PHYSICAL EDUCATION AND SPORT AND ITS HELP IN THE PREVENTING MEDICINE. MONITORING OF STUDENTS' PHYSICAL EFFICIENCY AS A HEALTH PROMOTION

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- health promotion,
- cardiorespiratory fitness,
- physical education.

Abstract:
The aim of the study was to establish the state of physical efficiency of the non-athlete students as a part of health promoting. To determine the conditions of the cardio-respiratory system of the students and the changes in it we used the standardized 20 m shuttle run test. The study was carried out among 415 non-athlete Bulgarian students (233 women and 192 men from UFT-Plovdiv, Bulgaria) with 758 observations and the results were compared with the results of 4355 Polish, Slovakian and Romanian students. Bulgaria is the country with the lowest level of physical efficiency and the highest burden of cardiovascular diseases (CVD). On the basis of good practices and achievements of the Polish and Slovak scientists and pedagogues www.studentfit.eu, a national Bulgarian strategy to reduce the increasing hypodynamia has to be worked out, and it is also desirable that team resources of all state authorities be combined for achieving the health promotion. It is of great importance that more attention be paid on the physical prophylactic of each age group of the populations so that a National program for prevention of chronograph non communicable diseases (2013-2020 year) be worked out by the Ministry of Health Protection, the World Health Organization, the Ministry of Education, Youth and Science, and the Ministry of Physical Education and Sport in order to achieve an increasing quality of life and health prevention.

INTRODUCTION

It is well-known that physical activities enable development and maintenance of the physical capability of the human body and its preparation for systematic sports training and healthy way of living. Here are some of the objectives in the cultural-and-educational area of *Physical Education and Sports.*

The issue of physical efficiency with a view to overall, complex perfection of physical and motor development of the contemporary human-being is current even today, as its study has a scientific and practical importance leading to health promotion through life.

In relation to this a program *Keep Fit*, coordinated by the Chief Sanitary Inspectorate is completed in Poland. This program is focused on children and young adults as well as their parents (www.trzymajforme.pl) [7]. At the moment a project *Activity for the Whole Life – Polish – Slovakian Physical Education and Students` Health Promotion Platform*, which is about to identify and modify (educational action) selected risk factors of ischemic heart

disease, such as low level of physical activity and cardio-respiratory resistance, irrational nourishing, overweight, abdominal obesity, tobacco smoking as well as activities related to health education is being carried out. The Health Platform is elaborating to be a helpful tool in shaping health efficiency of youth, and particularly the morphologic and cardio-respiratory (www.studentfit.eu) efficiency so as to be connected to the high quality of life [6, 7].

The period of university study is the last stage in which cardio-vascular disease prevention can be carried out through health education focused on development, maintenance and physical monitoring [6]. Unfortunately, there is no equal system of measures for evaluating the physical fitness of the students in the Republic of Bulgaria. Following their rights of autonomy, higher schools (HS) decide on how they interpret legal regulations, as they autonomously determine the need of a control and assessment system. It has been proved that the efficacy of the teacher's educational work is directly dependent on the control, check-up and assessment of the results of his/her work. A preliminary analysis of the psycho-physical condition of trainees ensures that the educational process in Physical education is built-up in conformity with the didactical principles, and applying the appropriate physiological load, functional and structural refinement in line with the students' capacity is to be achieved. At the same time the monitoring of physical condition would be part of health promotion of cardiovascular diseases.

The aim of the study was to establish the state of physical efficiency of the non-athlete students as a part of health promoting.

To achieve this objective, we had to fulfill some of the following basic tasks**:**

- Assessment and analysis to register results of the cardio-respiratory fitness of the students-non-athletes.
- Compare the gathered data of Bulgarian students with the similar results taken from students from the former eastern block - Poland, Slovakia, Romania.

MATERIALS AND METHODS

To determine the conditions of the cardio-respiratory system of the students and the changes in it we used the standardized 20 m shuttle run test, which has been described, ranked, and applied in former publications [2, 4, 5, 8].

