

## **Flexibility and agility in their relationship to speed among athletically gifted students - A field study in light of the talent identification process for school sports in the state of Bejaia**

**Boutaghane Mehdi**

Laboratory of Cognitive Dimensions and Applied Perceptions of Sports Training Sciences through Multiple Approaches, University of Amar Teliji Laghouat (Algeria), E-mail: [m.boutaghane@lagh-univ.dz](mailto:m.boutaghane@lagh-univ.dz)

Received: 10/2024, Published: 11/2024

---

### **Abstract:**

This study aims to explore the relationship between the attributes of flexibility and agility, and the attribute of speed in light of in the identification of gifted athletically gifted students specialising in sprint races. A descriptive method was employed, with a sample consisting of 80 second-year middle school students from some schools in Béjaïa, selected intentionally. The tests used included the forward bend test from a seated long position to measure flexibility, the zigzag run (Barrow) test to measure agility, and the 30-metre sprint test to measure speed. After statistical analysis of the data, a significant correlation was found between the attributes of flexibility, agility, and speed among the study's sample participants.

**Keywords:** flexibility; agility; speed; identification; Athletic talent.

---

### **1. Introduction and Problem Statement:**

Athletics is considered one of the most fundamental and widely practiced sports. Its performance is accessible to all individuals as its exercises are commonly performed in daily life since childhood. Athletics is often referred to as the "Queen of Sports" because its program is featured in all major sporting competitions, including the Olympic Games. (Hasan, 1986, p.07).

Athletics is characterised by the wide variety of its events, including sprinting specialisation. To achieve elite levels in sprinting, coaches must invest in the best athletic talents for this specialisation by selecting individuals with the necessary capabilities and attributes through a scientific and modern talent identification process. This ensures the correct start in the process of developing and refining talent, which is the aim of our current study. René suggests that selection is a process that requires finding individuals with the potential to develop high-level skills in a particular sport within a large group (Richard M., 1989, p.106). Judet Ezzah defines it as: identifying hidden potential to determine whether certain individuals have the likelihood of developing abilities suitable for achieving high-level results (Abdel Hadi, 1999, p.11). Mohamed Sabri Omar (2002) emphasises that the selection process must rely on scientifically standardised criteria and tests to identify talents with high predictive capabilities from one stage to another and in various activities.

It is essential to involve as many young people as possible in activities appropriate to their physical abilities, forming a broad base of practitioners while focusing on the quality of training. This process should consider measurements and tests that must be adopted for accurate prediction (Fathallah, 2015, p.39). Most researchers agree that talent is defined as natural (or acquired) competence or ability. Fainak describes it as a combination of general aptitudes and distinctive abilities of the athlete, including high-level techniques and skills that reach their highest development through continuous pedagogical monitoring. It is also an exceptional state of performance compared to others (Jurgen, 1999, p.89).

It is important to assume that physical ability appears early in an individual, and physical attributes maintain a relationship of dependency and independence among one another. For example, the development of flexibility can influence speed. One of the key physical attributes of athletically talented individuals in sprinting specialisation is speed. Kamal Jamil argues that short-distance running is not only crucial for athletics but for all other sports, as it grants the athlete the element of speed, which is one of the fundamental components of physical fitness and cannot be overlooked (Kamal Jamil, 2005, p.107). Lesserteur defines speed as the ability of movement, which is linked to the rapid contraction and relaxation of different muscle groups necessary to perform maximal movements in the shortest time possible (Lesserteur, 2009, p.113).

Flexibility, on the other hand, plays a significant role in this specialisation. Luiz et al. (2020) confirm that flexibility is related to other physical attributes such as strength, speed, and endurance. It is an essential element for achieving a high level of performance, as insufficient flexibility hinders the exploitation of the levels of strength and speed being developed (Luiz et al., 2020, p.695). Abdel Aziz defines flexibility as the ability to perform movements with a wide range of motion in the body's joints (Abdel Aziz, 1997, p.16). Ahmad (2018) points out that joint flexibility is affected by the ability of tendons to extend and muscle elasticity, which contributes to the improvement of other physical attributes requiring maximal range of motion in the joint, as well as helping prevent injury (Ahmad, 2018, p.296).

Agility is also a crucial attribute in sprinting and many other sports specialisations. Nebahat's study indicates that agility positively influences direction changes, speed characteristics, and overall athletic performance (Nebahat et Serdar, 2018, p.1913). Mustafa (2005) defines agility as the athlete's ability to change body position, direction, or speed, whether on the ground or in the air, with lightness and precision (Mustafa, 2005, p.163). Thus, these physical attributes and

characteristics are essential requirements and important criteria for many sports, especially in sprinting specialisation, during the process of identifying athletically gifted students.

