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*Professional paper*

# THE INFLUENCE OF SPECIFIC MOTOR SPACE ON THE ATHLETIC DISCIPLINE RUNNING 100 METER - SPRINT IN 17 YEAR OLD STUDENTS

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**Abstract**

The aim of this study was to determine the influence of specific motor abilities on performance in the 100-meter sprint among 17-year-old students. The sample consisted of 250 male students from two municipal high schools in Kichevo. A total of 13 specific motor tests were used as predictor variables, while the criterion variable was performance in the 100-meter sprint.
The data were analyzed using appropriate statistical methods, including descriptive statistics and regression analysis. The results indicate that the system of specific motor variables has a statistically significant influence on sprint performance ($p < 0.00$). In particular, variables related to speed and explosive strength showed a significant contribution to performance outcomes.
These findings highlight the importance of developing specific motor abilities in physical education and training programs aimed at improving sprint performance in adolescents.

Keywords: specific motor abilities, sprint running, adolescents, physical education, training.

## 1. Introduction

A well-structured and carefully programmed curriculum for sports and physical activities plays a crucial role in the development of motor abilities in adolescents. During this phase of development, students experience major biological changes that are associated with changes in their physical structure and cognitive abilities. Therefore, it is necessary for the curriculum to be carefully planned and adapted to the needs of students to ensure full physical development and improvement of motor skills.
Athletics, as a basic discipline in physical education, plays a key role in the development of motor skills. Within athletics, sprint running is a discipline that requires the development of specific motor skills, such as speed, strength and coordination. These skills are crucial for achieving top results in sprinting, as they are directly related to the requirements for performing effective movements with high precision and speed.
According to the results of the research, the system of specific motor variables has a significant impact on the results in the sprint running discipline among students aged 17. The research, based on a sample of 250 students, shows that sprint speed and explosive strength of the lower extremities have the greatest impact on performance in the discipline, as clearly demonstrated by the results of regression analyses showing high correlations between motor variables and results in the 60-meter and 120-meter sprints (Simeonov, Pavlović, & Karshakovska-Dimitrioska, 2022).
The aim of this study is to analyze the specific motor skills that influence sprint performance, with a particular focus on the 100-meter sprint. Statistical methods, such as regression analysis, will be applied to identify which motor skills have the greatest impact on sprint performance (Hakkinen et al., 1989).

The results of this research will offer important guidelines for optimizing curricula and training strategies in physical education, with an emphasis on developing the motor skills necessary to achieve better results in athletics.

## 2. Methodology

This study was conducted to examine the influence of specific motor abilities on 100-meter sprint performance in 17-year-old students. The research sample included 250 male students enrolled in two municipal high schools in Kichevo ("Drita" and "Mirko Mileski"). The participants were randomly selected, and all previously confirmed that they were healthy and able to perform physical activities according to their capacities.
The aim of the research was to analyze specific motor abilities and their influence on the results in the 100-meter sprint. For this purpose, 13 specific motor tests were used as predictor variables. The criterion variable was the results in the 100-meter sprint. The data were processed using appropriate statistical methods, including: descriptive statistics to determine basic parameters, such as the average and standard deviation, linear regression analysis to determine the influence of motor abilities on the results in the 100-meter sprint. The following statistical parameters were calculated in the regression analysis: beta coefficients, standard error of beta coefficients, standardized partial regression.

*Sample of criterion variables*

1. 100 meter run

While the sample of predictor variables is represented by a set of 13 specific motor variables, namely:
*Sample of specific motor variables*
1. Abalak, vertical jump from a place (MVSM)
2. Abalak from a half-lift (MVSPC)
3. Throwing a shot with two hands in front of the body (MFGPT)
4. Hold in a bent shaft (MIZV)
5. Pentajump from a place (MPSM)
6. Pentajump with a stronger leg (MPSJN)
7. Pentajump with a weaker leg (MPSSN)
8. Sprint at 60 m. (MS60m)
9. Sprint at 120 m. (MS120m)
10. Running at 600 m. (MS600m)
11. Bench with maximum weight in 15 sec. (MBMT15sec)
12. Lifting a weight with legs for 20 sec. (MPTN20sec)
13. Climbing a ladder with a weight on the shoulder for 20 sec. (MTRKS20sec)

