DIFFERENCES BETWEEN STUDENTS IN ATHLETIC DISCIPLINES

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Abstract

The athletic racing, jumping and throwing disciplines exhibit motor skills which are most dominant in their structure and technical performance and of its participation depends the result of the specific disciplines. Usually it is a type of basic skills of speed, all forms of strength, coordination, flexibility... Motor abilities as a segment of the human space in man are often the subject of scientific research. Sometimes it comes to influence, relationships and often differences in the scope of specific motor skills. The results are all the more interesting for science if we take into account a chronological cross-section of the population speaking about it from different time point in order to examine possible differences capabilities, morphological dimensions, certain disciplines, etc... It can be broken down by school years, by gender, the results achieved, and so on. In this paper have been analyzed the motor abilities of population of students of the Faculty of Physical Education and Sport in Pale, in order to determine the differences in racing, jumping and throwing events. The study involved 97 students, three different generations, since 2009 to 2012. In analyzing the data, using the T-test, results that were obtained are statistically significant in explaining the differences between respondent's disciplines.

Key words: *students, athletic events, differences, t-test*

Introduction

Research at home and abroad indicate that the performance of a sport as well as track and field, is determined by a certain level and structure of a large number of skills, knowledge and attributes of athletes that can be measured and analyzed, and the means and methods for improving throughout their careers. Management of complex systems, such as the man in the training process is not possible without knowing, above all, for his anthropological characteristics which can be assumed high predisposition to the formation of competitive athletics results (Tončev et al., 1996).

That is why the purpose of the application of methods and forms of work that contribute most to increasing the effectiveness of training to the individual characteristics of the training practice, are increasingly present more and more in the studies of different age groups or differences in the different generations of the same population. What is important is that the factors of success in athletics specifying hierarchical, which means that in the series, at the beginning, are the most important factors or dimensions, and in the end less important (Tončev, 2001). In relation to this, the researchers who work in athletics sets the task of scientific methods to allocate hypothetical factors (skills and qualities) that determine the athlete's perspective and participation of each factor in achieving high scores in a particular athletic discipline. In all athletic disciplines large share of the anthropological space is occupied by the motor skills in the practice known as conditional and participate in the implementation of all kinds of structure movement (Milanović, 1991).

In their basis is contained the efficiency of organic systems, particularly nerve-muscle that is responsible for the intensity, duration and control of movement. These capabilities enable fast, durable, strong and coordinated execution of different motor tasks. Athletics as a sport monostructural cyclic and acyclic type presents a wide field of manifestation of motor skills. Also, if you take into account its utility within the process of growth and development of the young organism, when directed through the correct process of dosed exercise affects the modification of the subject in a positive direction, we get a true picture of the relevance of athletics in the sports hierarchy. Usually it is a carefully selected, planned and programmed process of exercise that can provide any positive transformation, regardless of the age of the respondents. Athletic disciplines through a permanent process of training and perfecting have a direct impact on the development of basic motor skills exhibiting a reversible process on relation motor ability-discipline-athlete (Pavlović, 2010). It is a known fact that a good athletic preparation enables achieving success in other sports, confirming previous statement of utilitarian athletic disciplines in manifestation in other sports. One of the characteristics of athletics is that by athletic movements we often assess motor skills in any kind of sport (Šnajder, 1997). From another point of view we have a situation where the participation and influence of motor abilities depend the results in athletic disciplines. It is interesting to research that seek to identify and examine the influence of relationships and athletic events and motor abilities of a particular population.

Often those are relations in specific athletic disciplines (Milanović, 1980; Markota et al., 2009), and we also have some research which analyzes the chronological age of participants and its impact on results success in athletic disciplines (Mihajlović 1996; Tončev & Mihajlović, 1999; Bresauler, 2002; Bresauler et al., 2006; Maleš et al., 2003). Analogously earlier in athletic practices were significant researches (Milanović, 1976), and more recently have intensified the research examining the relationship of motor abilities with the score efficiency for athletic disciplines (Stojanović & Radić, 2002; Pavlović, 2005; Stojiljković et al., 2006; Mihajlović & Tončev, 2008; Žuvela et al., 2009; Pavlović, 2010, El Falah, 2010; Stanković et al., 2010).