One of the similar previous studies that addressed this topic is:

Bekir Mendes and Kenan Uzun (2015): A Study of Flexibility and Sprinting Performance Values in Adolescent Football Players. This study aimed to investigate the relationship between flexibility and sprinting performance values in relation to age, gender, and physical fitness characteristics of boys and girls who play football. A total of 100 male football players with an average age of  $12.078 \pm 0.919$  years and 72 female football players with an average age of  $12.973 \pm 0.065$  years were evaluated. The measurements taken included age, height, weight, body mass index, flexibility, and 10-metre and 20-metre sprint times for both groups. Multiple regression analysis was used for statistical processing. The results showed significant differences in the 10-metre and 20-metre sprint performance, favouring male players based on gender. The study also identified a relationship between speed and flexibility according to gender. A significant relationship was found between flexibility and 10-metre sprint performance among male football players, while a significant relationship was observed between flexibility and 20-metre sprint performance among female football players.

Koklu Y and Ersoz G (2015): The Relationship Between Sprinting Ability, Agility, and Vertical Jump Performance in Young Football Players. The aim of this study was to examine the relationships between speed, agility, and vertical jump performance in young football players. Fifteen football players with an average age of  $16.0 \pm 0.8$  years, average height of  $168.4 \pm 4.7$  cm, average body mass of  $62.6 \pm 7.7$  kg, and average training age of  $6.0 \pm 2.0$  years voluntarily participated in this study. Each player's sprinting ability was determined using individual 10-metre and 30-metre sprint times. Agility was measured with and without the ball using the zigzag agility test (ZAWHB). Vertical jump performance was measured using squat jumps (SJ) and counter-movement jumps (CMJ). The results showed a significant relationship between sprinting ability and agility. Additionally, strong correlations were found between vertical jump ability and sprinting ability, as well as between vertical jump ability and ZAWHB test performance. The study's findings suggest that speed, agility without the ball, and vertical jump ability share common physiological and biomechanical determinants.

Based on these established theoretical findings, the problem of the current study revolves around examining the relationship between the attributes of flexibility and agility, and the attribute

of speed among athletically gifted students specialising in sprint races. The main research question is:

- Is there a statistically significant correlation between the attributes of flexibility and agility, and the attribute of speed among athletically gifted students specialising in sprinting?

This general question is further divided into the following sub-questions:

- Is there a statistically significant correlation between the attribute of flexibility and the attribute of speed among athletically gifted students specialising in sprinting?
- Is there a statistically significant correlation between the attribute of agility and the attribute of speed among athletically gifted students specialising in sprinting?

General Hypothesis:

- There is a statistically significant correlation between the attributes of flexibility and agility, and the attribute of speed among athletically gifted students specialising in sprinting.

This general hypothesis is further broken down into the following sub-hypotheses:

- There is a statistically significant correlation between the attribute of flexibility and the attribute of speed among athletically gifted students specialising in sprinting.
- There is a statistically significant correlation between the attribute of agility and the attribute of speed among athletically gifted students specialising in sprinting.

The research aims to:

- Identify the correlation between the attributes of flexibility and agility in light of the athletic talent identification process for sprinting specialisation among second-year middle school students.
- Examine the role of the correlation between the attributes of flexibility and agility among athletically gifted students specialising in sprinting.

The significance of this research in:

- The importance of this age group in identifying athletically gifted students specialising in sprinting.
- The importance of studying the relationship between "speed" and "flexibility and agility" so as to understand how each attribute affects the other, and how they can influence the process of talent prediction.

- Highlight the importance of studying speed, flexibility, and agility as fundamental elements influencing sprinting specialisation.

## 2. Definitions of Concepts and Terms:

- **Flexibility:** Also referred to as the range of motion in a sporting context, it is the ability to move a single joint or a group of joints through the widest possible angle. (Sahiner, Balci, 2010, p. 05)
- **Agility:** Defined by "Barrow" as the ability of the body or its parts to change direction quickly and accurately. (Mufti, 2001, p. 199)
- **Speed:** "Bucher" defines it as the individual's ability to perform identical movements of the same type in the shortest possible time. (Ahmad, 2018, p. 227)
- **Talent Identification:** It refers to the prediction of performance over time through the use of psychological efficiency measures alongside physical and technical abilities. (Regnier, et Russell, 1993, p. 290).

