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The Contribution Of Foot Reaction Speed And Dynamic Balance To The 100-M Running Speed Of FIK UNM Makassar Students

Andi Rizal[1]

{andi.rizal@unm.ac.id[1]}

Universitas Negeri Makassar, Jl. A. P. Pettarani, Tidung, Kec. Rappocini, Kota Makassar, Sulawesi Selatan 90222[1]

Abstract.This study is a descriptive research that aims to determine the contribution of foot reaction speed and dynamic balance to the 100-meter running speed of FIK UNM Makassar students. This research was carried out on the student population of FIK UNM Makassar, using a random sample of 60 people. Data collection used foot reaction speed measurement instruments, dynamic balance tests, and 100-meter running tests. Data analysis used regression coefficient analysis techniques. And from the results of the data analysis, it can be concluded as follows: (1) There is a significant contribution of the reaction speed of the feet to the running speed of 100 meters in FIK UNM Makassar students. 57.1% (p=0.000). (2) There is a significant contribution of dynamic balance to the 100-meter running ability of FIK UNM Makassar students. By 36.8% (p = 0.000). (3) There is a significant contribution of the combination of leg reaction speed and dynamic balance to the 100-meter running ability of FIK UNM Makassar students. 62.0 % and F = 46.589 (p=0.000)

Keywords: Foot reaction speed, balance, 100 meter running ability, athleticism.

1 Introduction

Sport has an important role in improving the quality of human resources, both in terms of health, physical fitness, and character building. In Indonesia, sports also function as a medium for mental development and achievement improvement that brings the nation's good name at the international level. One of the sports that is the basis for many physical activities is athletics, which is often referred to as the *mother of sports*. The 100-meter sprint number is the purest form of human speed and strength, so it is an important indicator in assessing an athlete's physical ability (Healy et al., 2019).

However, conditions in the field show that students' sprinting skills, especially at the Faculty of Sports Sciences (FIK) of the State University of Makassar, are still far from optimal. Based on the results of observations and discussions with lecturers and athletic coaches in the FIK UNM environment, it was found that many students had difficulty reaching the ideal time in the 100-meter running test. Some of them experience a slow response to the start signal and lose balance when accelerating. This phenomenon shows weaknesses in fundamental aspects such as leg reaction speed and dynamic balance, which greatly affect the performance of the sprint on the field.

This problem is even more obvious when compared to the general fitness condition of Indonesian students. Based on a report by the World Health Organization (2022), around 33% of adolescents and young adults in Indonesia do not meet the standard of physical activity of at least 150 minutes per week. This data shows a low level of basic fitness which has implications for weak motor skills, including speed and body balance. In the context of sports education, this is a serious challenge because FIK students are expected to have ideal physical performance as prospective coaches and physical educators in the future.

The speed of the foot's reaction is one of the important components of a sprint because it determines the response time to the start signal. Runners with slow reactions will lose the initial momentum that greatly determines the final outcome (Hsieh et al., 2024). On the other hand, dynamic balance plays a role in maintaining body stability during acceleration and step transitions. Athletes who are not able to maintain good balance tend to lose movement efficiency, which results in a decrease in speed (Chryssomallis, 2004). In many cases in the field, students with good posture often lose stability due to poor coordination and neuromuscular systems.

Research by Falces-Prieto et al. (2022) shows that dynamic balance is closely related to the ability to sprint and make changes in direction. However, these results are still taken from the context of professional athletes or young football players. On the other hand, the population of sports students in Indonesia has different characteristics, where most of them have not undergone a structured training program and are still in the stage of forming the basic physical condition. Thus, a more contextual empirical study is needed to find out how foot reaction speed and dynamic balance contribute to running speed in sports students.

This research gap is an important basis for conducting studies within FIK UNM Makassar. So far, student performance measurements have often been focused on strength and endurance, while aspects of reaction speed and dynamic balance have not been evaluated quantitatively. As a result, many college students train to increase muscle strength, but neglect sensorimotor training which is the key to sprinting. This condition encourages the need for more focused research on these two physical components to provide a more effective and evidence-based direction of coaching.

