

ESTABLISHMENT OF THE LEVEL OF PHYSICAL DEVELOPMENT AND FLEXIBILITY AMONG STUDENTS FROM DIFFERENT SPORT GAMES - BASKETBALL AND FOOTBALL

Original scientific paper

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Abstract

The purpose of the research is to establish the level of physical development and flexibility among students based on the comparison between students practicing basketball and football. The study involved 82 male students, 31 of whom practicing basketball and 51, football. The following tests were applied: Toe Touch Test, Sit and Reach test, and V-Sit test with a straddle of 30cm. The average age of the students is $20,34 \pm 1,64$ years; Their height is $180.54 \text{ cm} \pm 7.34 \text{ cm}$, their weight is $74.90 \text{ kg} \pm 10.81 \text{ kg}$. The average Toe Touch Test scores are $7.22 \pm 7.42 \text{ cm}$, $V = 55.06\%$; the Sit and Reach test average score was $9.48 \pm 8.30 \text{ cm}$, $V = 68.89\%$; and the V-Sit test showed average score of $8.46 \pm 8.03 \text{ cm}$, $V = 64.55\%$. Despite the differences in the mean values, the comparative analysis shows that there are no statistically significant differences between the tests.

Keywords: *physical development, flexibility, students, basketball, football*

INTRODUCTION

The sport preparation of students is a complex process in which sport and academic training are an integral part of the overall development of the students' personality. The components of sport training are the development of the physical, technical, tactical and psychological qualities of the athletes, regardless of their sport level.

The physical load of exercises during sports activities must be consistent with the health status of the students to fulfil the main purpose of the sport activity at the University, namely, to preserve and strengthen the health of young people. Some physical exercises are not compatible with certain diseases; therefore the sport pedagogue must be familiar with the health status of the students. Unfortunately, it should be noted that in recent years students form basketball and football groups at Sofia University, show symptoms of breathing problems and low immune system which results in getting ill with every flu epidemic and suffering systematically from colds. Moreover, student get injured performing simple movements and the recovery process is prolonged. And despite the great desire to exercise, their weakened health deprives them of participation in the sport process in one of the most appropriate ages for sport and physical activity.

Physical development reflects a set of morphological, functional and psychic indicators that characterize the level and dynamics of body growth and its ability to adapt to changes in living conditions (Mutafhova, Pesheva, Georgieva & Hristov (Мутафова, Пешева, Георгиева & Христов), 2011).

According to (Воуанов (Боянов), 1988), physical development and physical capacity are important complex indicators, interrelated and mutually conditioned, which characterize to a great extent the health status and the level of working capacity of men. The author (Hare (Харе), 1971), states that the physical training of the youth is determined mainly by the development of physical abilities, especially of endurance, strength, speed and mobility. These abilities he calls "condition" and they are crucial for achieving high sports results within athletes. According to (Rachev (Рачев), 1991), the physical capacity gives an idea of the overall working capacity of the human body based on the complex development of the physical qualities and the necessary skills and habits for their manifestation. It also depends on physical development, gender, age, and hereditary factors. The author (Zaciorski (Зациорски), 1982), underlines the difference in the definitions of "development of physical qualities"

and "education of physical qualities". The development of physical qualities is the process of their change in the course of human life. The education of physical qualities is the pedagogical process of management and impact over the development, to stimulate change in the required direction. Another author (Belchev (Белчев), 2000), defines the purpose of physical education in Universities as: "to assist in the preparation of harmoniously developed and highly qualified specialists...". The basis for the presentation of this definition is the level of physical fitness and physical development of the students. According to (Bozhkova (Божкова), 2009), the objectives and tasks of physical education as a pedagogical process in higher education institutions are solved using a wide range of resources. Physical exercises are the main specific means of physical education. They improve the physical development, the level of physical qualities and efficiency, and the motor and coordination skills of students through training and improvement of the motor habits of the technique of the studied sport. Along with the many management problems accompanying physical education and sport in higher education institutions, the problem of enhancing the effectiveness of the learning process becomes more and more relevant (Colova & Ivanov (Цолова & Иванов), 2013; Lazarova (Лазарова), 2014). In this regard, numerous studies have been carried out on the various aspects of the educational process of physical education and sport in Universities.

