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Access to test selection in children's athletics – Prediction of reaching maximum speed level and result in sprint based on dynamic-kinematic parameters, speed-strength abilities and morphological characteristics

Slavenko Likić[1], Damira Vranešić – Hadžimehmedović[1], Izet Bajramović[1], Nedim Čović[1]

[1]Universitiy of Sarajevo, Faculty of Sport and Physical Education

Abstract

Running speed in the form of sprinting is one of the most important abilities that can significantly define performance success in many sports. From the perspective of genetically inherited motor functions, running speed can be classified as a primary phylogenetic human movement, manifested in the form of a "three-segment model" consisting of speed, power, and coordination. By comprehensively analyzing the general and partial predictive contributions of dynamic-kinematic parameters of running, speed-power abilities, and morphological characteristics, on a sample of 80 boys aged 10-12 years, it can be concluded that regardless of the choice of criteria, achieved maximal speeds (KVMAX) or results in children's athletic sprint over 50 meters (KT50m), the same or related predictor variables contributed to the explanation. The variable running time for 20m from a flying start (KTLS20m) has the greatest predictive contribution (β=0.83, p<0.001) to explaining both criteria, which may indicate the importance of conducting this test in the identification and selection for athletic sprint. Additionally, the selection of tests to assess speed-power abilities is extremely important for the identification and selection for athletic sprint. It can be concluded that tests of horizontal and vertical jumps are significant for identification, as well as tests for assessing neuro-muscular excitation. Tests for assessing continuous horizontal jump are also important, although there is an impression that, in boys aged 10-12 years, coordinatively simpler tests should be used. In the analysis of morphological characteristics, variables that significantly contributed to the explanation of criteria at a partial level were body height, back skinfold, and ankle diameter, indicating that in the identification of talented individuals, it should be considered that elite sprinters are characterized by light bones, optimal muscle mass, and low levels of subcutaneous fat tissue.

Keywords: *athletics, talent ID, speed, power, maximal velocity*

Correspondence:

N. Covic
Faculty of Sport and Physical Education, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
E-mail: nedim.covic@fasto.unsa.ba

Introduction

Athletics is a complex multidisciplinary sport. The foundation of athletics, as well as various athletic disciplines, consists of fundamental locomotor movements, namely walking, running, jumping, and throwing. Besides walking, running represents the most natural form of human locomotion. Despite the simplicity of the elementary form of running, the technical structure of athletic sprinting is extremely complex. The investigation of running speed and its impact on athletic performance represents a multifaceted and dynamic research area. Scholars have explored various dimensions of running speed, encompassing its biomechanical underpinnings, physiological determinants, and training methodologies. From a biomechanical standpoint, running speed is influenced by factors such as stride length, stride frequency, ground contact time, and flight time (Weyand et al., 2000). Athletes often aim to optimize these biomechanical variables to achieve maximal speed while minimizing energy expenditure and the risk of injury. Physiologically, running speed is intricately linked to the cardiovascular and musculoskeletal systems' ability to deliver oxygen and nutrients to working muscles and remove metabolic byproducts (Joyner & Coyle, 2008). Interventions targeting these physiological systems can result in enhancements in running speed and endurance. Regarding training practices, athletes employ a variety of techniques to improve their running speed, including sprint-specific drills, resistance training, plyometrics, and interval training (McMahon & Wenger, 1998). These training modalities are designed to enhance muscle strength, power, coordination, and neuromuscular efficiency, all of which are critical for sprint performance. Furthermore, the study of running speed transcends individual performance to encompass external factors such as environmental conditions, footwear selection, and track surfaces, all of which can influence an athlete's speed (Hausswirth et al., 2014). Researchers are actively exploring novel training methodologies and technological advancements, such as wearable sensors and biomechanical modelling, to deepen our comprehension of running speed and enhance athletic performance.