This study was conducted to answer the main question: the extent to which foot reaction speed and dynamic balance contribute to the 100-meter running ability of FIK UNM Makassar students, both partially and simultaneously. By using a correlational quantitative approach, this study is expected to provide an empirical picture of the relationship between physical variables that affect sprint performance in sports students

Theoretically, this study is expected to enrich the sports science literature with empirical data from the local Indonesian context, especially related to the contribution of sensorimotor factors to sprint speed. Practically, the results of this research can be a reference for trainers, lecturers, and students in developing a more targeted training program. The focus of training can be directed at increasing the speed of reaction of the legs and dynamic balance in an effort to improve sprint performance and strengthen the foundation of athletic coaching in a higher education environment.

2 Method

This study uses a quantitative approach with a correlational descriptive method to determine the relationship and contribution between foot reaction speed and dynamic balance on the 100-meter running ability of students of the Faculty of Sports Sciences, State University of Makassar. According to Sugiyono (2019), the correlational method is used to

measure the strength of the relationship between two or more variables without giving direct treatment to the research subject. This approach is relevant because it can illustrate the extent to which both physical factors contribute to sprint performance naturally.

The research design used is a non-experimental correlational design, where the researcher only measures the variables studied without certain interventions (Arikunto, 2016). Population is all things that will be studied, whether it is in the form of objects or inanimate objects or in the form of subjects or humans or social devices available in a study (Rahmadani et al., 2023). The research population includes all male students of FIK UNM who take basic athletic courses. Sample is any method used to identify a sample for research purposes (Purba et al., 2023). Sample used as many as 60 people, using the *Simple random sampling*, so that every member of the population has an equal chance of being elected. This technique is seen as effective because it increases external validity and reduces sampling bias (Fraenkel & Wallen, 2009).

The research instrument consists of three main tests, namely the Foot Reaction Test to measure the reaction speed of the foot with a reliability of 0.85, the Dynamic Balance Test to measure dynamic balance based on the guidelines of Johnson and Nelson (1986), and the 100 Meter Running Test from the Indonesian Physical Freshness Test standard (Ministry of Education, 1999). All of these instruments have high validity and have been widely used in sport science research.

Data collection was carried out at the athletic field of FIK UNM Makassar. Each participant underwent all three tests in a row with sufficient rest time to avoid fatigue that could affect the results. According to Bompa and Buzzichelli (2019), proper setting of physical conditions and rest times during testing is important to maintain the accuracy of measurement results.

The data obtained were analyzed using descriptive and inferential statistics. Descriptive analysis was used to describe data characteristics such as mean and standard deviation, while inferential analysis included Kolmogorov–Smirnov normality tests, as well as simple and multiple linear regression analyses to determine the contribution of each independent variable to the 100-meter running speed. The analysis was conducted using the SPSS program version 25.0, with a significance level of $\alpha = 0.05$ or a confidence level of 95%. According to Thomas, Nelson, and Silverman (2015), regression analysis is an effective technique in sports research to identify the magnitude of the influence between variables on physical performance. With this method, the research is expected to be able to provide a scientific picture of the magnitude of the influence of foot reaction speed and dynamic balance on the ability to run 100 meters. The results are expected to be an empirical basis for the development of a more targeted and scientifically evidence-based exercise model in the field of sports.

3 Results

The results of data analysis to present the findings or results of the study are the contribution of reaction speed of the legs and balance as well as the speed of running 100 meters. Descriptive data analysis is intended to get an overview of the research data. In full, it can be seen in the following table:

Table 1. Results of descriptive analysis of foot reaction speed and balance data as well as 100-meter running speed of FIK UNM Makassar students

Statistics	Leg reaction speed	Balance	Running speed 100m
A Lot of Data	60	60	60
Average	12.52	69.78	12.86

Junction baku	2.05	4.86	1.04
Variant	4.19	23.66	1.07
Range	9.60	29.00	4.01
Minimum	6.90	50.00	12.00
Maximum	16.50	79.00	15.00
Sum	751,05	1487	771,30