Operational Definition: A process aimed at identifying athletically gifted students using various scientific methods and criteria.

- **Athletic Talent:** The high level of performance efficiency and ability that an individual possesses in a particular sport, surpassing others. (Bernard, et Marion, 1998, p. 25)
- **Sprint Race:** Operational Definition: Running at maximum possible speed in the shortest possible time.

## 3. Methodological Approaches:

### 3.1. Pilot Study:

We conducted a pilot study on a sample of eight (08) students to test the data collection tools and assess the sample's responsiveness to them.

### 3.2. Study Domains:

**Spatial Domain:** This study was conducted in sixteen (16) secondary schools within the Béjaïa Province.

**Temporal Domain:** The study took place from 14 January 2024 to 17 March 2024.

**3.3. Methodology Used:** We adopted the descriptive method as it aligns with the nature of the research.

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

The research population comprised all middle school students in the Béjaïa Province. We purposefully selected a sample of eighty (80) second-year middle school students, distributed across sixteen (16) secondary schools.

### **3.5. Identification and Measurement of Variables:**

**Independent Variables:** The attributes of flexibility and agility.

**Dependent Variable:** The attribute of speed.

### **3.6. Data Collection Tools:**

Three (03) validated physical tests were applied:

- The first test measured flexibility.
- The second test measured agility.
- The third test measured speed.

### **Physical Tests Administered:**

- The forward trunk bending test from a seated long position to measure flexibility.
- The zigzag running test (Barrow test) to measure agility.
- The 30-metre sprint test (from an approximate running start) to measure speed.

The data collection tools were subjected to scientific validation.

### **3.7. Statistical Tools:**

We conducted several statistical analyses using the SPSS 2020 software. The following relationships were selected: (Mean, Standard deviation, Multiple linear regression, Pearson correlation coefficient, Coefficient of determination, Adjusted coefficient of determination, and F-ANOVA).

## **4. Presentation, Interpretation, and Discussion of Results:**

### **4.1. Presentation of Results:**

The results were as follows:

**Table (01): Regression Coefficients between the Independent Variables (Flexibility and Agility) and the Dependent Variable (Speed) for Athletically Gifted Students in Sprint races.**

Variable	Standardised Coefficients		Standardised Coefficients	T-test Value	Sig Value	Correlation Coefficient (R)	Coefficient of Determination	Adjusted Coefficient of Determination
	B	Standard Error	Beta					
<b>Regression Intercept <math>B_0</math></b>	3.20	0.55		5.74	0.000	0.39	0.15	0.13
<b>Flexibility</b>	-0.02	0.01	-0.24	-2.32	0.022			
<b>Agility</b>	0.06	0.02	0.34	3.25	0.002			

**Source:** Prepared by the researchers based on the SPSS output, 2020.

### First: Theoretical Conditions

#### a. Consistency or Logical Validity of the Regression Coefficient Values and Signs:

It is observed here that the variables under study fall within the framework of identifying athletically gifted students in the field of sports training.

Referring to the multiple linear regression model obtained in the study, which illustrates the significant relationship between the independent variables (flexibility and agility) and the dependent variable (speed) for athletically gifted students specialising in sprint races, we derive the following equation:

$$Y = -0,02X_1 + 0,06X_2 + 3,20$$

From this model, we conclude the following:

- The constant part  $B_0$  has a positive value and is not equal to zero (3.20).
- The slope of the regression line  $B_1$  has a negative value (-0.02).
- The slope of the regression line  $B_2$  has a positive value (0.06).

We note that there is no contradiction between the theoretical conditions of the phenomenon under study and the results of the regression model, which explains the effect relationship between the independent variables (flexibility and agility) and the dependent variable (speed) for athletically gifted students specialising in sprint races.

#### b. The Explanatory Power of the Model:

The explanatory power of the regression model is judged by the adjusted coefficient of determination, found in Table (01), which demonstrates the significant relationship between the dependent variable (speed) and the independent variables (flexibility and agility) in the study sample. The value of the adjusted coefficient of determination is estimated at (0.13), meaning that the selected study variables explain (13%) of the effect of the independent variables (flexibility and agility) on the dependent variable (speed) for the study sample. In other words, (13%) of the variations in the dependent variable (speed) are attributed to the independent variables (flexibility and agility) in the study sample, while (87%) are due to other factors.

These results reflect the validity of the selected study variables and their capacity to explain the results of the regression model. The statistical significance of this model is justified by the significance level, which is estimated at a probability value of (0.02). This is statistically significant and aligns with the study's hypotheses.