Additionally, maximal running speed can depend on various factors related to morphological and physiological characteristics, energy mechanisms, age, genetic inheritance, motor abilities, intermuscular and intramuscular coordination, as well as optimal biomechanical movement technique. Running speed is one of the motor abilities that is very difficult to develop. Furthermore, locomotor speed in the form of sprinting is one of the most important abilities that can significantly define performance success in many other sports. From the perspective of genetically inherited motor functions, running speed can be classified as a primary phylogenetic human movement and is manifested in a "three-segment model," consisting of speed, power, and coordination (Babić, V., & Dizdar, D., 2010; Čoh, Bračić, & Smajlović, 2009; Kampmiller, T., M. Vanderka, P. Šelinger, M. Šelingerová, D. Čierna, 2011). One study (Čović et al., 2015) explained the running structure in boys similar age explaining the similarity in race phases between boys and elite sprinters. Since the purpose of this scientific study is to select tests that are accessible for talent identification in children's athletics, it is necessary to consider the structure of dynamic-kinematic parameters of running in lower school age, speed-power abilities in terms of natural forms of horizontal and vertical jumps, as well as the speed of neuro-muscular excitation, and morphological characteristics of children in this age group.

The aim of the study is to select accessible tests for talent identification in children's athletics by examining the dynamic-kinematic parameters of running, speed-power abilities through natural forms of horizontal and vertical jumps, the speed of neuro-muscular excitation, and morphological characteristics in lower school-aged children.

Methods

Participants

The research was conducted on a sample of 80 respondents, boys aged 10-12, who were selected from the population of pupils of the fourth grade of elementary school (Sarajevo, Bosnia and Herzegovina). Subjects were advised to wear sport equipment and non-slippery shoes suitable for sports activities. Legal guardians were asked to sign a written contest declaring allowance to participate in research and confirming absence of injuries and medical condition that may compromise health. Participants were allowed to forfeit at any time during the testing procedure. All procedures were conducted according to Helsinki declaration with permission of local Ethical Committee.

Procedures

Testing was performed in the morning hours indoors on artificial surface suitable for athletic competitions. Overall, 12 experienced sport scientists were included in the testing procedure. Body mass and stature were measured using a scale with a stadiometer (Seca, Hamburg, Germany) to the nearest 0.1 kg and 0.1 cm, respectively. Body mass index was calculated as body mass (kg)/squared stature (m2). Body measures were measured by a level 3 anthropometrist following the procedures established by the ISAK featuring variables: longitudinal dimensionality of the skeleton – Body height (ALVT), Leg length (ALDN), Foot length (ALDST); transversal dimensionality of the skeleton – Width of the pelvis (ATŠZ), Diameter of the ankle (ATDSZ), Diameter of the knee (ATDKZ); volume and mass of the body – Scope of the upper leg (AVONAT), Scope of the lower leg (AVOPOT), body mass (AVMT).

Running dynamic and kinematic parameters were estimated using 50 meters running test. Running area from 20 to 40 meters was merged with Microgate (Bolzano, Italy) surface sensors while photocells were placed after each 5 meters from start to finish. Subjects were running from standing start 3 m from starting line (flaying start) to avoid any possible mistakes. Subjects started running on their own signal. Sample of variables for estimating running dynamic and kinematic parameters included a set of seven variables: maximum running speed (KVMAX (m/s)), 50m running time (KT50m (s)), 20m running time from flying start (KTLS20m (s)), stride frequency (KFK (Hz)), stride length (KDK (cm)), duration of contact (KTK (ms)) and duration of the flight (KTL (ms)). By selecting one of the two criteria variables (KVMAX or KT50m), the unselected variable was automatically placed in the role of predictor.

Kinematic parameters were registered on tensiometric carpet (Ergo Tester Bosco), while sample of variables estimating speed-strength motor abilities included a set of 12 variables: Standing long jump (MSDM (cm)), Vertical jump – Abalak test (MABL (cm)), Counter movement jump (MCMJ (cm)), Counter movement jump with free hands (MCMJH (cm)), Repetitive jumps over the right foot on the 20m - stride number (MSD20B), Repetitive jumps over the left foot on the 20m - stride number (MSL20B), Repetitive jumps over the right foot on the 20m – time (MSL20V), Repetitive jumps over the left foot on the 20m – time (MSL20B), Hand tapping on 15 seconds (MTAPR), Leg tapping on 15 seconds (MTAPN), Medicine-ball throw backwards (weight 1 kg) from standing position over head (MSMEDS), Medicine-ball throw forward (weight 1kg) from lying on back over head (MSMEDL).