The table above is explained as follows:

a) The results of the descriptive analysis of FIK UNM Makassar's foot reaction speed data, including an average value of 12.52 cm, a standard intersection value of 2.05 cm, a variant of 4.19 cm, the fastest reaction score of 6.90 cm, the slowest reaction score of 16.50 cm, and a data range = 9.60 cm.

b) The results of the descriptive analysis of the balance variable data of FIK UNM Makassar students obtained several values as an overview of the state of the data, including: average score of 69.78 points, standard intersection value of 2.05 points, variant of 4,190 points, lowest score of 50 points, highest score of 70 points, total score of 4187 points and data range of 29 points.

c) The results of the descriptive analysis of the variable data of 100 m running speed of FIK UNM Makassar students obtained several values as an overview of the state of the data, including: average score of 12.86 seconds, standard intersection value of 1.04 seconds, variant of 1.07 seconds, fastest score of 12.06 seconds, slowest score of 15.07 seconds, total score of 771.30 seconds and data range of = 4.01 seconds

Table 2. The results of the normality test of the data of foot reaction speed and balance as well as the 100-meter running speed of FIK UNM Makassar students.

	Leg reaction speed	Balance	Running speed 100 m
Kolmogorov-Smirnov coefficient Z	0.493	1.139	0.230
Value. Sig. (2-part test)	0.375	0.201	0.267

In the table above, it can be seen that the results of the data normality test using the Kolmogorov Smirnov test, show the following results:

a) For the leg reaction speed data, the value of KS-Z coefficient = 0.493 (P=0.375 > α 0.05) was obtained, so it can be concluded that the abdominal muscle strength data of FIK UNM Makassar students is normally distributed.
b) For balance data, the value of KS-Z = 1.139 (P=0.201 > α 0.05) was obtained, so it can be concluded that the data on the strength of the back muscles of FIK UNM Makassar students followed a normal distribution or a normal distribution.
c) For the 100m running speed data, the KS-Z value = 0.230 (P=0.276 > α 0.05) was obtained, so it can be concluded that the 100-meter running speed of FIK UNM Makassar students follows a normal distribution or a normal distribution

Table 3. Summary of the results of simple regression analysis of balance and running speed of 100 m FIK UNM Makassar students

Variable	a	β	P
Leg reaction speed * Running speed 100 m	8,065	0.383	0.000

Based on the table above, it can be seen that the value of the coefficient β = 0.383 (P = .000). This value indicates a change in the speed of running 100 m when the reaction speed of the legs changes. This means that this value shows a significant influence on the 100 m running speed of FIK UNM Makassar students. Based on the results of the analysis, it is known that the value, constanta (a) is = 8.065 Makassar which gives the meaning that if the variable is worth 0, then the running speed of 100 m FIK UNM Makassar students has a value of 8,065 units. And then the value of the regression direction coefficient (b) was obtained = 0.383. Showing the meaning of a direct influence between the reaction speed of the leg and the running speed of 100 m. In other words, every change in the reaction speed of the feet of FIK UNM Makassar students is followed by a change in the 100 m running speed score of 0.383 units at a stata of 8,065 units. The relationship can be understood through the regression line equation of the reaction speed of the legs and the running speed of 100 m, namely $\hat{Y} = 8.065 + 0.383$ X1.

Table 4. Summary of the results of simple regression analysis of balance and running speed of 100 m FIK UNM Makassar students

Variable	a	β	P
Balance* Running speed 100 m	21.876	0.129	0.000

Based on the table above, it can be seen that the value of the coefficient is β = 0.129 (P = .000). This value indicates a change in running speed of 100 m when the balance changes. This means that this value shows a significant influence on the 100 m running speed of FIK UNM Makassar students. Based on the results of the analysis, it is known that the value, constanta (a) is = 21,876 which gives the meaning that if the variable is worth 0, then the running speed of 100 m FIK UNM Makassar students has a value of 21,876 units. And then the value of the regression direction coefficient (b) is obtained = 0.129. Showing the meaning of a direct influence between balance and running speed of 100 m. In other words, every change in one unit of balance for FIK UNM Makassar students is followed by a change in the 100 m running speed score of 0.129 units at 21,876 units. The relationship can be understood through the equation of the regression line of balance and running speed of 100 m, namely $\hat{Y} = 21.876 + 0.129$ X1.