## 3. Results

Table 1 Descriptive statistics of the sample of specific motor variables

| **Descriptive Statistics** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **N** | **Range** | **M** | **Max.** | **Sum** | **Mean** | **Std. Dev.** | **Var.** | **Skew.** | **Kurt.** |
| **MVSM** | 226 | 92,5 | 77 | 169,5 | 24037 | 106,35 | 11,54 | 133,22 | 0,64 | 3,18 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **MVSPC** | 226 | 58,5 | 81,5 | 140 | 25323 | 112,04 | 11,38 | 129,51 | -0,12 | -0,15 |
| **MFGPT** | 226 | 1029 | 103 | 1132 | 163715 | 724,40 | 116,14 | 13489,1 | -0,30 | 3,59 |
| **MIZV** | 226 | 107 | 0 | 107 | 6850,88 | 30,313 | 19,13 | 366,01 | 0,78 | 0,67 |
| **MPSM** | 226 | 592 | 730 | 1322 | 234312 | 1036,78 | 113,01 | 12773,2 | -0,35 | -0,03 |
| **MPSJN** | 226 | 1256 | 711 | 1967 | 231668 | 1025,08 | 138,58 | 19205,4 | 1,28 | 8,75 |
| **MPSSN** | 226 | 725 | 670 | 1395 | 220570 | 975,97 | 123,88 | 15346,6 | -0,10 | 0,06 |
| **MS60m** | 226 | 3,77 | 6,64 | 10,41 | 1840,95 | 8,14 | 0,70 | 0,49 | 0,67 | 0,35 |
| **MS120m** | 226 | 8,22 | 14,28 | 22,5 | 3973,42 | 17,58 | 1,52 | 2,33 | 0,56 | 0,06 |
| **MS600m** | 226 | 120,83 | 79,36 | 200,19 | 30884,6 | 136,65 | 17,40 | 302,96 | 0,79 | 1,83 |
| **MBMT15sec** | 226 | 6 | 1 | 7 | 796 | 3,52 | 1,31 | 1,71 | 0,36 | -0,31 |
| **MPTN20sec** | 226 | 17 | 0 | 17 | 2177 | 9,63 | 3,00 | 9,05 | -0,80 | 1,19 |
| **MTRKS20sec** | 226 | 18 | 2 | 20 | 3096 | 13,69 | 2,96 | 8,77 | -0,27 | 0,46 |

Source: Data taken from the author's own research

The values shown in Table 1 represent basic descriptive statistical indicators for the specific motor variables. From them it can be noted that the standard deviation for all examined variables is less than one third of the arithmetic mean, which suggests good sensitivity of the results. The minimum and maximum values of the results are within the expected range for the respective variables. The analysis of the Gaussian curve kurtosis (Skew.) shows that the distribution of the results is approximately symmetrical, while the values of the roundness (Kurt.) indicate that the data are within the recommended values. However, the variable MPSJN is characterized by deviations, with Kurt = 8.75 and Skew = 1.28, which indicates that the results for this variable do not follow a normal distribution.

Table No. 2 Regression analysis of specific motor variables with the criterion variable - 100 m sprint (100m sprint)

Regression Summary for Dependent Variable: VAR28 (new.sta)
R= .78093293 $R^2$= .60985624 Adjusted $R^2$= .58593233
F(13,212)=25.491 p<.00000 Std.Error of estimate: 1.0255