The study was lead in the beginning (incoming level) and the end (outgoing level) of each academic year, within common pedagogic experiments in the University of Food Technologies-Plovdiv (UFT) and the Agricultural University-Plovdiv, Bulgaria. The study was carried out among 415 non-athlete students (233 women and 192 men) with 758 observations within 2008 – 2012 years.

Statistical processing of the obtained data (by sex designation) included variation, F-test, T-test, graphic analysis with program product of Microsoft Excel.

RESULTS

1. Physical efficiency of the studied Bulgarian students

On the basis of the gathered results of male and female students, with the help of descriptive statistics we can see that there is a high level of SD between 229-242.3 for women and 408.4-495.4 for men. The lowest result registered of female is only 60 m in the first study, with a higher achievement of 1320 m in the second study. The situation is similar with men, but the range is between 120 m and 2000 m. The score of the average running distance for each gender certainly shows the lowest level of physical efficiency of the students which means a very poor condition of cardio-respiratory fitness (Table 1).

Table 1. Descriptive statistics of the results of female and male students

	WOMEN				MEN			
	Incoming level		Outgoing level		Incoming level		Outgoing level	
	Distance	Absolute VO2 max	Distance	Absolute VO2 max	Distance	Absolute VO2 max	Distance	Absolute VO2 max
Mean	377.5	23.97	514.3	26.75	784	31.8	998	35.5
Median	280	22.2	480	25.91	720	30.3	920	34.76
SE	14.99	0.297	17.26	0.337	30.28	0.56	41	0.726
SD	229	4.531	242.3	4.727	408.4	7.49	495.4	8.777
Minimum	60	17.06	140	18.92	120	18.5	120	18.45
Maximum	1160	38.83	1320	41.53	1820	49.2	2000	52.02
Count	233	233	197	197	182	182	146	146
Confidence Level(95.0%)	29.55	0.585	34.04	0.664	59.738	1.1	81.04	1.436

Relying on the statistics, from the applied F-Test and T-Test for comparison of single dispersion it can be said ($p<0.0000$***) that there is a significant increase in the physical efficiency as a result of physical education in high school (Table 2).

Table 2. Dinamics of physical efficiency of studied students according applied T-Test

	incoming level		*outgoing level*			
gender	X cp.	SD	X cp.	SD	t	p
students-female	377.5	229	514.3	242.3	-6.01	p<0.0000***
students-male	784	408.4	998	495.4	-4.28	p<0.0000***

The ambition to acquire structural and functional changes in the organism of students puts forward certain requirements to teachers` educational work through a selection of means and methods of training and evaluating. In this relation we prefer to use 20 m shuttle running test as a means of measures for assessing the physical condition of the students.

Unfortunately, we have to mark the very poor level of cardio-respiratory fitness of the students for the incoming level - 82.4% for female, and 79.7% for male. The fair and the good results are not enough, only a few students - 14 women and 24 men cover the requirements for a fair score (Table 3, Figure 1). In spite of the increase of dynamics of the physical capacity the lowest incoming level is too low to achieve a higher conditioning level. There is no observation on excellent or superior score for both women and men (Table 3, Figure 1).

Table 3. Specification of the level of cardio-respiratory fitness of students between incoming and outgoing study

Score	Women		Men	
	incoming level	outgoing level	incoming level	outgoing level
very poor	192 (82.4%↓)	124 (62.9%↓)	145 (79.7%↓)	98 (67.1%↓)
poor	18 (7.7%↓)	29 (14.7%↓)	13 (7.1%↓)	17 (11.6%↓)
fair	14 (6%↓)	36 (18.3%↓)	24 (13.2%↓)	21 (14.4%↓)
good	9 (3.9%↓)	8 (4.1%↓)		10 (6.9%↓)
excellent	0	0	0	0
superior	0	0	0	0