Table 5. Summary of the results of simple regression analysis of leg reaction speed and balance with 100 m running speed FIK UNM Makassar students

Variable	a	β	P
Leg reaction speed (X1) Balance (X2)	13.004	0.307	0.000
Running speed 100 m		0,057	

Based on the results of the analysis, it is known that the value, constanta (a) is = 13,004 which gives the meaning that if the variable is worth 0, then the running speed of 100 m FIK UNM Makassar students has a value of 13,004 units. And then the value of the regression direction coefficient (b1) is obtained as = 0.307, and the regression coefficient (b2) is obtained as = 0.057. Showing the meaning of a directly proportional influence of the combination of speed, leg reaction and balance when running 100 m. In other words, every change in one unit of the combination of foot reaction speed and balance of FIK UNM Makassar students followed by a change in the 100 m running speed score. The relationship can be understood through the regression line equation, which is $\hat{Y} = 13.004 + 0.268\ X2$.

4 Discussion

The results of the analysis of the relationship between the independent variable of leg reaction speed and balance with a running speed of 10 m as a bound variable, and the hypothesis test needs to be further studied by providing an interpretation of the relationship between the results of the analysis achieved and the theories underlying this study. This explanation is needed so that the compatibility of the theories presented with the results of the research obtained can be known.

1. There was a significant influence between the reaction speed of the legs and the ability to run 100 meters, with a value of $\beta = 0.383$ (P=.000). with a contribution of 57.1% This value can be said that between the reaction speed of the legs and the ability to run 100 meters, the relationship is relatively strong and real. Thus, reaction time is one of the factors that can affect the quality of running speed, especially 100-meter running in athletics. This is in accordance with the statement by Harsono (1988:217) that "reaction time can be seen to be getting shorter by practicing reactions repeatedly". In order to be able to display a skillful movement pattern. So a fast runner who wants to run well must be supported by the ability of a good physical condition component such as the reaction speed of the legs, in other words that if someone has a fast reaction ability, it will be followed by an increase in the ability to run 100 m of FIK UNM Makassar students, so that it is expected to be able to present an even faster running speed.
2. There was a significant influence between dynamic balance and the ability to run 100 meters, with a value of $\beta = 0.129$ (P=.000). with a contribution of 36.8%, This value can be said that the relationship between the body balance during the 100-meter

run is relatively strong and strong, so the involvement of dynamic balance in the 100-meter sprint activity is very necessary. So a good sprinter must be supported by the ability of the physical condition, good dynamic balance components. Or if the runner has good balance ability will be followed by a higher increase in running ability as well. This is in line with the opinion of Harsono (1988:223) who stated that balance is "the ability to maintain our neuromuscular system or control the neuromuscular system an efficient position or attitude while we are moving" Furthermore, according to Mochamad Sajoto (1988:58) about balance that: Balance or balance is the ability of a person to control his muscular nerve organs during rapid movements with a change of point fast weight loss both in static and even more so in dynamic motion

3. There was a significant relationship between leg reaction speed and dynamic balance with 100-meter running ability, with detrmination values = 62.00% F values = 46.589(P = 0.000). This means that the value can be understood that the influence of the two components of physical condition is very strong and real, and with the involvement of foot reaction speed and dynamic balance in the 100-meter sprint activity is very decisive if the reaction speed of the foot and dynamic balance are applied together to a 100-meter sprint pattern, so that it is suspected that it will realize a higher level of sprint speed in FIK UNM students Makassar.

5 Conclusion

Based on the results of the analysis and theoretical study carried out, this study concludes that the speed of foot reaction and balance contribute significantly to the 100-meter running ability of students of the Faculty of Sports Sciences, State University of Makassar, both individually and simultaneously. These findings suggest that both physical components have an important role in improving sprint performance. Therefore, it is recommended that students and coaches pay special attention to exercises that emphasize increasing the speed of leg reaction and balance in an effort to optimize running ability. In addition, further research involving other relevant variables as well as a wider population needs to be conducted to gain a more comprehensive understanding of the factors that affect the ability to run 100 meters.

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