Given that some researchers (Bresauler, 2002; Bresauler, Delija & Mesarić, 2006) studied the differences in athletic events of the same population and chronological age and made a significant conclusions that support thinking that there are differences between generations within the same population in score performance of athletic disciplines. This research that was conducted on a population of students of the same age but of different generations aims to establish the potential of the existing differences in the result performance of athletic disciplines.

Methods

The sample of respondents
The population from which the sample of entities was extracted is consisting of third-year students of the Faculty of Physical Education and Sports in East Sarajevo, male, aged 20-21 years, who had passed a practical examination of athletic running, jumping and throwing. The research included students of three school years (2009/10, n = 34), (2010/11, n = 33), (2011/12, n = 30) for a total of 97 students.

A sample of measuring instruments
In the practical part of the exam students take norms in racing, jumping and throwing disciplines which are scored and as such form part of the assessment in this subject. The sample consisted of measuring instruments included: 1. Runs (200m, 400m and 800m); 2. Jumps (high jump-VIS; long jump-SUD); 3. Throws (shot put-KUG). All measurements of running were carried out in October, and jumping and throwing in the month of May (2009.-2012.), on Romania FC stadium and in the sports hall of Faculty of Physical Education and Sports under the rules of Athletics Federation of Bosnia and Herzegovina. At the time of testing all subjects were healthy without any injury that could adversely affect the final result of the measurement. In order to obtain relevant results based on which we will get answers, basic statistical parameters were applied, and in terms of determining the differences the analysis was carried out by using T-test for large independent samples. In Table 1 there are basic statistical parameters of athletic disciplines of the researched sample of students. For each variable were calculated relevant central and dispersion parameters. Inspecting the values of arithmetic means and standard deviations in all disciplines there is considerable homogeneity of results as a result of the selected sample of students. However, some differences do exist and, are generally related to the throwing events (shot put), where the sample of students in 2009/10 SD = 3.67, and track and field events (200, 400, 800), where the sample for 2010/2011 values ranging from 3.70 (M800m) to SD=6.30 for (M400m). A similar ratio of standard deviation is observed in the sample of students in the school year 2010/11 and 2011/12... In these disciplines, we have the greatest difference in terms of the distribution of results within a single generation, and also within the three generations of students.

Results and discussion

Table 1. Basic statistical parameters

	2009/10			2010/11			2011/12		
	Mean±SD	Min	Max	Mean±SD	Min	Max	Mean±SD	Min	Max
200m	27,70±4,70	25,13	36,00	27,54±3,30	26,57	31,14	28,11±4,30	26,00	33,02
400m	69,38±6,30	59,40	76,23	63,94±6,80	55,86	78,12	64,71±6,41	56,63	74,12
800m	2,45±3,70	2,16	2,57	2,58±4,11	2,31	3,01	2,30±3,70	2,21	3,00
SUD	4,60±2,75	4,20	5,75	4,55±3,12	4,25	5,90	4,50±3,43	4,00	5,65
VIS	1,60±1,15	1,55	1,75	1,57±1,34	1,50	1,70	1,55±1,56	1,50	1,85
KUG	9,14±3,67	8,00	13,50	8,65±1,41	8,00	11,50	8,30±1,43	7,50	11,00

Legend: Mean-arithmetic mean, Min-minimum score, maximum-maximum score, SD-standard deviation.

Table 2. Differences between students using the T-test

	2009/10 (n=34)			2010/11(n=33)			2011/12(n=30)			T-test
	Mean±SD	Min	Max	Mean±SD	Min	Max	Mean±SD	Min	Max	T
200m	27,70±4,70	25,13	36,00	27,54±3,30	26,57	31,14	28,11±4,30	26,00	33,02	1,73*
400m	69,38±6,30	59,40	76,23	63,94±6,80	55,86	78,12	64,71±6,41	56,63	74,12	2,55**
800m	2,45±3,70	2,16	2,57	2,58±4,11	2,31	3,01	2,31±3,70	2,21	3,00	2,97**
SUD	4,60±1,75	4,20	5,75	4,55±2,12	4,25	5,90	4,50±2,43	4,00	5,65	1,12**
VIS	1,60±1,15	1,55	1,75	1,57±1,34	1,50	1,70	1,55±1,56	1,50	1,85	1,98*
KUG	9,14±3,67	8,00	13,50	8,65±1,41	8,00	11,50	8,30±1,43	7,50	11,00	2,77**
*Sig (p<0.05); **Sig. (p<0.01)										

