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DIFFERENCES IN RUNNING SPEED BETWEEN YOUNG SPRINTERS AND NON-ATHLETES AGED FROM 17 TO 18 YEARS

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Aims of this research were to quantify the variables of morphologic characteristics in sprinters and non-athletes and to determine differences in running speed between these subjects aged from 17 to 18 years. The sample comprised of 60 male subjects, with average body height 175,26±13,58 cm, body mass 67,41±8,69 and body mass index 21,00±2,30 (Mean±Std.Dev.). The sample of subjects was divided into experimental subsample (ES) which comprises 45 subjects-athletes, divided into three groups of 15 subjects each (EG1, EG2, EG3), and one group of non-athletes (N=15), i.e., control subsample (CS). Research variables were related to sprinters running speed on 15, 30 and 60m: 1) SPEED15; 2) SPEED30; 3) SPEED60, respectively. For the purpose of statistical analysis of the data obtained, SPSS version 11 had been used, and the results are presented by descriptive statistics. For the comparison EG1, EG2, EG3 and KS subjects in different subsamples, Analysis of Variance (ANOVA method) was used. Results point out that the future working program with sprinters should be focused for a section 30 to 60m (maintenance phase of maximum speed), since subjects of control subsample had achieved almost the same results as the subjects of experimental subsample in this segment. Hence, there is a need for the improvement of dynamic muscle strength by using special exercises with the load or by increament of the maximum muscle force (Fmm) if the deficit in muscle strength of athletes is less than 50%, or by working on the rise of muscle force. Acta Medica Medianae 2016;55(1):76-80.

Key words: sprint running speed, differences, sprinters, non-athletes

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Introduction

The explosive strength is the ability to carry out the most possible force in the unit of time (1). According to Branković & Bubanj (2), the explosive strength makes it possible for one athlete to accelerate his body against some object or partner, and its appearance depends on the percentage and structure of the motor units of the adequate muscle group. The explosive strength can be seen in a number of sports activities among which are athletes, i.e., there are different levels of showing of the motoric abilities in relation to different engagements in sports and in relation to the sex of athletes (3).The speed can be defined as the ability to carry out certain defined or non-defined starting action of simple structure for as short as possible time interval. As well as a complete motoric space, the speed is also a complex motric ability. According to Idrizović (4), longitudinal dimensionality of body is characterized for a very long time as more or less significant motoric characteristic to achieve high results in athletic sprint but not as a crucial factor. It could be said that there isn't any relevant research which points to the conclusion that top sprinters should have a high level of longitudinal measures as one of crucial characteristics (5, 6). The research of Šolaja (7, in Idrizović) points to the fact that anthropometric dimensions are not of great importance in the selection of young sprinters. Namely, in sprint, contrary to many athletic disciplines, it is noticed that different body types that are according to body height, body mass and strength completely opposite, can achieve top results.

Aims

Aims of this research were to quantify the variables of morphologic characteristics in sprinters and non-athletes and to determine differences in running speed between these subjects.

Methods

The sample of examinees was made of 60 athletes and non-athletes of male sex, divided into experimental (ES) and control sub-sample (CS).

The sample of athletes (ES) was made of 45 athletes divided into three groups (EG1, EG2, EG3) of athletes, junior age, from 17 to 18 years who train sprint running in athlete clubs „Prijedor" from Prijedor and „Banja Luka" from Banja Luka. CS consisted of 15 highschool students, non-athletes, who are not in the training process, i.e., they are not professionals, nor are they included in sports clubs recreationally. The examinees EG1 were made of the average body height 177,87±8,53 cm, body mass 65,20±11,04 kg and body mass index 20,00±2,88 (Mean±Std.Dev.). Examinees EG2 were of average body height 176,77±7,14 cm, body mass 67,97±8,56 kg and body mass index 21,20±1,86 (Mean±Std.Dev.). Examinees EG3 were of average body height 175,53±4,67 cm, body mass 67,12±7,50 kg and body mass index 21,27±1,91 (Mean±Std.Dev.). Examinees CS were of the average body height 170,87±24,51 cm, body mass 69,35±7,56 kgand body mass index 21,53±2,33 (Mean±Std.Dev.).

The space of sprint running speed is assessed in the following measure instruments:

- SPEED15 (the speed of sprint running at 15 m expressed in m/s),
- SPEED30 (the speed of sprint running at 30 m expressed in m/s),
- SPEED60 (the speed of sprint running at 60 m expressed in m/s).