That is why we have focused our attention on the physical development of students who attend basketball and football sport activities.

At present, there is growing interest in developing flexibility. According to (Bogdanov & Bogdanova (Богданов & Богданова), 2004), flexibility is one of the most attractive and necessary physical qualities for people. For this reason, flexibility exercises take a special place among physical exercises. The flexible body is characterized by freedom and ease of movement, good coordination and beautiful figure. Insufficient development of flexibility is characterized by stiff and tangled movements and poor posture of the body.

In the theory of sport training, flexibility is defined as the ability of the individual to perform movements with great amplitude, depending on the nature of the motor activity (Zheliakzov & Dasheva (Желязков & Дашева), 2000, 2006).

In sports games, flexibility is manifested in combination with other physical qualities and aims at the variability in the implemen-

tation of the technical elements. The purposeful practice of flexibility exercises contributes to improving the speed performance (Żukowska, Krygowski, Szark-Eckardt & Zajac, 2016). Along with that, improving flexibility can protect athletes from injuries.

The poor development of flexibility leads to a number of health problems. For example, reduced flexibility of the Achilles tendon is a common clinical finding in adolescents (Brodersen, Pedersen & Reimers, 1994; Milne & Mierau, 1979). Other researchers (Harreby, Nygaard, Jessen, Larsen & Storr-Paulsen, 1999), observed a reduced flexibility in calves in the group of 15-17 year-old-boys. The reduced flexibility of the Achilles tendon is associated with increased back pain, (Sjolie, 2004; Jozwiak, Pietrzak & Tobjasz, 1997; Feldman, Shrier, Rossignol & Abenhaim, 2001; Mierau, Cassidy & Young-Hing, 1989, herniated disk (Takata K, Takahashy K., 1994), decreased spine folding ability (Gajdosik, Albert & Mitman, 1994) and an increased risk of muscle trauma (Witvrouw, Daneels, Asselman, D'Have & Cambier, 2003).

The literature research conducted has increased our interest in the importance of physical development and flexibility of students as factors that influence both the successful mastering of the technical elements of games and the preservation of the health of students.

The purpose of the article is to establish the degree of physical development and flexibility among students based on the comparison between students practicing basketball and football.

METHODOLOGY

The present study was conducted during sports activities of the 2015/2016 academic year, in May 2016.

The subject of the study is the individual indicators of physical development and flexibility of students attending basketball and football sport games at Sofia University "St. Kliment Ohridski", Bulgaria.

The object of study is the physical development and flexibility of students from Sofia University.

The sample of the study is represented by 82 males who are studying at the Sofia University "St. Kliment Ohridski", Bulgaria. The students are not active athletes and they do not participate in competitions. But they choose to attend sport classes once a week for 90 minutes. In one academic year, students attend 60 hours of practical sport. For the aim of the study, a field testing was conducted. The participants included 31 students from educational groups specialized in basketball and 51, in football. The students participated in the study voluntarily and are aware of its purpose.

To determine the physical development of the students, the anthropometric indicators height and weight were measured and the Body Mass Index (BMI) was calculated with this data. Exactly these indicators have been chosen because they are the keys to identifying physical development, their measuring can be done at the field and it is time efficient, and no specialized expensive equipment is required.

- Height is the most stable indicator characterizing the state of the plastic processes in the body and, to a certain extent, the level of its maturity.

- Weight, unlike height, is a very variable indicator that responds relatively quickly and changes under the influence of different exogenous and endogenous causes. The weight reflects the degree of development of the bone and muscular system, internal organs and subcutaneous fat cells.

- Body Mass Index (BMI) allows us to determine the percentage amount of fat in the body and to place the resulting values within a healthy scale. The results of this index are not accurate for people with significant muscle mass, pregnant women and children.

