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Original scientific paper

THE IMPACT OF SOME MOTOR ABILITIES UPON THE SUCCESS OF SPRINT RUNNING ON 30 AND 80 METERS AMONG 14-YEAR-OLD STUDENTS

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Abstract

This paper investigates the impact of some motor skills on the success of sprint running on 30 and 80 meters. The aim of this paper is to determine the relationship between motor skills as a predictive system upon the running on 30 and 80 meter as a criteria system.

The research was conducted with 52 males of 14 years ± 6 months, in the primary school "Jeronim De Rada" - Kumanovo. The research used a total of 13 variables, in which 11 variables in assessing the motor compartment and 2 variables in assessing the specific - motor abilities. The variables for assessment of motor skills are: 1. Long jump from a take-off point (MLJ), 2. Triple jump from a take-off point (MTJ), 3. Five-step high jump from a take-off point (MFSHJ), 4. High jump from a take-off point (MHJ), 5. Hand tapping (MHT) 6. Leg tapping (MTL), 7. Leg tapping on the wall (MLTW) 8. Raising the trunk for 30 seconds while lying on your back (MRTLB) 9. Raising the trunk for 30 seconds of Swedish box (Vaulting box) (MRTSB), 10 Push-ups (MPU) and 11. Squats (MS), while the variables for assessment of the specific - motor abilities are: 12. Running 30 meters (MTR30m) and 13. Running 80 meters (MTR80).

Based on the results of the regression analysis, as predictor variables are taken eleven variables in order to assess the motor compartment, while as criteria are taken two variables for the assessment of specific motor compartment, and the following can be concluded: motor variables used as predictor variables in this paper, have statistical significant impact upon the criteria variables for running 30 meters (MTR30m) and running 80 meters (MTR80m). The variables of motor abilities (as a predictor system), have a significant statistical impact upon the variable MTP30m with a significance level Q = 0.001, while upon the variable MTR80m with a significance level Q = 0.003. It is significant to state that the single greatest impact of predicting system upon the criteria variables MTR30m MTR80m is produced only by the MLJ variable, and the variable MTP30m is worth -0.449 and the significance level is 0.001, while the criteria variable MTR80m is worth -0536 and the level significance is 0.003.

Keywords: Motor skills, specific- motor skills, explosive power, students, regression analysis.

1. Introduction

Short-distance running or sprint running has been known since ancient Greece, when the first Olympic Games were held in 776 BC, in which running happened at a length of one stade or 192.27 meters. A characteristic of sprint running is that the movements are realized with maximum intensity, and therefore mastering this technique is much more difficult than running

in medium and long distances that are realized at a lower speed. In the structure of the sprint running movements we distinguish four phases: starting position, starting acceleration, running at maximum speed and finish (Radic, 2006, Radic & Simeonov, 2013). Achieving good results in sprint running depends primarily on the explosive strength of the runner and the speed of the neuromuscular reaction (Asllani, 2016). Explosive power as a motor ability is one of the main determinants of success in almost any sporting activity, where that activity is realized in the shortest possible time (Newton and Kreamer, 1994). Specific training for the development of explosive force in theory is called "Plyometric training", and if it is a training method then it is called "plyometric method" (Marullo, 1999). Very few articles focus on the sprint runs of 14-year-old athletes and students. Some authors consider functional and motor skills to be among the most important skills used for sprint running success (Homenkov 1977; Brown, Ferrigno & Santana 2000; Milanovic 2007).

The main purpose of this research was to determine the impact of some motor skills on the results in sprint running. The results of research on the impact of motor skills on sprinters have theoretical and practical value for the training process because this research will give us new scientific information about the value of motor tests, especially for explosive force tests which tests mostly affect the performance of sprint runs, which in this paper, we practice, as the most appropriate runs for this age category, running at 30 and 80 meters.

2. Methods

The population sample was drawn from male students of 14 years ± 6 months. The research was conducted with 52 respondents in the primary school "Jeronim De Rada" - Kumanovo. The sample in this research is non-selective in relation to motor abilities and specifically - motor abilities, ie running on short distances. The results obtained from this research will be taken only by the respondents who regularly attended physical education classes and have participated in all motor tests. The research used a total of 13 variables, of which 11 for assessment of motor abilities or predictor parameters and 2 variables for assessment of specific - motor abilities or criterion variables. The variables for assessing motor abilities are: 1. Long jump from a take-off point (MLJ), 2. Triple jump from a take-off point (MTJ), 3. Five-step high jump from a take-off point (MFSHJ), 4. High jump from a take-off point (MHJ), 5. Hand tapping (MHT) 6. Leg tapping (MTL), 7. Leg tapping on the wall (MLTW) 8. Raising the trunk for 30 seconds while lying on your back (MRTLB) 9. Raising the trunk for 30 seconds of Swedish box (Vaulting box) (MRTSB), 10 Push-ups (MPU) and 11. Squats (MS), while the variables to assess the specific - motor abilities are: 12. Running 30 meters (MTR30m) and 13. Running 80 meters (MTR80). The motor variables were selected to be representative of the second-order motor dimensions in the studies of (Kurelič et al., 1975) and the Eurofit test (Adam et al., 1988). In order to determine the relationship between the basic motor variables as a predictive system and the situational motor variables as a criterion system, it was applied the regression analysis or method for analysis of the impact and the relationship belonging to the group of multivariate analyzes (Bala, 1988, Malacko, 2000). The statistical package SPSS 16.0 was applied for data processing.

