

## The relationship between some physical abilities among gifted students

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### **Abstract:**

The study aims at investigating the relationship between the trait of speed and the traits of speed specific force and force endurance in the context of identifying sports talents in the specialisation of fast running (100m). A descriptive approach was employed in the study with the help of a sample of 65 students from some middle schools in the wilaya (province) of Bordj Bou Arreridj, selected purposively. To collect data, the 30-meter sprint test (from a crouch start) was employed to measure speed, the five-step jump test (pentathlon) to measure speed specific force, and the squat test to measure force endurance. After statistical processing of the data using the SPSS statistical program, the results exhibited the existence of a statistically significant correlation between the trait of speed and the traits of speed specific force and force endurance among the individuals in the study sample.

**Keywords:** Speed; force speed; force endurance; sports talent; fast running.

### **1. INTRODUCTION**

The field of athletics is witnessing significant developments in various athletic disciplines thanks to continuous scientific research and experiments that contribute to raising the athletic level and achieving sports achievements. Athletics is considered one of the most prominent and important athletic disciplines due to the wide range of its diverse activities and the large number of methods and forms of these activities, including the specialisation of fast running (100m), which is one of the important competitions in athletics due to the excitement and suspense it brings out, highlighting the individual's potential in competition and the various technical aspects it includes. To achieve sports achievement in these competitions, it is necessary to exploit the sports talents in this specialisation through the process of detecting and selecting the best individuals who are distinguished by possessing the abilities and characteristics that are consistent with the requirements of the specialisation of fast running (100m) according to scientific measurement methods

and procedures. This ensures the right way to make and refine talent, and this is what is sought within such study.

According to Thil (1983) the selection process requires finding individuals in a large population who have the ability to perform at a high level in a particular sport. (Wolff & Grosgeorge, 1996, p. 446), Régnier (1987) defines it as: "Choosing the best athletes who have the ability to excel in future sports competitions". Therefore, it is important and necessary for the athlete to possess the characteristics and abilities that are consistent with the requirements of the type of sport practiced, as the main purpose of selection is to determine the abilities and characteristics of the athlete who is distinguished by a high level of performance and predict it in the future to reach the elite level. Therefore, it is necessary to rely on accurate measurement methods and procedures according to scientific bases and standards during the process of detecting and selecting sports talents. (Salmela & Durand-Bush, 1994, p. 234).

Many researchers believe that talent is the natural (innate) ability or acquired efficiency, while others believe that talent refers to aptitude and efficiency to a product that can be observed and proven. Klentrou (1990) believes that talent is the ability granted to the individual at the highest levels of its performance. This is what assumes that the physical abilities and characteristics of the person become clear at an early age. (Ericsson & Tesch-Romer, 1993, p. 367).

Force endurance and force speed are considered among the main physical characteristics of athletic talent in the specialisation of fast running (100m), and at the forefront is the trait of speed as an essential physical element in this specialisation. Bastousi (1997) mentions that speed races are not considered competitive races in themselves only, but rather a means of advancing the level of many different sports and competitions, as the element of speed is related as an important physical, motor and physiological element to the level and results of those games and competitions. Speed races are in themselves tests to measure the player's potential by measuring speed, strength, and endurance. (Ahmed, 1997, p. 14).

Force speed is one of the necessary requirements for the specialisation of fast running (100m) due to its effective role in enhancing the efficiency of a 100m sprinter. Nett (1977) mentions that force speed has a great effect on training for short races, as this trait is distinguished by the ability of the neuromuscular system to produce rapid power. (Shaghatai & Israa, 2019, p. 9), Abdel Wahab (1983) defines it as the muscle's ability to produce the maximum force in the shortest possible time ( $\text{power} = \text{force} \times \text{speed}$ ). (Al-Marawi, 2020, p. 8)

Force endurance is also one of the very important elements in many different sports disciplines, especially in the specialisation of fast running (100m). Jonath (1989) defines force endurance as the individual's ability to continue to exert successive effort with resistance on general muscle groups. (Jonath, 1989, p. 104), Ahmed and Ali Al-Baik (1978) indicate that force endurance is a mixture of

strength and endurance, and it is the ability to maintain muscle strength without interruption for a long period of time. (Al-Marawi, 2020, p. 19).