To establish the flexibility, we used a three-test combination to determine the degree of flexibility in the spine, hip, and knee joints. The following tests were applied: Toe Touch Test (TTT or Test_1, Sit and Reach Test (SRT or Test_2), and V-Sit test with 30cm straddle (V-Sit test, VST or Test_3).

For the study, the following research methods were applied: survey, anthropometry measures, sports-pedagogical testing, index method and expert assessment.

The results of the study were mathematically processed through variation and comparative analysis (Student's t-test for independent samples).

RESULTS AND DISCUSSION

The variation analysis conducted allowed us to reveal the average level and the variability of the indexes of physical development and flexibility of the researched students. The results of the Analysis of variance are presented in Table 1.

The students were born between 1990 and 1996. Their average age was 20.34 ± 1.64 . Their mean height was 180.54 ± 7.34 cm, with an average weight of 74.90 ± 10.81 kg. There is no significant difference between the group of basketball players and football players, but the high average height of students in these groups is impressive. There is a large difference between the minimum (160 cm and 168 cm) and the maximum height in both groups (196 cm and 197 cm).

The average body mass index (BMI) of basketball players has a value of 23.60, and of football players, it is 22.52. These results determine that the weight of the students lays within the normal scale without a risk of obesity.

The average flexibility indicators measured with the three different tests are shown in Fig. 1. It can be noticed that the average values of flexibility of the football players are greater than those of the basketball players in all three measurements. The difference is the greatest in the Sit and Reach test (SRT), where football players score $M=11.71$ cm and basketball players score $M=5.81$ cm for the players (difference of 5.9 cm). In the case of V-Sit test, (VST), $M=9.82$ cm for football players, and $M=6.23$ cm for basketball players (3.59 cm difference). When measured with a Toe Touch Test (TTT), the values are $M=8.53$ cm for the football players and $M=5.06$ cm for the basketball players (difference of 3.47 cm).

The flexibility of students is important to improve their technical abilities and prevent injuries. Therefore, specialized exercises which develop flexibility must be provided at the beginning and at the end of the training session. This applies to a greater extent to students practicing basketball, where the flexibility results are lower. There is no reason to assume that the height of basketball players is the cause for the low scores because the research data shows that the average height of the basketball players (180.61 ± 7.91) and the football players (180.49 ± 7.05 cm) is identical.

The apparent dispersion of physical development indicators shows that in terms of height and weight, the students are well above the boundaries of relative homogeneity ($V > 30\%$), which means that the groups are highly heterogeneous (Fig. 2.). Concerning body mass, there is a uniformity in both groups – basketball ($V=10.53\%$) and football ($V=6.15\%$), which means the stability of this indicator.

The dispersion of the indicators of flexibility is presented in Fig. 3. It can be seen that the greatest dispersion ($V=82.11\%$) within the group of basketball students is observed when measuring the flexibility with the V-Sit test (VST). This is a statistical confirmation of the opinion expressed by the students at the time of the measurement that this method of measuring flexibility is the most difficult and inconvenient to be executed. As a percentage ratio ($V=74.16\%$), within