3. Results

The following tables show the results of the basic statistical parameters of the criterion and predictor variables or measures of central tendency and dispersion for each indicator: 1. Minimum score, maximum score, arithmetic mean, standard deviation, Skewennes and Kurtosis.

Table 1. Basic statistical parameters

	N	Minimum	Maximum	Mean	Std. Dev	Skewnees	Kurtosis
MLJ	52	124.00	217.00	157.94	19.50004	.366	.361
MTJ	52	394.00	626.00	496.77	47.42450	.062	.274
MFSHJ	52	704.00	1054.00	872.08	85.20744	.126	-.646
MHJ	52	18.00	43.00	29.4423	5.78847	.312	-.101
MHT	52	15.00	40.00	28.1731	5.09025	.370	.164
MTL	52	17.00	28.00	23.3269	2.01680	-.364	1.127
MLTW	52	10.00	30.00	21.3462	4.21428	-.697	.179
MRTLB	52	9.00	26.00	19.2500	3.59670	-.711	.529
MRTSB	52	9.00	25.00	19.2308	3.55691	-1.013	1.146
MPU	52	4.00	33.00	15.0192	7.64786	.662	-.024
MS	52	12.00	75.00	42.3654	15.34445	.031	-.479
MTR30м	52	42.00	60.00	51.5000	4.52661	-.041	-.675
MTR80м	52	107.00	181.00	134.23	13.24226	.947	2.180

From Table 1, it can be concluded that the values of all variables have the largest difference between the minimum and maximum results. The value standard deviations in the basic motor tests MTJ, MFSHJ, MLJ are at a high level, and these are results that are heterogeneous or results that have high variability, while the motor tests MLJ, MHT, MLT, MPU, MS, are at the low level, which shows that discrimination is not satisfactory and that these are results that are homogeneous, ie results that have low variability. The asymmetry of the curve is small, in almost all variables, and in some even with negative values. The rounded value of the curve in most variables is below 2.75, so all of these values are of a platykurtic character, which means that the results are far from the arithmetic mean.

Table 2. Intercorrelation of basic and specific - motor variables

	MLJ	MTJ	MFSHJ	MHJ	MHT	MLT	MLTW	MRTLB	MRTSB	MPU	MS	MTH30м	MTH80
MLJ	1												
MTJ	**.636****	1											
MFSHJ	**.571****	**.704****	1										
MHJ	.330*	.450**	.275*	1									
MHT	.228	.107	.123	.124	1								
MLT	.176	.099	.081	.174	.252	1							
MTLW	.085	.175	.078	.282*	.183	**.517****	1						
MRTLB	.282*	.247	.217	.340*	-.014	.234	.146	1					
MRTSB	.093	.111	.159	.081	.147	.189	-.117	**.527****	1				
MPU	.330*	.266	.263	.080	-.081	-.134	-.302*	.441**	.484**	1			
MS	.275*	.202	.106	.283*	.021	-.005	-.100	.132	.215	.337*	1		
MTR30м	-**.608****	-.471**	-.442**	-.232	-.166	.083	.014	-.201	.116	-.157	-.152	1	
MTR80м	-**.578****	-.402**	-.380**	-.358**	.008	-.241	-.285*	-.357**	-.059	-.221	-.082	**.564****	1

Table 2 shows the interconnection coefficients for all motor and specific motor variables of 14-year-old students. From a total of 78 interconnection coefficients, 28 coefficients are statistically significant. High correlations are presented between: MTJ and MFSHJ, with value .704 **, MLJ and MTSHJ, with value .636 **, MLJ and MHT30m, with value. -608 **, MJDP and MTR80m, with value.-578 * *, MLJ and MFSHJ, with value .571 **, MHT30m and MHT80m, with value .564 **, MRTLB and MRTSB, with value .527 and MLT and MLTW, with value .517. We also have coefficients with significant correlations and some coefficients with low correlation values. Out of a total of 78 interconnection coefficients, 50 coefficients are not statistically significant, which means that we will not comment on these coefficients.