Many studies have shown that developing the trait of force endurance has a positive relationship in improving the performance of short-distance runners. (Cloudy, 2010, p. 661), Thus, these physical elements are important determinants and a main requirement for various sports activities, especially the specialisation of fast running (100m) during the process of detecting sports talents.

Previous Studies Related to the Topic:

Hamza Traai and Abdel Hakim Boulba (2021): Proposed Program for Developing Speed Endurance and Force endurance for Middle-Distance Runners (1500m) in the 18-19 Age Group. This study aimed at investigating the effectiveness of using a training program to develop speed endurance and force endurance for 1500m runners. A sample of 10 runners was selected purposively. The training program was applied to two groups (experimental and control) using physical tests as a data collection tool in the research. The results showed statistically significant differences in the development of speed endurance and force endurance for the two groups in favour of the group that underwent the training program.

Essam Ahmed Abdullah Al-Marawi (2020): The Effect of Weight Training on Some Physical Fitness Elements to Develop force speed for Short-Distance Runners. This study aimed at determining the effect of weight training exercises specifically designed to develop force speed on the performance of short-distance runners. The researcher used the experimental method on a sample of 8 runners. The training program was applied to two groups (A) and (B) based on a set of tests to collect data. The results showed that the use of weight training contributed significantly to the development of the technical and physical performance level of short-distance runners to a large extent in raising the level of some physical fitness elements of force speed among the individuals in the study sample.

Amer Fakher and Israa Fouad (2019): The Effect of Jumping and Weight (Baunzek) Track Running Training on Developing Force endurance, force speed Endurance, and 800m Running Performance for Juniors (14-16 Years Old). This study aimed at investigating the effect of jumping and weight (Baunzek) track running training on developing force endurance, force speed endurance, and 800m running performance in the sample. The study sample included 16 juniors, and the training programs were applied to two experimental groups (pre-test and post-test) using physical tests to collect data. The results of the study showed that jumping and weight running exercises contributed positively to the development of force endurance, force speed endurance, and the performance of running 800m for both experimental groups.

Based on previous studies and theoretical knowledge, the research problem of this study revolves around the relationship between speed, force speed, and force endurance among Talented Students in the specialisation of fast running (100m):

- Is there a statistically significant correlation between speed, force speed, and force endurance among Talented Students in the specialisation of fast running (100m)?

**Sub-questions:**

- Is there a statistically significant correlation between speed and force speed among Talented Students in the specialisation of fast running (100m)?
- Is there a statistically significant correlation between speed and force endurance among Talented Students in the specialisation of fast running (100m)?

**General Hypothesis:**

- There is a statistically significant correlation between speed, force speed, and force endurance among Talented Students in the specialisation of fast running (100m).

**Sub-Hypotheses:**

- There is a statistically significant correlation between speed and force speed among Talented Students in the specialisation of fast running (100m).
- There is a statistically significant correlation between speed and force endurance among Talented Students in the specialisation of fast running (100m).

**Research Objectives:**

- To determine the type of relationship between speed and force speed among Talented Students in the specialisation of fast running (100m) during the identification process.
- To determine the type of relationship between speed and force endurance among Talented Students in the specialisation of fast running (100m) during the identification process.

**Significance of the Research:**

- The importance of the chronological age of this category in the process of detecting and selecting athletic talent in fast running (100m).
- The importance of studying the relationship between speed, force speed, and force endurance in the process of identification and predicting talent in the future in the fast running race (100m).
- The importance of the effect of force speed and force endurance on speed contributes to achieving good results in the records of the fast running race (100m).

**Definition of Concepts and Terms:**

**Detection:** The act of detecting something that is hidden. In the context of sports, detection refers to the process of identifying an individual's athletic abilities and potential with high accuracy in a specific sporting activity. (Baker & Vegt, 2020, p. 611)

Operationally, it is defined as a process aimed at identifying sports talents using various scientific methods and criteria.

**Sports talent:** An individual who can be reasonably assumed to have the ability to perform at a high level in a specific sporting activity and achieve success in the future. (Vaeyens & Philippaerts, 2008, p. 67)

Operationally, it is defined as the high efficiency and performance ability that an individual possesses over others in a specific sporting activity.