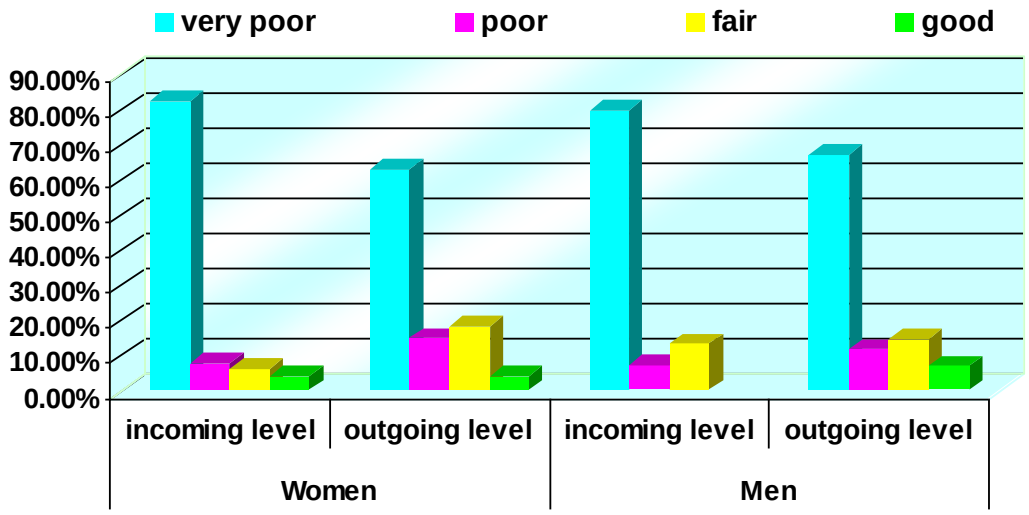

Figure 1. Specification of the level of cardio-respiratory of student fitness between incoming and outgoing study

2. Level of cardio-respiratory fitness comparison observing nationality

Tables 4 and 5 show the distribution of the number of students in accordance to their nationality and the specification of the structure of faculties. The total number of tested students is 4770 from Poland, Slovakia, Romania and Bulgaria, where the dominant students are female in all the countries.

Table 4. Distribution of the number of students (women and men) in accordance to their nationality

Gender	Nationality				Total
	Poland	Slovakia	Romania	Bulgaria	
women	1965 (58,6%↓)	397 (61,2%↓)	204 (57,8%↓)	233 (56.1%↓)	2799
men	1388 (41,4%↓)	252 (38,8%↓)	149 (42,2%↓)	182 (43.9%↓)	1971
Total	3353	649	353	415	4770

In the analysis of the results it is necessary to be marked that almost 1/3 of the tested Polish students (27%) are active athletes (Table 5).

Table 5. Distribution of the number of students in accordance to the specification of the structure of faculties

Faculty	Nationality				Total
	Poland	Slovakia	Romania	Bulgaria	
physical education	906 (27%↓)	28 (4,3%↓)	60 (17.6%↓)		994
others	2447 (73%↓)	621 (95,7%↓)	280 (82,4%↓)	415 (100%↓)	3763
Total	3353	649	340	415	4757

A detailed analysis was done in the previous related publication [5, 6, 7], therefore we are going to examine some of the main significant data. First of all, we were far from glad to observe the bad results of the Bulgarian students, which show 90.1% results of very poor plus poor cardio-respiratory fitness for women and accordingly 86.8% for men (Tables 6, 7, Figures 2, 3).

Table 6. Specification of the level of cardio-respiratory fitness of women in accordance to nationality

Cadiorespiratory fitness	Nationality				Total
	Poland (N-1965)	Slovakia (N-397)	Romania (N-204)	Bulgaria (N-233)	
very poor	14 (0,7%↓)	3 (0,8%↓)	1 (0,5%↓)	192 (82.4%↓)	210
poor	220 (11,2%↓)	49 (12,3%↓)	61 (29,9%↓)	18 (7.7%↓)	348
fair	526 (26,8%↓)	127 (32%↓)	74 (36,3%↓)	14 (6%↓)	741
good	507 (25,8%↓)	91 (22,9%↓)	40 (19,6%↓)	9 (3.9%↓)	647
excellent	421 (21,4%↓)	83 (20,9%↓)	10 (4,9%↓)		514
superior	277 (14,1%↓)	44 (11,1%↓)	18 (8,8%↓)		339
	1965	397	204	233	2799