Statistical analysis

For all the data, measures of central tendency and dispersion (mean ± SD) were calculated, and the normality of distribution was checked using the Kolmogorov-Smirnov test. The predictive general and partial contributions of variables from different anthropological areas to the achieved maximum running speed in boys aged 10-12 years were estimated using multiple regression analysis - Stepwise method, which is based on a successive procedure of variable introduction into the discriminant equation according to the criterion $F \leq 1.00$. This procedure introduces or discards a variable from the discriminant function if another variable more satisfactorily meets the entry criterion. The analysis was conducted using the SPSS software package (v 21.0) (IBM, Chicago), with statistical significance set at the conventional 95% level ($p > 0.05$).

Results

The predictive values of general and partial contributions of treated sets of variables of dynamic and kinematic running parameters, speed-strength abilities, and morphological characteristics (table 1) in explaining the criteria of achieving maximum running speed (KVMAX) and results in children's athletic sprinting over 50 meters (KT50m) were determined. Based on the obtained coefficients of determination (R^2), which reflected the general predictive contribution of three predictor sets of variables in relation to the criterion variables KVMAX and KT50m, the research results indicated the following: the complete set of predictor variables of kinematic running parameters explained 91% of the shared variance of the criterion of achieved maximum running speed - KVMAX (Table 2), and 96% of the shared variance of the criterion variable of 50m sprint running results - KT50m (Table 3); the complete set of predictor variables of speed-strength abilities explained 68% of the shared variance of the criterion variable KVMAX (Table 4), and 69% of the shared variance of the criterion variable KT50m (Table 5); also, based on the obtained results, it was determined that the complete set of morphological characteristics variables explained 21% of the shared variance of the criterion variable KVMAX (Table 6), and 27% of

Tabel 1. Morphology, running dynamic and kinematic and speed-strength features in young school age (n=80) male participants.

Morphology (n=80)	Mean±SD
Body height (ALVT) (cm)	145.3±6.6
Body mass (AVMT) (kg)	39.73±8.88
Leg length (ALDN) (cm)	83.04±5.02
Foot length (ALDST) (cm)	22.89±1.32
Width of the pelvis (ATŠZ) (cm)	20.8±2.68
Diameter of the ankle (ATDSZ) (cm)	6.54±0.435
Diameter of the knee (ATDKZ) (cm)	9.04±0.846
Scope of the upper leg (AVONAT) (cm)	45.22±6.18
Scope of the lower leg (AVOPOT) (cm)	30.79±3.34
Running dynamic and kinematic parameters (n=80)	
50m running time (KT50m) (s)	9.91±0.67
Maximum running speed (KVMAX) (m/s)	6.02±0.433
20m running time from flying start (KTLS20m) (s)	3.48±0.261
Stride frequency (KFK) (Hz)	3.96±0.255
Stride length (KDK) (cm)	145.51±10.72
Duration of contact (KTK) (ms)	0.15±0.015
Duration of the flight (KTL) (ms)	0.1±0.012
Dynamic parameters of speed-strength motor abilities (n=80)	
Standing long jump (MSDM) (cm)	145.54±19.09
Vertical jump – Abalak test (MABL) (cm)	27.13±5.01
Counter movement jump (MCMJ) (cm)	19.87±4.28
Counter movement free arms (MCMJH) (cm)	23.72±4.62
Repetitive jumps over the right foot on the 20m (MSD20V) (s)	12.24±3.12
Repetitive jumps over the right foot on the 20m (MSD20B) (n)	28.52±6.72
Repetitive jumps over the left foot on the 20m (MSL20V) (s)	12.37±2.83
Repetitive jumps over the left foot on the 20m (MSL20B) (n)	28.58±6.42
Leg tapping on 15" (MTAPN) (n)	18.54±1.91
Hand tapping on 15" (MTAPR) (n)	25.77±2.74
Backwards overhead medicine-ball throw (1 kg) from standing position (MSMEDS) (m)	4.95±0.965
Forward overhead medicine-ball throw (1kg) from lying on back (MSMEDL) (m)	6.95±1.34