**Speed:** The ability of the body or a group of its muscles to cover the greatest distance in a specified time or run a shorter time in a specified distance. (Reiss & Pascal Prevost, 2013, p. 361)

**Force speed:** The ability of the muscle to overcome a resistance force that requires a high degree of muscle contraction speed. (Hamad, 2001, p. 169)

**Force endurance:** The ability to resist fatigue during long-term efforts controlled by strength.

**Fast Running (100m):** Operationally defined as running at the maximum possible speed for a distance of 100m in the shortest possible time.

## 2. APPLIED METHODS

### 2.1. Pilot Study:

A pilot study was conducted on a sample of 8 Students from the middle school level to gain a closer understanding of the study and the data collection tools.

### 2.2. Scope of the Study:

**Spatial Scope:** The study was conducted in specialized sports fields within the middle schools of Bordj Bou Arreridj province.

**Temporal Scope:** The study was conducted from January 11, 2024, to February 28, 2024.

### 2.3. Methodology:

A descriptive approach was adopted in this study due to its suitability to the nature of the research.

### 2.4. Population and Sample of the Study:

The population of this study is all middle school students in western Bordj Bou Arreridj province. A purposive sample of 65 fourth-year middle school students was selected from 13 middle schools.

### 2.5. Definition of Variables and Measurement Methods:

**Independent Variable:** force speed and force endurance.

**Dependent Variable:** Speed.

### 2.6. Data Collection Tools:

Three standardized physical tests were applied: the first to measure speed, the second to measure force speed, and the third to measure force endurance.

#### Applied Physical Tests:

- 30-meter sprint test from a crouched start (from a slow run) to measure speed.
- Five-step jump test (pentathlon) to measure force speed.

- Squat jump test to measure force endurance.

The data collection tools were subjected to scientific standards.

### 2.7. Statistical Tools:

The SPSS statistical program was used to perform the appropriate statistical analyses for the research objectives and the nature of the variables, which included: (Mean, standard deviation, Pearson's linear correlation coefficient, simple and multiple linear regression, coefficient of determination, F. Anova).

## 3. PRESENTATION AND DISCUSSION OF RESULTS

### 3.1. Presentation of Results:

The results are as follows:

**Table 1:** Correlation Coefficient, Coefficient of Determination, and Adjusted Coefficient of Determination between Indicators of the Independent Variable (force speed and Force endurance) and the Dependent Variable (Speed) for Talented Students in Fast running.

Variable	Pearson Correlation Coefficient (R)	Coefficient of Determination (R <sup>2</sup> )	Adjusted Coefficient of Determination	Sig Value
Independent Variable Indicator: force speed	0.43	0.19	0.16	0.01
Independent Variable Indicator: force endurance				
Dependent Variable: Speed				

**Source:** Prepared by the researcher based on the outputs of SPSS software, 2020.

**Table 1** shows the correlation coefficients between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for Talented Students in fast running. The results are as follows:

- The value of the Pearson linear correlation coefficient was (0.43) at the probability value (0.01), which is less than (0.05). Therefore, it can be concluded that there is a statistically significant relationship between the indicators of the independent variable (speed specific force and force endurance) and the dependent variable (speed) for the individuals in the research sample.

- The value of the coefficient of determination ( $R^2$ ) was (0.19) at the probability value (0.01), which is less than (0.05). Therefore, it can be concluded that there is a statistically significant relationship between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for the individuals in the research sample.
- The value of the adjusted coefficient of determination (R) was (0.16) at the probability value (0.01), which is less than (0.05). Therefore, it can be concluded that there is a statistically significant relationship between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for the individuals in the research sample.

**Table 2:** Shows the coefficients (B) and the values of the test (T.test) between the indicators of the independent variable (force speed and Force endurance) and the Dependent Variable (Speed) for Talented Students in Fast running.