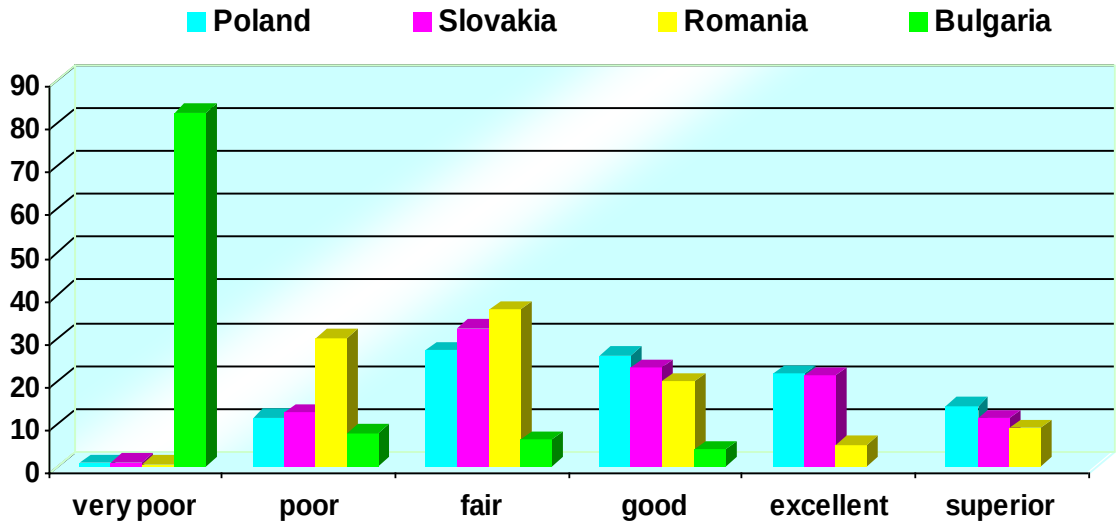

Figure 2. Specification of the level of cardio-respiratory fitness of women in accordance to nationality

There are excellent and superior results in the observed countries, except Bulgaria, in each gender. We can also say that there is a similar physical efficiency between the tested students prom Poland and Slovakia. Romanian students have stable data of cardio-vaslular capacity with the similar result for good, excellent and superior rate of men.

It is worth to underline, that the male students have a higher level of cardio-respiratory fitness than female students among all marked countries.

Table 7. Specification of the level of cardio-respiratory fitness of men in accordance to nationality

Cadiorespiratory fitness	Nationality				Total
	Poland (N-1388)	Slovakia (N-252)	Romania (N-149)	Bulgaria (N-182)	
very poor	25 (1,8%↓)	5 (2%↓)	3 (2%↓)	145 (79.7%↓)	178
poor	28 (2%↓)	6 (2,4%↓)	6 (4%↓)	13 (7.1%↓)	53
fair	194 (14%↓)	39 (15,5%↓)	37 (24,8%↓)	24 (13.2%↓)	294
good	250 (18%↓)	52 (20,6%↓)	33 (22,1%↓)		335
excellent	449 (32,3%↓)	84 (33,3%↓)	35 (23,5%↓)		568
superior	442 (31,8%↓)	66 (26,2%↓)	35 (23,5%↓)		543
	1388	252	149	182	1971