Table 2. Predictive contribution of dynamic-kinematic parameters to maximum running speed (KVMAX)

Model summary for criterion variable KVMAX					
R= 0.954, R^2= 0.91, SE= 0.131, $F_{(2,78)}$ = 397.78, P<0.001					
Variables in the Equation					
Variable	B	SE of B	Beta	T	P
KTLS20m	-1.010	.269	-.610	-3.746	<.001
KT50m	-.226	.105	-.348	-2.139	.035
Variables not in the Equation					
Variable	Beta In	Partial	Min.	T	P
KFK	.023	.071	.042	.631	.529
KDK	4.515	.001	.042	.011	.991
KTK	-.003	-.011	.042	-.103	.918
KTL	-.030	-.097	.042	-.863	.391

SE – Standard Error; P statistical significance; DF – degrees of freedom; SS – sum of squares; MS – Mean square

Table 3. Predictive contribution of dynamic-kinematic parameters to 50 meters time (KT50)

Model summary for criterion variable KT50					
R= 0.979, R^2= 0.96, SE= 0.136, $F_{(2,78)}$ = 918.93, P<0.001					
Variables in the Equation					
Variable	B	SE of B	Beta	T	P
KTLS20m	2.105	.189	.826	11.129	<.001
KT50m	-.244	.114	-.158	-2.139	.035
Variables not in the Equation					
Variable	Beta In	Partial	Min.	T	P
KFK	.005	.022	.094	.199	.842
KDK	-.009	-.038	.090	-.338	.736
KTK	-.015	-.075	.094	-.662	.509
KTL	-.0172	-.082	.092	-.722	.472

SE – Standard Error; P statistical significance; DF – degrees of freedom; SS – sum of squares; MS – Mean square

Table 4. Predictive contribution of power-speed parameters to maximum running speed (KVMAX)

Model summary for criterion variable KVMAX					
R= 0.824, R^2= 0.68, SE= 0.251, $F_{(4,76)}$ = 40.361, P<0.001					
Variables in the Equation					
Variable	B	SE of B	Beta	T	P
MSD20B	-.025	.005	-.394	-4.506	<.001
MABL	.023	.007	.270	3.116	.002
MTAPR	.034	.010	.215	3.209	.002
MSDM	.004	.001	.207	2.375	.020
Variables not in the Equation					
Variable	Beta In	Partial	Min.	T	P
MCMJ	.086	.108	.441	.945	.347
MCMJH	-.004	-.005	.430	-.048	.962
MSD20V	-.142	-.141	.248	-1.241	.218
MSL20V	-.142	-.168	.428	-1.482	.142
MSL20B	-.069	-.074	.363	-.643	.522
MTAPN	.035	.046	.505	.402	.688
MSMEDL	.103	.166	.543	1.466	.146
MSMEDS	.092	.145	.536	1.270	.208

SE – Standard Error; P statistical significance; DF – degrees of freedom; SS – sum of squares; MS – Mean square

Table 5. Predictive contribution of power-speed parameters to 50 meters time (KT50)