Variable	Unstandardized Coefficients		Standardized Coefficients	T-test Value	Sig Value
	B	Standard Error	Beta		
<b>Intercept B<sub>0</sub></b>	4.58	0.31		14.54	0.00
<b>force speed Indicator</b>	0.01	0.03	0.04	0.34	0.72
<b>Force endurance Indicator</b>	-0.08	0.02	-0.44	-3.73	0.00

**Source:** Prepared by the researcher based on the outputs of SPSS software, 2020.

**First: Theoretical Conditions:**

**a) Agreement or Logic of Signs of Regression Coefficients:**

As observed, the variables of the phenomenon under study fall within the framework of the process of identifying and selecting Talented Students in the sports field.

Through the simple linear regression model shown in the table above, which shows the correlation between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for Talented Students in fast running, after the quantization process, it can be concluded that:

$$Y = 0,01X_1 - 0,08X_2 + 4,58$$

Therefore, it can be concluded that:

- The constant part of  $B_0$  has a positive value not equal to zero (4.58).
- The slope of the regression line  $B_1$  has a positive value and is equal to (0.01).
- The slope of the regression line  $B_2$  has a positive value and is equal to (-0.08).

It is clear that there is no contradiction between the theoretical conditions of the phenomenon under study and the results of the regression model that shows the correlation between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for Talented Students in fast running.

**b) Explanatory Power of the Model:**

The explanatory power of the regression model is judged by the adjusted coefficient of determination, shown in Table 1, which explains the correlation between the dependent variable (speed) and the indicators of the independent variable (force speed and force endurance) for the individuals in the research sample. The value of the adjusted coefficient of determination was (0.16), which confirms that the variables of the linear regression model explained (16%) of the effect of the indicators of the independent variable (force speed and force endurance) on the dependent variable (speed) for the individuals in the research sample.

This indicates that the changes that occur in the dependent variable (speed) are due to the indicators of the independent variable (force speed and force endurance) and (84%) due to other factors. These results justify the ability of the variables to explain the results of the regression model, and the statistical significance of this model was confirmed by a probability value (0.01) less than (0.05), which is statistically significant and consistent with the research hypothesis.

**Second: Mathematical Conditions:**

**Table 3:** ANOVA Analysis of Regression Coefficients for Indicators of the Independent Variable (force speed and Force endurance) and the Dependent Variable (Speed) for Talented Students in Fast running.

Source	Sum of Squares	Degrees of Freedom	Mean Squares	F-value	Sig Value
Regression	1.56	2	0.78	7.37	0.01
Error	6.66	63	0.10		



<b>Total</b>	8.22	65			
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**Source:** Prepared by the researcher based on the outputs of SPSS software, 2020.

The purpose of using ANOVA is to test the significance of the linear regression model. This analysis involves partitioning the total sum of squares of deviations of the dependent variable (SST) into two parts: the sum of squares of deviations due to regression (SSR) and the sum of squares of error (SSE). The coefficient of determination ( $R^2$ ), the most important indicator of the significance of the regression model, can also be calculated.

$$R^2 = \frac{\text{Sum Of Squares of Deviations Due to Regression (SSR)}}{\text{Sum of Squares of Error (SSE)}} = \frac{1,56}{8,22} = 0,19$$

**a) Explanatory Power of the Model:**

Referring to the square root of the coefficient of determination value, which is equal to the Pearson linear correlation coefficient  $r = \sqrt{R^2}$ , and substituting the values,  $r = \sqrt{0.19} = 0.43$

This result justifies the findings in Table 2 and indicates that (43%) of the variance in the total deviations of the dependent variable values is explained by the linear regression relationship between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for the individuals in the research sample. This result also confirms the value of the adjusted coefficient of determination obtained in Table 1.

**b) Overall Significance of the Model:**

Table 3 shows that the (F) value is (7.37) with a probability value (0.01) less than (0.05), indicating that there is at least one regression coefficient that is not equal to zero and has a significant value.