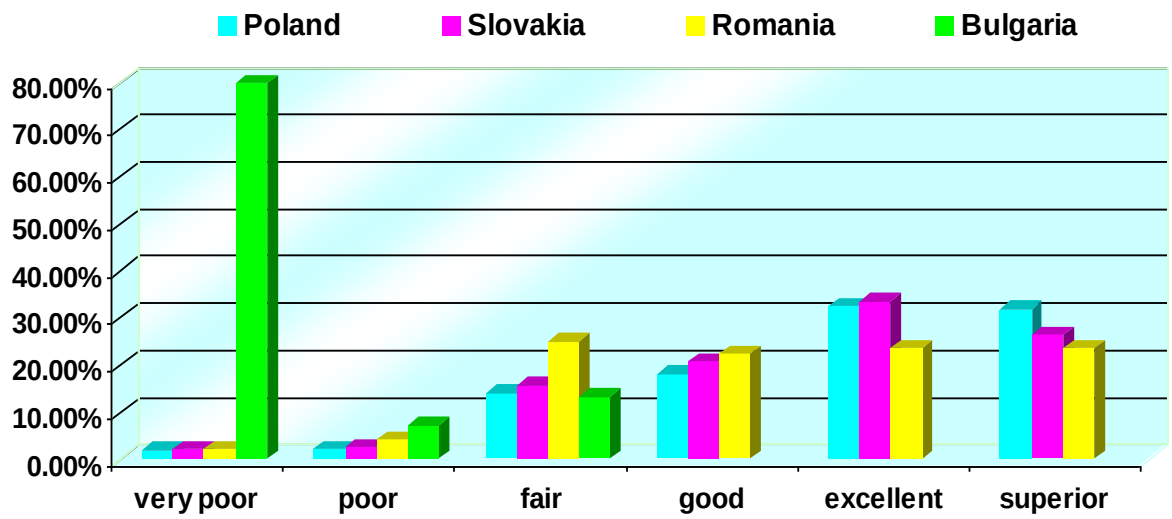

Figure 3. Specification of the level of cardio-respiratory fitness of men in accordance to nationality

DISCUSSION AND CONCLUSION

A necessity to implement preventive actions is a result of the fact that cardiovascular diseases are still the main cause of death [5].

The exposure of more than ten years to high blood pressure (diagnosed arterial hypertension) doubles the risk of AMI and is its second strongest risk factor. The risk from hypercholesterolemia (total serum cholesterol ≥ 6.2 mmol/l), moderate smoking, alcohol abuse and overweight (body mass index (BMI) ≥ 25 kg/m²) is not statistically significant (P>0.05). The coronary risk from heavy smoking in AMI patients, compared to controls is nearly two times higher (P<0.05). Diabetes also significantly increases the risk of AMI almost twice (P<0.05). Only 19.4% (±1.75) of the study participants had regular physical activity. This factor had a highly significant protective effect on the development of CHD (P<0.001). The same relation was found between the factor "Regular intake of fruits and vegetables" and AMI development (P<0.05) [1]. The combination of arterial hypertension (over 10 years of exposure), diabetes and a low level of education increased the chance of developing cardiac ischemia. The combination of arterial hypertension (blood pressure over 140/90 mmHg), physical inactivity and unbalanced diet increased the risk of AMI twice (P<0.05). The combination of 'Periods of unemployment / a job loss' and 'Poor working conditions: harmful substances, noise, cold, etc.' also increased the AMI risk twice (P<0.05). The combination of a regular physical activity and having a balanced diet decreased significantly the chances of developing AMI (P<0.05) [1].

It should be noted that in 2004, Bulgaria was the country with the highest level of deaths caused by blood vascular diseases in the European Union. Male victims – 840,52 (average EU number – 225,84). Female victims – 559,95 (average EU number – 225,84). The affected Bulgarians by BVD in 2004 are 3.55 times more than the Spanish, 2.67 more than Finnish and 4.56 more than French. The female deaths in Finland caused by BVD are 3.07 times less than those in Bulgaria, in France females die 5.02 less and Spanish – 4 times less. Resulted from BVD male deaths in Bulgaria are 2.51 times more than those in Finland, 4.41 times more than in France and 4 times more in Spain. The female deaths number in Romania is close to the Bulgarian one, while the male is greatly lower.