Table 3. Linear regression of variables MHT30м (content model)

Content model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	**.706[a]**	**.498**	.360	3.62095	.498	3.609	11	40	**.001**

a. Predictors: (constant), MS, MLT, MFSHJ, MHT, MRTSB, MSVM, MLTW, MPU, MLJ, MRTLB, MTSHJ

Table 4. Regression analysis of the variable MHT30m - Coefficients (a)

Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	69.318	8.020		8.643	.000
	MLJ	**-.104**	**.039**	**-.449**	**-2.695**	**.010**
	MTJ	-.011	.018	-.111	-.599	.553
	MFSHJ	-.007	.009	-.127	-.773	.444
	MHJ	.028	.110	.036	.255	.800
	MHT	-.129	.111	-.145	-1.166	.251
	MLT	.406	.321	.181	1.267	.213
	MTLW	.111	.159	.104	.699	.489
	MRTLB	-.357	.198	-.283	-1.803	.079
	MRTSB	.385	.199	.303	1.932	.060
	MPU	.053	.094	.089	.560	.579
	MS	-.014	.038	-.046	-.358	.722

a. dependent variable: MHT30m

Multiple correlation between the system of predictor variables and the criterion variable (MTR30m) is shown in Table 3 and its value is 0.706, ie the stated correlation explains the common variability with around 49% (R2 = 0.498). The remaining 51% in explaining the variability of the criterion variable (MHT30m), can be attributed to some other anthropological characteristics that were not included in these studies (functional, cognitive, cognitive, social, etc.). From the presented regression analysis of the variable MHT30m, it can be seen that there is a statistically significant influence between the predictor system and the criterion variable, as shown by the signifier with a value of 0.001.

It is worth mentioning that of the entire predictor system, only the variable MLJ has the greatest individual impact (Table 4), with a value of -0.449 and a significance level of 0.001, where this value has a negative sign which means that the impact of the variable MLJ on the variable MHT30m is negative. From this we can conclude that the weaker the result in the jump in distance, the weaker will be the result in running 30 meters and vice versa, the higher the value of the jump in distance from the place, the better will be the result in running at 30 meters. The values of the other variables have an impact but not of statistical significance so we will not comment on them in detail.

Table 5. Linear regression of variables MHT80m (content model)

Content model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
						F Change	df1	df2	Sig. F Change
1	**.690[a]**	**.477**	.333	10.81598	.477	3.313	11	40	**.003**

(a) Predictors (constant) MS, MLT, MFSHJ, MHT, MRTSB, MSVM, MLTW, MPU, MLJ, MRTLB, MTSHJ

Table 6. Regression analysis of the variable MHT80m – Coefficients (a)

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	209.835	23.955		8.759	.000
	MLJ	**-.364**	**.115**	**-.536**	**-3.152**	**.003**
	MTJ	.033	.053	.120	.634	.530
	MFSHJ	-.013	.026	-.083	-.494	.624
	MHJP	-.349	.328	-.153	-1.066	.293
	MHT	.468	.331	.180	1.413	.165
	MLT	-.384	.957	-.059	-.402	.690
	MTLW	-.674	.476	-.215	-1.416	.164
	MRTLB	-.402	.591	-.109	-.681	.500
	MRTSB	.191	.595	.051	.320	.750
	MPU	-.196	.281	-.113	-.699	.488
	MS	.095	.113	.110	.838	.407

Table 5, which shows the regression analysis of the variable MHT80m, shows that there is a statistically significant correlation between the predictor system and the criterion variable (R =

0.690), at the level of Q = 0.003, ie the correlation explains the common variability with 47.7% (R = 0.477). The remaining 52.3% in its explanation can be attributed to some approximate characteristics and abilities of the respondents that were not covered in these surveys.
Individually, the largest impact from the predictor system on the criterion variable MHT80m has the variable MLJ (tab.6), with a value of -0.536 and a significance level of 0.003, where this value has a negative sign which means that the impact of the variable MLJ on the variable MHT30m is negative. From this we can conclude that the lower will be the value of jump in distance from place, the weaker the result will be in running 80 meters and vice versa. The values of the other variables have an impact but not of statistical significance so we will not comment on them in detail.

