters Through the Motivation of South Sulawesi Athletic Athletes.

Based on the results of the study, it show that there is an influence of step frequency on the ability to run 1500 meters through the motivation of South Sulawesi athletes by 13.4%. This result shows the analysis that the step frequency of an athlete is needed to improve the ability to run 1500-meters through motivation.

Step frequency is a balancer because the main mechanical goal of sprinting is to move the body from one point to another to achieve maximum horizontal movement. The faster the leg movement, the higher the knee is lifted forward. This movement allows the pushing leg to reduce the angle between the foot and the ground surface, thereby

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increasing the effective force of the leg push. This can be seen when the sole is lifted off the ground after stepping firmly, then immediately the foot (Rudianto et al., 2020).

The factors that influence a runner to excel include physical ability, technique, tactics, and psychology or motivation. All of these components must be met for a runner, because they are a requirement for runners to be able to improve their abilities so that they achieve their goals.

There is an Influence of Stride Length on the Ability to Run 1500-meters Through the Motivation of South Sulawesi Athletic Athletes.

Based on the results of the study, it shows that there is an influence of stride length on the ability to run 1500-meters through the motivation of South Sulawesi athletic athletes by 11.4%. This result shows that the analysis of the stride length of an athlete is needed to improve the ability to run 1500-meters through motivation. The optimal stride length is largely determined by the physical ability and endurance of the strength possessed by the runner at each running step. This endurance is influenced by muscle strength, power, and mobility (Basuki, 2016).

A person's running speed can be influenced by the length of a person's stride. This means that a runner who has long legs and has long strides will have a faster running speed compared to a runner who has short strides. In sports themselves, athletes need motivational intervention for the training process and competitions, even though motivation is generally accepted as an important prerequisite for helping athletes to fulfil their potential and performance. Motivation and sports performance play an important role because the level of psychological stress increases along with the increasing level of competition (Blegur & Mae, 2018).

CONCLUSION

From the results of hypothesis testing and the discussion of research results, the following conclusions can be drawn:

1. There is a direct but insignificant effect of step frequency on the motivation of South Sulawesi athletes.
2. There is a direct but insignificant effect of stride length on the motivation of South Sulawesi athletes.
3. There is a significant direct effect of step frequency on the 1500-meter running ability of South Sulawesi athletes.
4. There is a significant direct effect of stride length on the 1500-meter running ability of South Sulawesi athletes.
5. There is a significant direct effect of motivation on the 1500-meter running ability of South Sulawesi athletes.
6. There is a significant effect of step frequency on the 1500-meter running ability through the motivation of South Sulawesi athletes.

7. There is a significant effect of stride length on the 1500-meter running ability through the motivation of South Sulawesi athletes.

Based on the conclusions above, there are several suggestions that can be conveyed, namely: Coaches are advised to conduct routine evaluations of athlete step patterns and provide individual technical feedback in order to improve running efficiency. For future researchers, they can consider adding other variables that can influence the ability to run 1500 meters, so that the analysis model built is more comprehensive.

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