Table 8. Standardized quotient of death from basic causes in EU countries in 2004 year according to gender (100 000 standardized population)

Countries	**Morbid growths**		**Diseases affecting the blood circulation**		**Traumas and toxemias**	
	men	***women***	***men***	***women***	***men***	***women***
EU	**250,49**	**140,77**	**342,23**	**225,84**	**64,44**	**23,03**
1. Austria	228,33	139,33	298,30	209,88	65,97	22,06
2. Belgium	...	...	...	...	...	...
3. Bulgaria	209,86	116,08	840,52	559,95	72,68	19,67
4. Great Britain	226,32	159,89	280,13	177,37	40,34	17,41
5. Germany	224,11	138,99	315,19	218,60	46,65	18,50
6. Greece	218,90	114,75	343,30	284,40	51,73	14,40
7. Denmark	...	...	...	...	...	...
8. Estonia	307,47	144,20	706,12	392,84	224,55	43,36
9. Ireland	232,87	160,32	303,56	185,36	42,81	16,20
10. Spain	246,67	109,54	210,77	140,90	50,07	16,83
11. Italy	...	...	...	...	...	...
12. Cyprus	168,73	94,53	297,91	193,27	61,71	21,76
13. Latvia	298,29	138,94	792,49	443,63	214,49	58,30
14. Lithuania	294,81	141,07	692,56	416,54	247,89	54,35
15. Luxemburg	238,20	117,28	290,76	189,12	64,01	26,63
16. Malta	193,76	127,57	294,40	221,84	32,69	21,92
17. Nederland	251,90	162,09	252,74	155,80	36,81	18,65
18. Poland	309,11	158,56	510,22	314,23	101,88	25,62
19. Portugal	220,20	113,83	271,06	194,07	70,46	21,20
20. Romania	238,94	131,38	762,03	558,08	96,81	26,05
21. Slovakia	301,42	146,23	627,07	412,01	92,79	22,31
22. Slovenia	283,00	149,91	354,19	222,68	98,57	33,77
23. Hungary	372,05	191,24	618,52	393,64	117,76	41,77
24. Finland	192,63	119,57	335,02	182,45	108,25	38,28
25. France	259,93	126,89	190,61	111,45	69,86	29,98
26. Czech Republic	315,15	172,97	530,92	356,93	89,02	34,03
27. Sweden	186,68	142,77	277,61	171,70	61,45	27,82

Source: Health for all – statistic database of Regional Bureau of World Health Organization for Europe, June 2007

All this groping about in the dark of the governmental policy during the socio-economic crisis of post-communism in Bulgaria on health and education of people reflects undoubtedly both in low quality of education and restriction of the capacity to carry out the social, healthcare and educational functions of the school subject Physical Education and Sports. Unfortunately, these trends are seen in practice where during sports lessons first-year students show a lack of the necessary level of physical capacity, motor culture, skills and available knowledge for adequate performance of training in Physical Education and Sports.

It has to be underlined that the registered results about the condition of the cardiovascular system, as an indirect measurement of cardiovascular fitness, through 20 m shuttle running test are substantiated by World Health Organization data and reports. Cardiovascular diseases (CVD) and neuropsychiatric condition account for the highest burden of disease, both among males and females in Bulgaria [8, 11]. The risk of Bulgarians dying from CVD is similar to that of the corresponding Eur-B+C average; however, it is about three times higher than corresponding Eur-A average [8, 11]. According to the DALYs, high blood pressure and tobacco place the greatest burden of diseases on the Bulgarian male and respectively high blood pressure and high level of body mass index (BMI) on female. The lack or physical inactivity has rate 7 for male and 4 for male of the first ten burdens of diseases. There is subordination between the rating of cardiovascular diseases, the studied nationality [10] and the problem of physical efficiency (Table 9, Figure 4).