**Second: Mathematical Conditions**

**Table (02): Analysis of Variance (ANOVA) for the Independent Variables (Flexibility and Agility) and the Dependent Variable (Speed) in Athletically Gifted Students Specialising in Sprinting.**

Source	Sum of Squares	Degrees of Freedom	Mean Squares	F Value	Sig Value
Regression	3,05	2	1,52	7,06	0,02
Error	16,88	78	0,21		
Total	19,94	80			

Source: Prepared by researchers based on SPSS output, 2020.

The purpose of calculating the ANOVA table is to analyse the total sum of squares of the dependent variable (SST), the sum of squares due to regression (SSR), and the sum of squares for the error (SSE).

Additionally, the key indicator for the quality of the regression model is the coefficient of determination ( $R^2$ ), calculated as follows:

$$R^2 = \frac{\text{Sum of Squares for Regression (SSR)}}{\text{Total Sum of Squares (SST)}} = \frac{3,05}{19,94} = 0,15$$

### a. Explanatory Power of the Model

The square root of the coefficient of determination equals the correlation coefficient  $\sqrt{R^2} = r$

By substituting the values, we find  $r = \sqrt{0,15} = 0,39$ . These results align with the outcomes shown in Table (02) and indicate that (39%) of the total variance in the dependent variable is explained by the linear relationship in the regression model between the dependent variable (speed) and the independent variables (flexibility and agility) in the study sample. This result justifies the adjusted coefficient of determination obtained in Table (02).

### b. Overall Significance of the Model

From Table (02), it is clear that the calculated F-value is (7,06), and the P-value is (0,02), which is less than the significance level of (0,05). This means that at least one of the regression coefficients differs from zero and is statistically significant.

### c. Partial Significance of the Model

In the previous step, we concluded that at least one of the regression coefficients differs from zero. To determine which of these coefficients is significant, we conduct a partial significance test for the model using the T-test.

From the results in Table (01), we find:

- The constant  $B_0$  (5,74) with a probability value of (0,00), which is less than (0,05), indicating that the constant in the regression model is significant.
- The slope of the regression line  $B_1$  for the flexibility index among the study sample is (-2,32) with a probability value of (0,022), which is less than (0,05). Therefore, we conclude that the slope for flexibility in the regression model is not significant.
- The slope of the regression line  $B_2$  for the agility index among the study sample is (3,25) with a probability value of (0,02), which is less than (0,05). Thus, we conclude that the slope for agility in the regression model is significant.

## 4.2. Interpretation and Discussion of Results:

The obtained results indicate a significant relationship between the independent variables, flexibility and agility, and the dependent variable, speed, for students who are athletically gifted in sprint races. Changes in the independent variables, flexibility and agility, have a noticeable impact on the dependent variable, speed, among the study sample.

The statistical model shows that (13%) of the effects on the dependent variable, speed, can be attributed to the independent variables, flexibility and agility, among the sample participants, while (87%) is due to other factors. Additionally, (39%) of the total variance in the residuals is explained by the linear correlation of the regression model between speed (dependent variable) and flexibility and agility (independent variables) among the study sample. This result highlights the strong correlation between speed and agility, which equals (0,39) with a probability value (P-value) of (0,02), less than (0,05), making it statistically significant.

Therefore, the study hypothesis is confirmed, indicating a statistically significant correlation between flexibility and agility and speed among students who are athletically gifted in sprint races. This suggests that flexibility and agility have a positive effect on speed, meaning that speed is influenced by the levels of flexibility and agility. In other words, as an individual's flexibility and agility increase, so does their ability to achieve greater speed, and vice versa. Luiz et al. (2020) note that flexibility is correlated with other physical attributes such as strength, speed, and endurance, and is a crucial component in achieving high levels of performance.

A lack of sufficient flexibility hinders the exploitation of developed strength and speed levels, as increased strength and speed relate to the ability to perform exercises through various ranges of motion in the body's joints. Thus, a sprinter requires flexibility to develop muscle strength and speed in short-distance races, ultimately reaching a high level of performance (Luiz et al., 2020, p. 695). Furthermore, Nebahat and Serdar (2018) highlight that agility exercises have a positive impact on changing direction, speed characteristics, and the performance of school handball team players.

The researchers stress the need for early development of speed and agility in this age group (Nebahat and Serdar, 2018, p. 1913). Our study's results also align with the findings of Bekir and Kenanuzun (2015), which demonstrated a significant relationship between speed and flexibility, influenced by age, in football players. The researcher concluded that improving sprint performance requires developing muscle flexibility through a training programme at an early age. Similarly, our current study's results are consistent with those of Y. Kaklu and G. Ersoz (2015), who found a statistically significant relationship between sprinting ability and agility. They also discovered significant correlations between vertical jumping ability and sprinting in football players.