Model summary for criterion variable KT50					
R= 0.832, R^2= 0.69, SE= 0.378, $F_{(4,76)}$ = 42.853, P<0.001					
Variables in the Equation					
Variable	B	SE of B	Beta	T	P
MSD20B	.034	.009	.344	3.597	<.001
MABL	-.040	.010	-.308	-3.795	<.001
MSL20V	.060	.021	.255	2.826	.006
MTAPR	-.040	.015	-.165	-2.526	.013
Variables not in the Equation					
Variable	Beta In	Partial	Min.	T	P
MSDM	-.137	-.175	.428	-1.544	.126
MCMJ	-.168	-.214	.436	-1.902	.061
MCMJH	-.149	-.180	.422	-1.587	.116
MSD20V	.116	.118	.225	1.032	.305
MSL20B	.071	.059	.210	.515	.608
MTAPN	-.101	-.143	.408	-1.255	.213
MSMEDL	-.092	-.149	.424	-1.308	.195
MSMEDS	.092	.145	.536	1.270	.208

SE – Standard Error; P statistical significance; DF – degrees of freedom; SS – sum of squares; MS – Mean square

Table 6. Predictive contribution of morphological characteristics to maximum running speed (KVMAX)

Model summary for criterion variable KVMAX					
R= 0.459, R2= 0.21, SE= 0.389, F(2,78) = 10.417, P<0.001					
Variables in the Equation					
Variable	B	SE of B	Beta	T	P
ANL	-.002	6.022	-.422	-4.07	<.001
ALVT	.020	.006	.311	3.005	.003
Variables not in the Equation					
Variable	Beta In	Partial	Min.	T	P
ALDN	.029	.018	.308	.161	.872
ALDST	-.054	-.034	.313	-.299	.765
ATŠZ	.066	.060	.647	.532	.596
ATDSZ	.181	.144	.498	1.282	.203
ATDKZ	-.088	-.071	.518	-.631	.529
AVONAT	.262	.170	.334	1.522	.132
AVOPOT	.171	.105	.298	.933	.353
AVMT	.172	.073	.143	.647	.519
ANS	.338	.130	.117	1.159	.250
ANPOT	-.101	-.072	.399	-.638	.525

SE – Standard Error; P statistical significance; DF – degrees of freedom; SS – sum of squares; MS – Mean square

Table 7. Predictive contribution of morphological characteristics to 50 meters time (KT50)

Model summary for criterion variable KT50					
R= 0.525, R^2= 0.28, SE= 0.573, $F_{(2,78)}$ = 14.897, P<0.001					
Variables in the Equation					
Variable	B	SE of B	Beta	T	P
ANL	.004	9.002	.518	5.143	<.001
ATDSZ	-.505	.154	-.330	-3.275	.001

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Table 7. Predictive contribution of morphological characteristics to 50 meters time (KT50)

Variables not in the Equation					
Variable	Beta In	Partial	Min.	T	P
ALVT	-.088	-.074	.498	-.656	.514
ALDN	-.079	-.081	.748	-.714	.477
ALDST	-.036	-.029	.483	-.263	.793
ATŠZ	-.134	-.142	.814	-1.262	.210
ATDKZ	.153	.124	.475	1.098	.275
AVONAT	-.261	-.179	.343	-1.604	.112
AVOPOT	-.189	-.121	.297	-1.075	.285
AVMT	-.223	-.116	.197	-1.031	.305
ANS	-.279	-.113	.119	-1.004	.318
ANPOT	.097	.073	.409	.646	.520

SE – Standard Error; P statistical significance; DF – degrees of freedom; SS – sum of squares; MS – Mean square

the shared variance of the criterion variable KT50m (Table 7). These research results may indicate that there is an extremely high general predictive contribution of kinematic running parameters, a high contribution of speed-strength abilities, as well as a negligible contribution of morphological characteristics in relation to both set criteria KVMAX and KT50m, in the case of boys aged 10-12 years.