The current transversal research is conducted at the city stadium, within the research of longitudinal character of 9 months of duration, which means initial-final measurements and realization of a certain training plan and program of special exercises with load for developmet of explosive muscle force and strength. The examinees determined the values of morphological characteristics and the assessment of sprint running, divided in groups according to stops. The speed of sprint running is measured with photocells placed in pairs at the 15, 30 and 60 m from the beginning of the running distance. Photocells were connected to a personal computer which in the hundredth parts of seconds determined time, i.e. by computer data processing, the speed of running of examinees. At command "On your marks" examinees took up the position of low start in the starting block. At command "Get set", they raised their hips and set their shoulders projected to starting lines, and finally, at the sound signal to start they started sprint. Before determining the speed of sprint running, 10-15min of warm-up of dynamic character was done. For statistical analysis and interpretation software SPSS version 11 was used. All the results of research were presented and interpreted by descriptive statistics–by tables. To compare examinees of different subsamples of examinees the variant analysis (method ANOVA) was used.

Results

Subsamples ES and CS		SPEED15 (m/s)	SPEED30 (m/s)	SPEED60 (m/s)
EG1 (N=15)	Mean	4,73	5,67	6,35
	Std. Dev.	0,28	0,34	0,33
	Minimum	4,12	4,98	5,77
	Maximum	5,14	6,24	6,87
EG2 (N=15)	Mean	5,08	6,19	6,94
	Std. Dev.	0,21	0,18	0,18
	Minimum	4,76	5,91	6,60
	Maximum	5,47	6,54	7,25
EG3 (N=15)	Mean	5,23	6,37	7,18
	Std. Dev.	0,28	0,34	0,35
	Minimum	4,55	5,47	6,36
	Maximum	5,66	6,88	7,71
CS (N=15)	Mean	4,60	5,67	6,92
	Std. Dev.	0,28	0,82	2,64
	Minimum	3,97	4,98	5,33
	Maximum	5,05	8,52	16,35
Total (N=60)	Mean	4,91	5,98	6,85
	Std. Dev.	0,36	0,57	1,35
	Minimum	3,97	4,98	5,33
	Maximum	5,66	8,52	16,35

Table 1. The space of speed of sprint running of examinees according to subsamples, i.e., groups

		SPEED15 (m/s)	SPEED30 (m/s)	SPEED60 (m/s)
EG1	sig	,975	,926	1,000
EG2	sig	,944	,867	,958
EG3	sig	,859	,516	,561
CS	sig	,758	,053	,153

Table 2. Kolmogorov Smirnov test for examining of normal distribution of date of the speed of sprint running .

Based on the results obtained of the average values per subsamples it could be seen that the highest average values in the studied variables of speed of sprint running are detected in subjects of the third group (EG3) of experimental subsample.

The average values of speed of sprint running are greater with athletes regarding non-athletes (except athletes of EG1 of experimental subsample and running in 60m).

According to the results of the test Kolmogorov Smirnov, it could be concluded that the values of measuring are distributed naturally in all subsample of examinees. It justified the application of the parameter procedure.

		Sum of Squares	df	Mean Square	F	Sig. #
SPEED15 (m/s)	Between Groups	3,834	3	1,278	18,400	,000
	Within Groups	3,889	56	,069		
	Total	7,723	59			
SPEED30 (m/s)	Between Groups	5,905	3	1,968	8,490	,000
	Within Groups	12,983	56	,232		
	Total	18,888	59			
SPEED60 (m/s)	Between Groups	5,535	3	1,845	1,019	,391
	Within Groups	101,429	56	1,811		
	Total	106,964	59			

Table 3. The differences in space of running speed between subsamples (method ANOVA).

Based on the coefficient F-relations and their significance (Sig), it can be concluded that at univariate level, there are significant differences in the level of sprinting speed between investigated subsamples on 15m and 30m: on 15 m (SPEED15 F=18,400; Sig=0.000), on 30 m (SPEED30 F=8.490, Sig=0.000. At the variable SPEED60 there are no statistically significant differences between groups.

In the space of speed of sprint running (table 4), at variables SPEED15, SPEED30, the control subsample (with the best average results) and experimental subsample EG1 on one hand, differentiate significantly from the groups EG2 and EG3 of the experimental subsample on the other side.

By analyzing the results of Post Hoc test at the variable SPEED15 statistically significant difference was determined between EG1 and EG2 (Sig=0.001), EG1 and EG3 (Sig=0.000), and EG2 KS (Sig=0.000) EG3 and KS (Sig=0.000).

At the variable SPEED30 the largest and statistically most significant differences were determined between EG1 and EG2 (Sig=0.004) EG1 and EG3 (Sig=0.000), and EG2 KS (Sig=0.004), and EG3 KS (Sig=0.000).