Table 9. Environmental burden by cardiovascular disease [DALYs/1000 capita], per year

Country	World's lowest country rate	Country rate	World's highest country rate
Poland	1.4	5.4	14
Slovakia		2.4	
Romania		8.3	
Bulgaria		11	

Sources: [10] http://www.who.int/gho/countries/en/

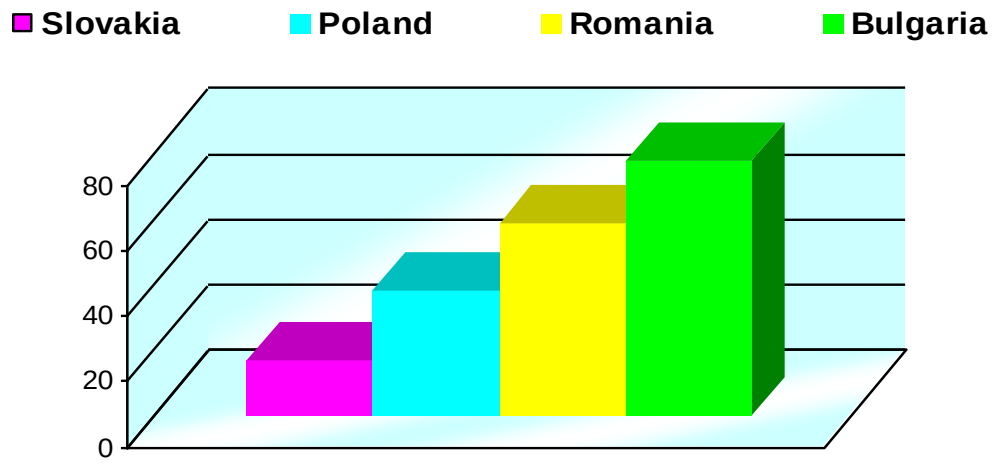

Figure 4. Environmental burden by cardiovascular disease [DALYs/1000 capita], per year according nationality

Bulgaria is the country with the lowest level of physical efficiency and the highest burden of cardiovascular diseases. The greatest results are presented by the Polish and the Slovak students with a similar running distance. But in accordance with the overall assessment and the fact that almost 1/3 of Polish students are active athletes, we can claim that the Slovak have the highest level of physical fitness as general and the lowest burden of CVD - 2.4 (Table 9).

The importance of the preliminary, ongoing, and final monitoring, including control of their physical capacity, for the implementation of motivated, purposeful, and highly efficient academic activities involving students and their sports teachers, has long been proven. In the same condition the possibility to implement the Beep test for diagnostics of endurance within the ongoing control of the physical capacity of students and as a part of health monitoring is a must. The Beep test (20 m shuttle running test) is adequately informative with regard to the health status of female students, thus making it possible to introduce it permanently in the Bulgarian experience as a kind of reliable test for measuring the endurance and physical fitness of trainees [3].

We can say that the state of the physical efficiency of the studied group of Bulgarian students, despite having the lowest values, is also having the highest growth as far as the dynamics of their development is concerned. The effect of our sports-and-pedagogic work has to be improved by the means of adequate content in accordance with the efficiency, motor and theoretical experience of students referring to their physical culture and healthy lifestyle since the health condition is a key factor to achieve happiness and high-quality life.

We consider it advisable that evaluating the physical endurance through 20 m. shuttle run test be input constantly in high school. This would stimulate the purposive work for the development of cardio-respiratory system, and at the same time, Physical Education would

fulfill one of its main objectives, namely, health prevention of the high-school students and prophylaxis of the cardiovascular diseases at young age. The choice of healthy lifestyle (including optimal physical activity) is a result of personal motivation, but appropriate information supporting undertaking this decision is a responsibility of health, social and state authorities.

On the basis of good practices and achievements of the Polish and Slovak scientists and pedagogues www.studentfit.eu, a national Bulgarian strategy to reduce the increasing hypodynamia has to be worked out, and it is also desirable that team resources of all state authorities be combined for achieving the health promotion mentioned above.

It is of great importance that more attention be paid on the physical prophylactic of each age group of the populations so that a National program for prevention of chronograph non communicable diseases (2013-2020 year) be worked out by the Ministry of Health Protection, the World Health Organization, the Ministry of Education, Youth and Science, and the Ministry of Physical Education and Sport in order to achieve an increasing quality of life and health prevention.

We consider that to work out a united educational system in the European Union relating curriculum, contents and methods for teaching and assessment would lead to an increase of the educational quality, and the subject of Physical Educational and Sport would contribute to the European health promotion.

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