| | **BETA** | **St. Err.of BETA** | **B** | **St. Err. of B** | **t(212)** | **p-level** |
|---|---|---|---|---|---|---|
| **Intercpt** | | | 4.049395 | 1.784364 | 2.26938 | .024252 |
| **MVSM** | -.025294 | .092576 | -.003492 | .012782 | -.27322 | .784947 |
| **MVSPC** | .033740 | .104522 | .004725 | .014636 | .32280 | .747165 |
| **MFGPT** | -.060029 | .056068 | -.000824 | .000769 | -1.07065 | .285545 |
| **MIZV** | -.076602 | .052544 | -.006381 | .004377 | -1.45788 | .146353 |
| **MPSM** | -.023560 | .085606 | -.000332 | .001207 | -.27522 | .783416 |
| **MPSJN** | .002295 | .093808 | .000026 | .001079 | .02446 | .980507 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **MPSSN** | -.076175 | .113915 | -.000980 | .001465 | -.66871 | .504411 |
| **MS60m** | .287582 | .067918 | .648769 | .153220 | 4.23423 | .000034 |
| **MS120m** | .394806 | .071160 | .411750 | .074214 | 5.54813 | .000000 |
| **MS600m** | .018063 | .053982 | .001654 | .004942 | .33461 | .738252 |
| **MBMT15sec** | .059431 | .046296 | .072273 | .056299 | 1.28373 | .200637 |
| **MPTN20sec** | -.040301 | .048175 | -.021347 | .025518 | -.83655 | .403786 |
| **MTRKS20sec** | -.034599 | .050687 | -.018617 | .027274 | -.68261 | .495601 |

Source: Data taken from the author's own research

The influence of predictors (specific motor variables) on the criterion Sprint at 100 m. (KSP100m) shown in table no. 15, indicates that it is statistically significant ($p<0.000$).
The value of the multiple correlation coefficient is high R=.78 which confirms that the entire predictor system of basic motor variables has a statistically significant influence on the criterion variable Sprint at 100 m. While the coefficient of determination is $R^2$=.60 which explains the total variability of the system predictors with the criterion by 60%. The remaining part of 40% can be attributed to other characteristics and abilities. The results indicate that only two predictor variables 60 m sprint (MS60m) and 120 m sprint (MS120m) demonstrated a statistically significant influence on the criterion variable: variable no. 22. 60 m sprint. (MS60m) with a value of the BETA coefficient BETA=.287 and a significance level of p=.000 and 23. 120 m sprint. (MS120m), with a value of the BETA coefficient BETA=.394 and a significance level of p=.000.

## 4. Discussion

The findings of this study are consistent with previous research that highlights the importance of explosive strength and speed in sprint performance.
Based on the results obtained, as well as the comparison with the relevant scientific literature, it can be concluded that the specific motor space has a significant impact on the development and improvement of speed in sprint disciplines in 17-year-old students. A large number of modern studies indicate that explosive strength is one of the key factors for achieving high results in sprinting. Thus, according to Diker et al. (2020), there is a high correlation between the explosive strength of the lower extremities and sprinting performance at short distances (5–30 m), which indicates that increasing strength directly contributes to improving speed. These findings are consistent with the results of this study, where variables related to explosive strength show a significant role in explaining the variance of sprinting speed.
Additionally, research by González-Fernández et al. (2022) highlights the importance of the force–power–velocity relationship, with maximal muscular power and the ability to rapidly generate force being closely related to sprinting ability. This suggests that it is not enough to simply possess force, but that it must be produced in a short time interval, which is characteristic of sprinting activities. On the other hand, biomechanical factors, such as stride length and frequency, also play a significant role in determining sprinting speed. According to Pietraszewski et al. (2025), the optimal combination of these two parameters allows for the achievement of maximum speed, with the activation of large muscle groups, especially the gluteus maximus and hamstrings, being of essential importance. The results of the research of Tvrdý et al. (2023) show that combined training, which includes plyometrics and sprinting, leads to significant improvements in speed and explosive power. This further confirms the importance of specific motor space and targeted training processes for the development of sprinting abilities in the young population.
In addition, research suggests that sprinting speed is influenced by other factors such as anthropometric characteristics, coordination and neuromuscular control (Oku, 2024), as well as

external conditions such as temperature and air resistance (Mureika, 2005). However, despite the influence of these factors, the results of this study indicate that motor abilities, especially explosive strength, remain the dominant factor in the development of sprinting speed.

## 5. Conclusion

Based on the results obtained, it can be concluded that the criterion variable – sprint is under a statistically significant influence of the system of predictor specific motor variables at the level (p=0.00), which confirms their importance for achieving a quality result.
Sprinting represents a complex motor activity influenced by multiple factors, particularly explosive strength, coordination, and biomechanical characteristics. The results show that the specific motor space has a significant role in the development of sprinting speed in 17-year-old students.
These findings have practical applications in physical education teaching and open the possibility for further research by including additional factors and different populations.

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