4. Discussion

In this study, the main purpose was to verify the impact of basic motor variables as criterion variables, in the criterion variables running in 30 meters (VR30m) and running in 80 meters (VR80m). From the examination of the results it was confirmed that the basic-motor variables have an impact with statistical significance on the criterion variables running at 30 and 80 meters. Radic and Simeonov (2009) set as a goal to prove the influence of some morphological and motor factors on the results of the sprint run in the 100 meter. The research was conducted on a sample of 125 second year students of the Faculty of Physical Education in Skopje. Based on the obtained results, it was proved that morphological characteristics have no statistically significant impact on the result of running in 100 meters, while motor skills have an impact with statistical significance on running in 100 meters, especially the factor F1 - factor of explosive force and speed of the lower extremities and factor F2 - factor of explosive force of the upper extremities. Przulj and other authors (2011) investigated the impact of functional skills on the results of sprint running in young athletes. The research was conducted in a sample of 30 entities – with 14 years old primary school students in the city of Niš. The results of the regression analysis showed significant statistical significance of the heart tests at rest, heart after exercise, the vital capacity of the lungs and the Margariev test in the criterion variables running at 300 and 400 meters. Zivkovic and Lazarevic (2011) investigated the impact of flexibility and explosive force on the results of sprint disciplines. The sample of entities was composed of 14-years old primary school students who, in addition to physical education classes, also attended additional classes from the athletics section. The results from this study confirmed that tests for assessing flexibility and explosive strength have an effective impact on improving results in sprint runs at 100 and 200 meters. Iseni (2013) has investigated the impact of motor skills on the success of sprint runs at 20 and 60 meters. The research was conducted in a sample of 40 male entities 10-14 years old at the “Teuta” Karate Club -Kumanovo. The author concluded that karate players who possess the most advanced degree of basic motor skills, defined as explosive force, speed, mobility, and flexibility, will achieve better results in sprint runs at 20 and 60 meters. Ciliik and the authors (2013) investigated the impact and correlation between tests for assessing speed and endurance at speed on running in young sprinters. The research was conducted on a sample of 7 athletes,

with 14 years old, members of an athletics club in Slovakia. The results showed that sprinters had better results in speed than medium and long distance runners, while lower results in speed endurance tests. The authors concluded that the jump test from the sitting position on the Miotest ergometer gives a significant impact on the development of speed and explosive force in sprinters. Stojanovic and the authors (2014) investigated the impact of basic and specific-motor skills on 60-meter running results. The research was conducted on a sample of 30 high school students in Paracin. The results of the regression analysis showed that there are statistically significant influences between the predictive variables in the criterion variable running at 60 meters, of which the most important influence showed the specific-motor variables: jump in distance with weights and running at 300 meters, while from the basic-motor variables: jump in distance from the place and running at 20 meters. Blazevic and the authors (2014) in a sample of 150 entities, of which 70 students and 80 students, aged 8 years, conducted research in order to verify the impact between some specific motor skills and kinetic parameters in the sprint run at 50 meters. The authors concluded that statistically significant impact on 50-meter running in students - boys show predictive variables triple jump, while the girls show the static jump from the tensiometric platform - counter movement jump (CMJ). Atanaskovic and Georgiev (2014) set out as the aim to prove the effect of myogenic weight training with explosive force on the explosive force in the lower extremities. The research was conducted in a sample of 36 student entities of 11-14 years old. The study had a longitudinal character and lasted 6 weeks. Based on the obtained results, the authors concluded that there are statistically significant differences between the initial and final measurements in the experimental group, at the level of 0.000 reliability, from which they concluded that myogenic training with loads/exercises has a positive impact on the development of explosive force lower extremities and is almost ideal especially for developing sports performance in sprinters. Malyadi and Indah (2019) applied training for the development of explosive force in sprint running in 100 meters, with 14 students aged 14 years old, and came to the conclusion that the program for the development of explosive force has a positive impact with statistical significance on the result of sprint running in 100 meters and the starting speed of the athletes. Iseni and other authors (2020) have investigated the impact of motor skills on the success of sprint runs at 30 and 80 meters. The research was conducted on a sample of 170 male students aged 14, students of primary schools in Kumanovo. The interpreted results conclude that between the predictive system and the variables running criteria at 30 and 80 meters, there is a correlation with statistically significant impact, where individual influence on the variables running criteria at 30 and 80 meters, have shown the variables taping with the foot on the wall, eights variables with bending and T-test variables, which means that the variables for the assessment of segmental speed and the assessment of agility, have a high impact on improving the results in sprint runs at 30 and 80 meters.

5. Conclusion

Based on the obtained results and performed analyzes, it can be concluded that:
The basic motor variables used as predictor variables in this paper have a statistically significant impact on the criterion variables running at 30 meters (MHT30m) and running at 80 meters (MHT80m). From these results we can conclude that students of this age who possess motor skills such as explosive force and speed, will achieve better results in sprint runs of 30 meters and 80 meters where are also expressed the explosive force and speed. From here we can recommend to all coaches and teachers involved in the development of athletics or more specifically sprinting as one of the most attractive disciplines in running, to practice these types of motor tests to develop explosive strength and speed in their curriculum of exercise, and also if it is possible at least twice a year to conduct measurements of motor abilities and other anthropological premises in order to see the current and final condition of students and to achieve the best results within school sports, and also in professional sports.

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