*Legend: Mean-arithmetic mean, Min-minimum score, maximum-maximum result, SD-standard deviation; tT test * (p <0.05), ** (p <0.01) - the level of significance*

To display any quantitative differences in athletic disciplines of students, basic statistical measures were shown that require analysis by t-test (Mean, SD), the numerical value of the t-test with a significance level of 0.05 and 0.01. By applying the T-test were obtained statistically significant differences in all six athletic events (Table 2). If we generalize the univariate differences in athletic disciplines among students, it can be concluded that all the disciplines achieved statistically significant differences on both levels of significance (p <0.05, p <0.01). Of the six disciplines in the two disciplines was a significant difference at the level of p <0.05 (run 200m, high jump), while the remaining four (400m, 800m, long jump, shot put), there was a significant difference of p <0.01. In percentage terms this amounts to about 67% at the 0.01 level and 33% at the 0.05 level what is very high and a significant percentage ratio. The existing differences between subjects are the result of selection for enrolment of students to college, their anthropological characteristics, first of all, morphological and motor dimensions, former training of specific sport, the level of acquisition techniques for a particular athletic discipline and the mere motivation at the time of testing. The smallest deviations in the results are in the long jump (SUD) and high jump (VIS) where it can be concluded that the differences between all three samples of students are somewhat less but also significant. The likelihood of such relationships can be explained almost identical acquisition of the technique of performance involved in these disciplines, with of course the influence of motor abilities and morphological dimensions. We should bear in mind the fact that a number of respondents is actively engaged in certain sports, as opposed to those who practice less so that are also limiting factors for the eventual different distribution of variables, normally in a positive way, depending on the type of motor tasks. Significant differences between the good and weaker performance in athletic events can be attributed to the fact that in this region played a crucial role factors, above all, doing some kind of physical activity, sports activity in the home club, on the basis which can be increased the result success of the performance of tests, then pre-motor experience, mature CNS, a number of exogenous and endogenous factors. Although it is the same age, the same disciplines, the changes are evident. Similar results were obtained by (Bresauler, 2002; Bresauler et al., 2006) who studied the differences in athletic events of the same population and chronological age and took significant findings that support thinking at that there are differences between generations within the same population in result success of athletic disciplines. The largest contribution to the differences between the generations can be attributed to the anthropological status of students, their morphological dimensions and particularly motor skills, muscle fibre structure, mobility of cardio vascular system and functions of respiratory system. The influence of motor abilities on the implementation of athletic events has been confirmed in previous studies (Milanović, 1976;

Stojanović & Radić, 2002; Pavlović, 2008; Bošnjak et al., 2009; Stanković et al., 2010). They all studied the relationship of motor abilities and athletic disciplines. Sometimes it referred to the racing and sometimes the jumping and throwing events. Basically these survey results confirmed the dominance of the central mechanisms of energy and central regulation of movement, which is closely related to the maturation of central nervous system, the structure of the muscle fibres, possible types of training process as well as possible performances in the mere muscular structure (Tesch & Karlsson, 1985; Bishop et al., 1999).
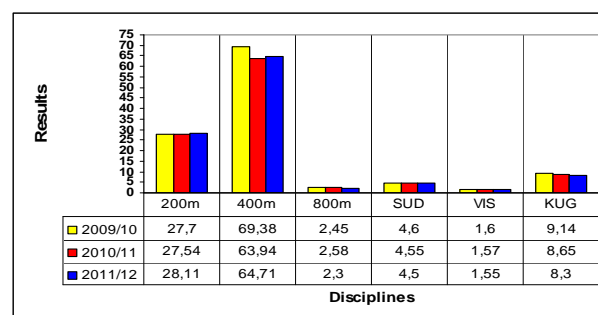