**c) Partial Significance of the Model:**

In the previous step, it was concluded that there is at least one regression coefficient that is not equal to zero. To determine which of these coefficients are significant, the partial significance of the model needs to be interpreted via applying the (T-test). Table 2 shows the following results:

- The (T-test) value for the constant part of  $B_0$  is (14.54) with a probability value (0.00) less than (0.05), which means that the constant term in the regression model is significant.
- The (T-test) value for the slope of the regression line  $B_1$  for the force speed indicator is (0.34) with a probability value (0.72) greater than (0.05), which means that the slope of the regression line in the regression model is not significant.
- The (T-test) value for the slope of the regression line  $B_2$  for the force endurance indicator is (-3.73) with a probability value (0.00) less than (0.05), which means that the slope of the regression line in the regression model is significant.

### 3.2. Discussion of Results:

Based on the results obtained in Tables 1, 2, and 3, which represent the regression, correlation, and ANOVA coefficients between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed), it is evident that (16%) of the effect of the indicators of the independent variable (force speed and force endurance) on the dependent variable (speed) for the individuals in the research sample.

This indicates that (16%) of the changes that occur in the dependent variable (speed) are due to the indicators of the independent variable (force speed and force endurance) and (84%) are due to other factors. The result was statistically significant. Additionally, (43%) of the variance in the total deviations of the dependent variable values is explained by the linear regression relationship between the indicators of the independent variable (force speed and force endurance) and the dependent variable (speed) for the individuals in the research sample. This result confirms the value of the strong correlation between speed and the two qualities of force speed and force endurance, which is (0.43) at the probability value ((0.01) less than (0.05), which is statistically significant and consistent with the research hypothesis. There is a statistically significant correlation between speed and the two qualities of force speed and force endurance for Talented Students in the specialisation of fast running (100m) during the identification process.

This correlation explains the existence of a positive effect on speed attributed to the two qualities of force speed and force endurance for Talented Students in the specialisation of fast running (100m). This means that the speed of a Talented Students is affected by the extent to which they can possess force speed and force endurance. A sports talent who acquires a high level of force speed and force endurance can acquire a higher level of speed and achieve good performance in speed races (100m).

A study by (Shaghatai & Israa, 2019) confirms that developing force speed and force endurance using exercises (jumping and weightlifting) has a positive effect on the performance of runners in the 800m race. The researchers believe that this effect is due to the adaptation of complex physical exercises for runners, as they contributed to the development of the level of strength and its association with speed activity according to time and distance, which is distinguished by the runners' endurance. In their study, (traai & Abdel Hakim Bouliba, 2021) found a strong effect of force endurance on the performance of 1500m runners during the proposed training programme. A study by (Jalil & Salam Mohammed, 2019, p. 132) indicates that force endurance development training for 400m runners had a positive effect on raising the general level of endurance of the working muscles, especially the circulatory system. Developing the level of aerobic capacity significantly affected the performance of runners in the 400m race.

A study by (Al-Marawi, 2020) confirms that developing force speed with weights has a positive effect on the performance of runners in short-distance races. The level of force speed of the runners improved in the good improvement of the time of the 20m run, the 91m shuttle run, and the height of the vertical jump during their performance. (Samir, 2021, p. 16) indicates that developing the force speed complex has a strong positive effect on developing the physiological abilities of 400m runners and their level of achievement. The researcher points out that this is reflected in the training programme for developing the force speed quality for runners.

These findings hold significance for the identification and selection of athletic talents, as they underscore a direct relationship between speed, force speed, and force endurance. Essentially, the higher the levels of these force speed, and force endurance traits in a gifted student, the more likely they are to possess more excellent speed capabilities.

#### **4. CONCLUSION**

Based on the results obtained in this research, it can be concluded that there is a statistically significant correlation between speed and the two qualities of force speed and force endurance. The more a sports talent at this stage possesses the ability of force speed and force endurance, the greater the possibility of possessing the quality of speed. This facilitates the process of identifying and selecting talent and predicting it in the future in athletics, especially in the specialisation of fast running (100m). It is suggested that teachers and coaches responsible for identifying sports talents rely on the physical aspect and strengthen it by conducting physical tests specific to the specialisation of fast running (100m), such as speed, force speed, and force endurance. This is because these qualities are positively and significantly related to each other, especially in the specialisation of fast running. Researchers are also encouraged to develop this study and conduct new studies in speed races, delving into the study of other physical qualities that affect this type of specialisation, such as reaction speed, speed endurance, maximum strength, flexibility, and agility.

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