Discussion

Within the research results, the partial contribution of predictor variables of dynamic-kinematic running parameters was examined in relation to the set criterion variables (Table 1 and 2). It is important to highlight that in the space of dynamic-kinematic running parameters, by choosing one of the two criterion variables (KVMAX or KT50m), the unselected variable automatically assumed the role of predictor. Regardless of the chosen criterion variable, in both cases, the predictor variable - Time to run 20m from a flying start (KTLS20m) emerged as the top contributor to partial predictive contribution with a level of statistical significance (T≤0.01). The variables KMAX or KT50m were then identified as the second contributors to partial predictive contribution when they were set as predictors (P≤0.05), confirming their inverse proportionality and strong interdependence. Since the instrument used to measure the time to run 20m from a flying start (KTLS20m) was set between the 20th and 40th meters of the track, it means it addressed the phase of running over a distance - the time in which the achieved level of maximum running speed is sought to be maintained at an optimal level. Consequently, it is logical that participants reached and maintained their maximum running speed during this period, which can explain the highest partial predictive contribution of the variable KTLS20m, regardless of the chosen criterion. Therefore, a higher achieved and maintained level of maximum running speed over a distance result in a better performance in athletic sprinting. These results confirm findings from earlier studies reporting the significance of 20m flying start running tests and determining the level of maximum running speed as crucial for assessing performance in athletic sprinting (Kampmiller et al., 2011; Ae, Ito, & Suzuki, 1992; Chapman & Caldwell, 1983). However, regardless of the choice of criterion variable (KVMAX or KT50m), all other kinematic variables related to step length (KDK), step frequency (KFK), contact time (KTK), and flight time (KTL) did not meet the inclusion criteria in the discriminant equation (F≤1.00). Identifying factors influencing the development of maximum running speed and differences in dynamic-kinematic running parameters in relation to age in adolescents, it was concluded that an increase in maximum running speed is a result of increasing step length and decreasing contact phase duration (Bračić, Tomažin, & Čoh, 2009). Also, in the case of younger age groups, they concluded that step frequency is less important for the development of maximum running speed.

Based on the results obtained in our study, it is important to note that the analyzed sample of boys aged 10-12 years represented a random sample of participants, consisting of students who had not undergone basic running technique training. Therefore, the occurrence of typical technical errors in running, such as running over the full foot or incomplete leg extension during push-off, was very possible. Consequently, these typical errors in executing the running stride result in a longer contact time (KTK), which automatically negatively affects step length (KDK) and flight time (KTL), which may also be the reason for the partial non-selection of these kinematic variables in explaining the criteria KVMAX and KT50m. Even though these kinematic parameters, which are significant for the result in athletic sprinting, were not singled out by the study results, it is important to consider the fact confirmed by relevant studies that maximum running speed is achieved primarily when step length and frequency are in an optimal ratio (Belotti et al., 1991; Donati, 1995; Čoh et al., 1997, 2001). Studies also indicate that step frequency and ground contact time parameters are significant for assessing running speed and are good indicators of the sprint potential of young runners, being significant for talent identification processes (Kampmiller et al., 2011; Čoh et al., 1994).

Within the research results, the individual contribution of predictor variables from the speed-strength abilities domain in relation to the set criterion variables was examined (Table 3 and 4). The variable that achieved the greatest predictive contribution to the criterion KVMAX was the number of jumps on the right leg (MSD20B). However, it is interesting to note that the variable for the number of jumps on the left leg (MSL20B) did not meet the entry criteria for the discriminant equation, especially considering the general assumption of the left leg being more dominant in jumping. In contrast to the KVMAX criterion, when choosing the criterion KT50m, in addition to the greatest predictive contribution of the variable number of jumps on the right leg (MSD20B), a predictive contribution of the variable jumps on the left leg for 20m time (MSL20V) was observed. Also, a high predictive contribution, regardless of the criterion choice (KVMAX or KT50m), was achieved by the variable Abalakov jump reach (MABL), which was not the case with the other two variables measuring vertical jump - static jump with preparation (MCMJ) and static jump with free arm swing (MCMJH). By reviewing the research results, specifically the variables that did not meet the inclusion criteria in the discriminant equation (F≤1.00), it can be noted that the variable static jump with preparation (MCMJ) was very close to the statistical significance threshold in the case of the criterion KT50m. The variable standing long jump (MSDM) made a slightly lower contribution compared to the others that met the entry criteria, indicating the extremely high importance of horizontal jumping ability in assessing the criterion of maximum running speed (KVMAX). The variable hand tapping (MTAPR) made a high predictive contribution, indicating an exceptionally high contribution of the neuro-muscular excitation mechanism in achieving maximum speed and results in athletic sprinting. This also confirms the contribution of speed-strength abilities such as vertical and horizontal jumping, as well as the neuro-muscular excitation ability, to the potential maximum speed and results in athletic sprinting, as confirmed by many previous studies (Zatsiorsky & Primakov, 1969; Belotti, 1991).