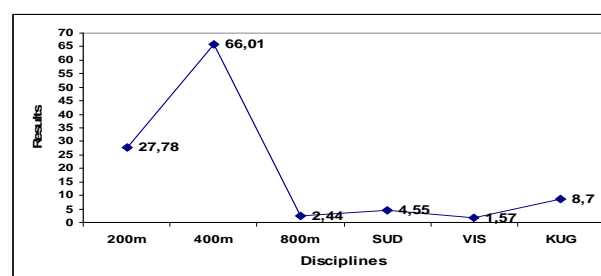**Figure 1.** Mean values of the results of the disciplines by the school years

Figure 2. Mean values of the results in student's athletic disciplines (2009-2012.)

By the analysis of our sample were observed slight differences between respondents in the 200m running variables. This is a typical discipline of anaerobic character, (glycolytic mechanism) where glycogen dissolute to lactic acid and by training there cannot be much impact on its improvement (Greenhaff & Timmons, 1998; Créer et al., 2004). Average results achieved in middle 200m event of all three generations of students are 27,78sec. in the range of 27,54 sec. generation for 2010/11. to 28.11 sec. for generation of students 2011/12. Identical results were achieved also in the discipline of running 800m, with a total average (Mean=66,01sec), with achieved significant differences at level p<0.01, where generation of students 2010/11. achieved the best average score, Mean=63.94sec (Figure 1, 2). Based on the results it can be concluded that the generation of students 2010/11. year had a better developed motor skills, speed type, especially functional capabilities demonstrated by running 400m, a discipline that is typical anaerobic-lactate type, submaximal intensity with a duration of 20 sec. to 2 min. Something different attitude is evident in the discipline of running 800m, where it was achieved significant difference at p <0.01.

The mean value of results of the students in this discipline was (Mean=2,44min). The lowest average result recorded a generation of 2010/11. (Mean=2,58min.), And the best result achieved the generation of students 2011/12. (Mean=2,31min.). Running 800m is a typical anaerobic-aerobic type discipline because activity generally exceeds 2 minutes and requires from body well-functioning of cardio vascular and respiratory system, where oxygen should be transferred to the active muscles and delay in the long term accumulation of lactic acid (Daniels et al., 1978; Galy et al., 2003). Similar results in their study were obtained by the authors who have studied the impact of specific athletic movement skills on the results of running 800m in students studying kinesiology (Markota et al., 2009). One should also take into account the assumption that an important influence played a reduced body weight of subjects, which is mostly disturbing factor in these athletic events as well as the assumption that the respondents belonged to the type of leptosome constitution. These states can be justified in the shot put event, where the generation of students 2011/12 had the lowest average scores (Mean=8,30m), unlike the generation of 2009/10 where the average of the results achieved was (Mean=9,14m) and max. result even 13,50m. It can be concluded that this generation has, on average, higher body weight and skin folds. Joint mean value of students achieved results in the shot put was (Mean=8,70m). Also on the results performance in the shot put in addition to morphological characteristics (Kyriazis et al,. 2010; Tešanović et al., 2010) also takes power, with all its forms of expression and the speed of a technique (Stojanović & Radić, 2003; Kyriazis et al., 2009; Pavlović, 2010). In some studies as an important factor for success in the shot put is the level of activation of certain muscle groups, primarily the feet. quadriceps vastus lateralis m. gastrocnemius internus, m. pectoralis major and m. triceps brachii (Tesch & Karlsson, 1985; Terzis et al., 2007), as well as casting speed, angular displacement and momentum during ejection (Mayhew et al.,1993; Harasin, Milanović & Čoh, 2010). In our case, although it is not top throwers, but the students, the said factors have also had an impact on the results success. When it comes to jumping, the more technical events (long jump and high jump) there were also recorded significant differences, where the mean value of the results of all three student generations amounted 1,57m high jump (p<0.05), respectively 4,55m in the long jump (p<0.01). Analyzed by age, this reveals the best average performance of generation 2009/10.year in both disciplines, where the long jump event was achieved average score of 4,60 meters, with a significant difference between the generations, and in the discipline high jump 1,60 meters. Based on these results, it can be assumed and concluded that the generation of students 2009/10., in addition to the shot put also achieved better results in the jumping disciplines. This generation, in addition to better motor skills had better technical performance and the level of mastery in performing of jumping disciplines. This is manifested particularly in the high jump, where the score depends on the success of the well-executed jump technique, which is required the synchronized effect of the kinetic chain of the body parts to pass through a given height of the bar (Pavlović, 2010). Differences obtained between the three generations of students in athletic disciplines are evident and significant at level p<0.01 and p<0.05. Although this are the students of physical education and sport, good homogeneous groups and closely selected for this university, the present differences are an indication of different anthropological dimensions of individual students. Although they are not included in the study of morphological dimension, the assumption is that the greatest impact achieved height and weight of respondents in a positive or negative context. From motor capabilities power and speed are those who have contributed to differences among students, and as a result of physiological parameters (type and structure of the muscle fibres, mobility and function of the respiratory and cardiovascular systems), especially in racing sprint events.