The study suggests that speed, agility without the ball, and vertical jumping ability share common physiological and biomechanical determinants. All these findings are valuable in identifying and selecting students who are athletically gifted in sprint races, as they confirm a

positive, direct relationship between flexibility, agility, and speed. In other words, a gifted student who possesses high levels of flexibility and agility is likely to exhibit greater speed.

## 5. Conclusion:

Based on the results obtained from this research conducted on second-year middle school students in the context of identifying athletic talent in sprint races, we conclude that there is a direct relationship between flexibility, agility, and speed. As students in this stage possess greater levels of flexibility and agility, their potential for exhibiting speed also increases, and vice versa. This finding facilitates the process of identifying and selecting talent, as well as making future predictions in athletics, particularly in sprint races.

We recommend that teachers and coaches involved in identifying and selecting athletic talent should focus on enhancing physical capabilities by conducting specific physical tests related to this discipline, such as those assessing speed, flexibility, and agility. The positive and significant interconnections between these attributes are particularly relevant in sprinting. Additionally, we encourage researchers to develop this study further by exploring other physical attributes that influence sprinting, such as speed strength, explosive power, and speed endurance.

## References:

- 1) Saad Fathallah Muhammad Al-Alim. (2015). *Genes and Talent Selection in Athletics*. Alexandria: World of Sports Publishing and Dar Al-Wafa for Printing.
- 2) Abdul Hadi. (1999). *Psychological Guidance and Counselling*. 1st ed. Jordan: Dar Al-Thaqafa.
- 3) Abdul Aziz Nimer, et al. (1997). *Kinetic stretching*. Cairo: Markaz al-Kitāb lil-Nashr.
- 4) Kamal Jamil Al-Rabdi. (2005). *What's New in Athletics*. 3rd ed. Beirut: Dar Wa'il lil-Nashr.
- 5) Malik Hasan. (1986). *Athletics*. Moscow: Dar Radouga.
- 6) Ahmad Jaber Mahmoud. (2018). *Components of Physical Fitness between Physiology and Training*. Al-Arish University: College of Physical Education.
- 7) Rifai Mustafa. (2005). *Principles of Football Training*. Mansoura: Amer for Printing and Publishing.
- 8) Lesserteur, A. (2009). *Entrainement de foot ball la preparation physique. (Lit. Football Training: Physical Preparation.)* France: Edi. Action.
- 9) Régnier, G., and Russell, S. (1993). *Talent Detection and Development in Sport*. In: *Handbook of Research on Sport Psychology*, Eds. (pp. 290-313). New York.

- 10) Richard Monpetit. (1989). *Problème lié à la détection des talons en sport. France: édition vigot. (Lit. Problems Related to Talent Detection in Sport.)* France: Vigot Publishing.
- 11) Bernard, G., Marion, W. (1998). *Détection, selection et expertise en sport collectifs, l'exemple du basket-ball. (Lit. Detection, Selection, and Expertise in Team Sports: The Case of Basketball.)* In: Les Cahiers de l'INSEP, No. 23. (pp. 9-179).
- 12) Juergen Wienek. (1999). *Manuel d'entraînement. Paris. 4eme. Edition. Vigot. (Lit. Training Manual. Paris: 4th ed. Vigot.)*
- 13) Bekir Mendes, Kenanuzun. (2015). *Examination of Flexibility and Sprint Performance Values of Adolescent Footballers.* Turkish Journal of Sport and Exercise, 17 (3), 16-20.
- 14) Luiz, H. et al. (2020). *Acute Effects of Warm-Up, Exercise, and Recovery-Related Strategies on Assessments of Soccer Kicking Performance: A Critical and Systematic Review.* Sport Medicine.
- 15) Nebahat Eler, Serdar Eler. (2018). *The Effect of Agility Exercises on COD Speed and Speed in Terms of Training Frequency.* Journal of Educational Research, 6 (9), 1909-1915.
- 16) Y. Kaklu, G. Ersoz. (2015). *The Relationship Between Sprint Ability, Agility, and Vertical Jump Performance.* Journal of Science and Sports, 30 (1).
- 17) Sahiner, I., Balci, S. S. *Comparison of Different Sit and Reach Tests in Children.* Nigde University Journal of Physical Education and Sport Sciences, 2010, 4 (1).