Table 1. Variation data processing results

Sport	Indicators	n	Xmin	Xmax	R	Mean	SD	V	As	Ex
Basketball	Age	31	18	26	8	20,90	1,97	3,89	0,78	0,28
	Height (cm)	31	160	196	36	180,61	7,91	62,65	-0,46	0,81
	Weight (kg)	31	60	109	49	77,10	11,87	140,89	0,84	1,54
	BMI (index)	31	17	34	17	23,60	3,24	10,53	0,84	2,87
	TT Test_1 (cm)	31	-8	20	28	5,06	7,06	49,8	-0,35	0,05
	SR Test_2 (cm)	31	-10	25	35	5,81	8,61	74,16	0,09	-0,11
	V-S Test_3 (cm)	31	-10	28	38	6,23	9,06	82,11	0,39	0,56
Football	Age	51	18	23	5	20	1,31	1,72	0,78	-0,52
	Height (cm)	51	168	197	29	180,49	7,05	49,69	0,27	-0,38
	Weight (kg)	51	54	105	51	73,57	10	99,97	0,61	0,7
	BMI (index)	51	19	30	11	22,52	2,48	6,15	0,71	0,46
	TT Test_1 (cm)	51	-22	23	45	8,53	7,1	54,69	-1,17	4,69
	SR Test_2 (cm)	51	-10	24	34	11,71	7,33	53,69	-0,37	0,24
	V-S Test_3 (cm)	51	-10	22	32	9,82	7,09	50,31	-0,31	-0,19
Total	Age	82	18	26	8	20,34	1,64	2,70	1,04	,98
	Height (cm)	82	160	197	37	180,54	7,34	53,88	-,06	,11
	Weight (kg)	82	54	109	55	74,90	10,81	116,85	,88	1,32
	BMI (index)	82	17	34	17	22,92	2,82	7,97	,90	2,22
	TT Test_1 (cm)	82	-22	23	45	7,22	7,42	55,06	-,78	2,29
	SR Test_2 (cm)	82	-10	25	35	9,48	8,30	68,89	-,28	-,16
	V-S Test_3 (cm)	82	-10	28	38	8,46	8,03	64,55	-,09	,02

Table 2. Comparative analysis of the average levels of flexibility in the three tests

Indicator	Basketball			Football			Difference	Statistical significance of differences	
	n ₁	Mean ₁	S ₁	n ₂	Mean ₂	S ₂		d	temp
TT Test_1 (cm)	31	5,06	7,057	51	8,53	7,396	3,47	-2,09	0,04
SR Test_2 (cm)	31	5,81	8,612	51	11,71	7,327	5,90	-3,31	0,01
V-S Test_3 (cm)	31	6,23	9,062	51	9,82	7,093	3,59	-2,00	0,05

Note: The critical value of the t-test of Student with $k=n1+n2-2=80$ and $a=0.05$ is equal to 1.98

the basketball players, the second-greatest dispersion is the one measured with the Sit and Reach test (SRT) and the lowest ($V=49.80\%$) with the Toe Touch Test (TTT). Within football players, the greatest dispersion is observed in the Toe Touch Test (TTT), where the value is $V=54.69\%$, follows the dispersion of the Sit and Reach test (SRT) where the value is $V=53.69\%$ and finally the V-Sit test (VST) with