Conclusion

The research was conducted on a sample of 97 students of physical education and sport, ages 21-22 years, three generations (2009-2012), with the aim of determining the difference in his score results in athletic disciplines: Running 200m, 400m, 800m, Shot put (KUG), High jump (VIS), Long jump (SUD). By applying the T-test, the results that were obtained are statistically significant in explaining the differences between respondent's disciplines. Of the six disciplines, in the two there was a significant difference at the level of p <0.05 (run 200m, high jump), while in the other four disciplines (running 400m, 800m, long jump, shot put), the significant difference was achieved on the level p <0.01. In percentage terms this amounts to about 67% at the 0.01 level and 33% at the 0.05 level which is very high and a significant percentage ratio. Analyzing school years by generations of students, as the most successful in jumping and throwing events is the generation of 2009/10 (Long Jump=4,60m, high jump =1,60m and Shot Put =9,14). In the second position is the generation of 2010/11, as the most successful in the disciplines short and long sprints (200m=27,54sec. 400m=63,94sec.).

As the third generation and the weakest generation in achieved results is the generation of 2011/12 that were, on average, the best in the discipline of running 800m=2,31sec. The existing differences between generations can be attributed to various motor and functional abilities, certain endogenous factors and the degree of student motivation at the time of testing. This research can serve as a basis for further research of this kind in the same or a different population of respondents in order to monitor the development, comparing and determining the differences of states of certain population in athletic disciplines.

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RAZLIKE IZMEĐU STUDENATA U ATLETSKIM DISCIPLINAMA

Sažetak

U atletskim trkačkim, skakačkim i bacačkim disciplinama iskazuju se motoričke sposobnosti koje su najčešće dominantne u njihovoj strukturi tehničkog izvođenja a od čijeg učešća zavisi i rezultat u konkretnoj disiciplini. Obično se radi o bazičnim sposobnostima tipa brzine, svih oblika snage, koordinacije, fleksibilnosti,... Motoričke sposobnosti kao segment antropološkog prostora čovjeka su vrlo često predmet znanstvenih istraživanja. Nekada se radi o utjecaju, relacijama a često i razlikama u okviru određene motoričke sposobnosti. Rezultati su utoliko interesantniji za znanost ako se uzme u obzir jedan kronološki presjek populacije promatrano s različitog vremenskog aspekta u cilju provjere eventualnih razlika sposobnosti, morfoloških dimenzija, određenih disciplina, itd. To može biti presjek po školskim godinama, po spolu, po postignutom rezultatu, itd. U radu je analiziran prostor motoričkih sposobnosti populacije studenata Fakulteta fizičkog vaspitanja i sporta s Pala, s ciljem utvrđivanja razlika u trkačkim, skakačkim i bacačkim disciplinama. Istraživanjem je obuhvaćeno 97 studenata, tri različite generacije, od 2009. do 2012. godine. U analizi podataka, primjenom T-testa dobiveni su rezultati koji statistički značajno objašnjavaju razlike u disciplinama među ispitanicima.

Ključne riječi*: studenti, atletske discipline, razlike, t-test.*