Discussion

According to Brown, Ferrigno, & Santana (8) the increase in the maximal speed of running is directly related to the muscle strength increase. Since the concentric muscle contractions are dominant in sprint, it is logical that during training with load, similar movements with the aim of developing neural and muscular parameters of athletes should be used. Still, there is not a complete agreement related to the adequate method of training with load which should improve the acceleration of sprint running (9). Saltin & Gollnick (10) pointed to the change of the size of the skeleton muscle fiber, i.e., its muscle ability related to different loads and strains. Fitts & Widrick (11) pointed that both fast and slow strained muscle fibers get hypertrophy during overloading. However, the mechanisms of structural muscle adaptation are not completely explained. Edman, Reggiani, Schiaffino, & Kronnie (12) point that the improvement in the muscle strength could be the consequence of isomorphic change of heavy myosin chain of proteins. Hence, the results of this research confirmed that morphological characteristics that were in favor of examinees of the experimental subsample, as well as the training process which they were subjected to, had influenced manifestation of significant differences in speed of sprint running comparing to the examinees of control subsample, i.e., non-athletes on sections of 15m and 30m. However, on section 30m to 60m statistically significant differences between athletes and non-athletes had not been established, nor between the athletes themselves.

Conclusion

After the statistical processing of data, it is concluded that the future schedule for sprinters, which could partially influence the speed of sprint running, as far as the current subsample of athletes is concerned, should be focused for a section 30 to 60m (maintenance phase of maximum speed), since subjects of control subsample had achieved

almost the same results as the subjects of experimental subsample in this segment. Hence, there is a need for the improvement of dynamic muscle strength by using special exercises with the load or by increament of the maximum muscle force (Fmm) if the deficit in muscle strength of athletes is less than 50%, or by working on the rise of muscle force

Dependent Variable	(I) subsample-NUM	(J) subsample-NUM	Sig. #
SPEED15 (m/s)	EG1	EG2	,001
		EG3	,000
		CS	,185
	EG2	EG1	,001
		EG3	,146
		CS	,000
	EG3	EG1	,000
		EG2	,146
		CS	,000
	CS	EG1	,185
		EG2	,000
		EG3	,000
SPEED30 (m/s)	EG1	EG2	,004
		EG3	,000
		CS	,984
	EG2	EG1	,004
		EG3	,307
		CS	,004
	EG3	EG1	,000
		EG2	,307
		CS	,000
	CS	EG1	,984
		EG2	,004
		EG3	,000
SPEED60 (m/s)	EG1	EG2	,001
		EG3	,000
		CS	,185
	EG2	EG1	,001
		EG3	,146
		CS	,000
	EG3	EG1	,000
		EG2	,146
		CS	,000
	CS	EG1	,185
		EG2	,000
		EG3	,000

Table 4. The differences in space of running speed among subsamples (methods POST HOC LSD).

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Stručni članak

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RAZLIKE U BRZINI SPRINTERSKOG TRČANjA IZMEĐU MLADIH SPRINTERA I NESPORTISTA STAROSTI OD 17 DO 18 GODINA

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Ciljevi aktuelnog istraživanja bili su da se kvantifikuju vrednosti morfoloških karakteristika i utvrde razlike u brzini sprinterskog trčanja između sprintera i nesportista starosti od 17 do 18 godina. Šezdeset zdravih ispitanika, muškog pola, starosti od 17 do 18 godina, telesne visine 175,26±13,58 cm, telesne mase 67,41±8,69 kg i indeksa telesne mase 21,00±2,30 (Mean±Std.Dev.), učestvovalo je u istraživanju. Uzorak ispitanika podeljen je u eksperimentalni subuzorak (ES) kojeg je sačinjavalo 45 sportista, dalje podeljenih u tri grupe od po 15 sportista svaka (EG1, EG2, EG3) i grupu od 15 nesportista (kontrolni subuzorak, KS). Varijable istraživanja bile su vezane za brzinu sprinterskog trčanja na 15, 30 i 60 m: 1) BRZ15; 2) BRZ30; 3) BRZ60. Za statističku analizu i interpretaciju korišćen je softver SPSS verzija 11. Svi rezultati istraživanja predstavljeni su i interpretirani deskriptivnom statistikom–tabelarno. Za poređenje ispitanika različitih subuzoraka ispitanika upotrebljena je analiza varijanse (metoda ANOVA). Rezultati ukazuju da bi budući program rada sa sprinterima trebalo da bude fokusiran na deonicu od 30 do 60 m (faza održavanja maksimalne brzine), s obzirom da su u tom segmentu ispitanici kontrolnog subuzorka postigli gotovo jednake rezultate kao i ispitanici eksperimentalnog subuzorka. Dakle, treba raditi na dinamičkoj snazi mišića primenom specijalnih vežbi sa opterećenjem ili povećanjem maksimalne sile mišića (Fmm) ukoliko je deficit snage mišića sportista manji od 50% ili raditi na porastu prirasta mišićne sile. Acta Medica Medianae 2016;55(1):76-80.

Ključne reči: *brzina sprinterskog trčanja, razlike, sprinteri, nesportisti*