Within the research results, the individual contribution of predictor variables from the morphological characteristics domain in relation to the set criterion variables was examined (Table 5 and 6). For the criterion KVMAX, two variables - back skinfold thickness (ANL) and body height (ALVT) - achieved a significant predictive contribution (T≤0.01), while for the criterion KT50m, the variables back skinfold thickness (ANL) and ankle joint diameter (ATDSZ) contributed predictively. Other variables from the morphological characteristics domain did not meet the inclusion criteria in the discriminant equation (F≤1.00). The partial contribution of one variable for assessing adiposity to both criteria, as well as the partial contribution of one variable for assessing longitudinal dimensionality and one variable for assessing transversal dimensionality to one of the criteria, may indicate the significance of certain morphological characteristics. However, since the general contribution to explaining the criteria was very low, the conclusion leans more towards the results of some previous studies suggesting that morphological characteristics may not have a decisive impact on achieving maximum speed or results in athletic sprinting. Čoh, Mihajlovič, and Praportnik (2001) state that morphological characteristics are not a significant generator of differences in competitive results. The authors conclude that elite athletic sprinters are characterized by light bones and an optimal amount of muscle mass, emphasizing that this is not the sole relevant factor in speed development, but also highlighting the importance of biochemical energy processes and intermuscular coordination of agonists and antagonists.

Conclusion

Comprehensively analyzing the general and partial predictive contributions of dynamic-kinematic running parameters, speed-strength abilities, and morphological characteristics, it can be concluded that regardless of the criterion chosen, the achieved maximum speeds (KVMAX) or results in children's 50-meter athletic sprint (KT50m) were explained by the same or related predictor variables. In relation to both criteria, the general contribution of the complete set of dynamic-kinematic running parameters was extremely high. The variable Time to run 20m from a flying start (KTLS20m) made the highest predictive contribution to explaining both set criteria, indicating the importance of conducting this test in identifying and selecting for athletic sprinting. Additionally, the variables achieved maximum running speed (KVMAX) and result in the 50m sprint (KT50m) confirmed their inseparable interdependence, suggesting that in identifying talent for athletic sprinting, tests that can accurately assess their speed potential or level of maximum running speed should be considered. It would be beneficial for speed potential in sprinting to be assessed in practice using the 20m flying start running time test, as it contains both the level of achieved maximum running speed and the ability to maintain the achieved speed level when running over a distance. Variables from the domain of speed-strength abilities made significant general predictive contributions to explaining both set criteria. It can be concluded that variables assessing vertical and horizontal jumping ability, as well as the speed of neuro-muscular excitation, made significant individual contributions to explaining both set criteria, confirming the importance of these qualities for speed and performance potential in athletic sprinting. Considering that speed is conditioned by processes of intermuscular coordination of agonists and antagonists, the choice of tests to assess speed-strength abilities is extremely important for identifying and selecting for athletic sprinting. It can be concluded that tests of horizontal and vertical jumping ability, as well as tests assessing neuro-muscular excitation, are significant for identification. Additionally, tests assessing continuous horizontal jumping are important, although it is advisable to use coordinationally simpler tests in the age group of boys aged 10-12 years. The morphological characteristics domain did not show a significant general predictive contribution to explaining the criteria of maximum speed and results in children's athletic sprinting. Variables that made a significant predictive contribution at the partial level in explaining the criteria were body height, back skinfold thickness, and ankle joint diameter, suggesting that in identifying talents for athletic sprinting, it should be taken into account that elite sprinters are characterized by light bones, optimal muscle mass, and a low level of subcutaneous fat tissue.

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