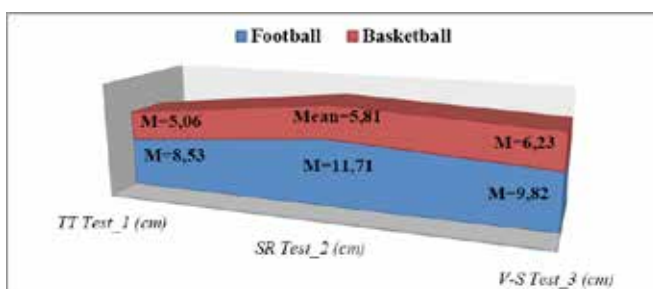


Figure 1.: Mean values for flexibility measured with three different tests

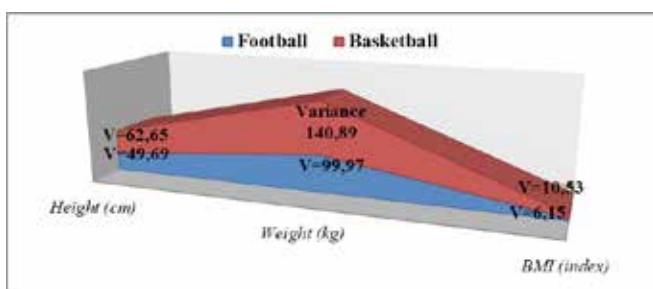


Figure 2. Distraction of the signs of physical development

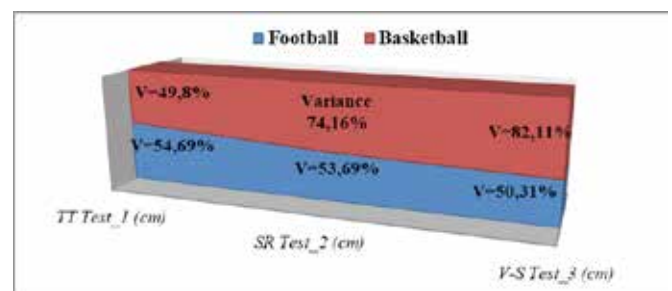


Figure 3. Distraction of the signs of flexibility

$V=50.31\%$. It is clear that for all three measurement methods in both sports groups, the values are greater than 10-12%, which is the maximum value for homogeneity indicated by the statistical rules. High values of the coefficients of variation indicate that the indicator is unstable and the groups are heterogeneous.

The comparative analysis of the average levels of flexibility was conducted using the Student's t-test for independent samples. The results show that in all three test methods, by which the students' flexibility was measured, there are statistically significant differences between basketball players and football players (Table 2). The better average results are performed by football players.

The difference of 3.47 cm is significant because the level of significance reached is less than 0.05 ($a=0.04$) of the first indicator. The second indicator also has a significant difference of 5.90 cm, defined significant because ($a=0.01$). For the third indicator, an equation of $a=0.05$ is observed, but this determines the difference of 3.59 cm, also statistically significant.

CONCLUSIONS

A physically trained and physically well-developed student is energetic, vibrant, motivated, and keen to execute their everyday duties at the University. The student has a positive energy towards the work done and the achievement of the best possible results. Physical development and physical fitness of students during their studies have a huge impact on the development of their identity and the quality of their lives in the future.

Based on the results of the analysis of variance, it is evident that the studied sample is the same in terms of age ($M=1.64$).

The analysis of variance of the physical development of the height and weight of the students found that, within the groups, these indicators are highly heterogeneous. There is a big difference between the minimum and maximum height in both groups ($X_{min} = 160$ cm and $X_{max} = 196$ cm for basketball players and $X_{min} = 168$ cm and $X_{max} = 197$ cm for football players). In terms of weight, the differences are also large ($X_{min} = 60$ kg and $X_{max} = 109$ kg for basketball players and $X_{min} = 54$ kg and $X_{max} = 105$ kg for football players).

According to the body mass index (BMI), students have a normal weight and are in the healthy range, with no risk of obesity relative to their gender and age (the average body mass index - BMI of basketball players is 23.60 and the one of football players is 22.52).

These data are indicative of the different levels of physical preparation of basketball and football students. The establishment of football and basketball training groups with the presence of such a great difference in the physical qualities of students generally makes the learning process extremely difficult. The planning of specific actions by sports pedagogues at the Universities for improvement of the homogeneity of sports groups is a top priority. It would lead to an ever-increasing quality of training and a rise in the positive impact of sport in the life of students during their academic career.

Regarding the results of the flexibility study, there are no statistically significant differences in the values obtained between the three tests. The average flexibility values of football players are higher than those of basketball players in all three measurements. This difference is the greatest in the Sit and Reach Test (SRT), where football players score $M = 11.71$ cm and basketball players score $M = 5.81$ cm (difference of 5.9 cm).

From the scattering of the flexibility results, it can be seen that in all three indicators in both sports groups the values of the coefficients of variation are high and indicate that the indicator is unstable and this confirms that the groups are heterogeneous. The results obtained show that the average values of the three tests used to measure the flexibility in the study were comparatively close. The three tests can be used seamlessly, depending on the available flexibility measurement tools, which would help to optimize the learning process and the purposeful impact of exercises in developing both flexibility and the other physical qualities.

The research of physical development and flexibility will contribute both to the successful mastery of the technical elements of the sports games, basketball and football, as well as to the preservation of the health of the students who practice these sports.

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