

## ELEVATED ARTERIAL BLOOD PRESSURE AND PHYSICAL ACTIVITY IN ADOLESCENCE

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### ABSTRACT

Physical activity (PhA) in adolescence and its influence on the arterial blood pressure (ABP) is investigated in 964 adolescents, aged 15 to 17 years. Screening of ABP is carried out and interview with the students for determining the PhA in their free time, the frequency of the physical activities and the time for active physical exercises. The results show that every second girl and third boy is not going for sport in its free time and the level of PhA in adolescents with elevated ABP is significantly lower. It is found that the level of PhA in girls with normal or elevated ABP is 2 times lower compared to that of boys. Models of PhA with high cardioprotective effect are created for the adolescent age.

**Keywords:** arterial blood pressure, physical activity, sports, adolescence

### INTRODUCTION

The role of physical activity (PhA) in the regulation of arterial blood pressure (ABP) is not enough clarified. In adults the increased aerobic activity leads to decreasing of ABP (2, 4). Some authors find statistically significant correlation between hypokinesia, obesity and elevated ABP (EABP) in adolescence (when is not subsequent to obesity).

According to data of Salis in adolescence the boys are 15% to 25% more active than girls with tendency of age-related decrease in physical activity with 2,7% in boys and 7,4% in girls for a year (11). The study carried out in the outset of SINDY program shows that 35,2% of Bulgarian adolescent boys and 53,7% of the girls do not go or go occasionally for physical exercises (1).

The aim of this study is to investigate the physical activity in adolescence and its influence on ABP.

### MATERIAL AND METHODS

The ABP is investigated in 964 students (423 boys and 541 girls) aged 15 to 17 years from randomly chosen schools in Sofia and Varna. ABP is measured with standard methods (3). The mean value of three measurements is analyzed and on its basis the students are divided in 2 groups:

group one – with normal systolic and diastolic ABP (SABP, DABP) - with values of ABP in the referent

range, i.e. under 90<sup>th</sup> percentile for age and gender; group two – with elevated SABP and DABP - with values of ABP higher than the referent range, i.e. above 90<sup>th</sup> percentile for age and gender.

Students are interviewed by questionnaire for determination of the physical activity in out school time, the frequency of physical exercises and the time spared for active physical exercises (till getting out of breath and sweating). Processing of data is performed by SPSS PC+. In statistical analysis the level of significance was determined for p value of less than 0.05.

### RESULTS AND DISCUSSION

The results of the study of the physical activity of students with different levels of ABP are shown on Table 1.

Data from the inquiry study show that 71,2% of the boys with elevated SABP and 53,8% with elevated DABP do not go for sport. In the group with normal ABP the relative part of the no sporting boys is 2, 5 to 4 times smaller ( $p < 0,001$ ). The girls compared to boys represent lower physical activity. More than 80% of the girls with elevated SABP and DABP do not go for sport.

The frequency of physical exercises of students with different levels of ABP is shown on Table 2.

The frequency of physical exercises in boys and girls with elevated SABP and DABP is significantly lower than that of the students with normal ABP ( $p < 0,001$ ;  $p < 0,01$ ).

The level of physical activity (evaluated on the number of week hours for active physical exercises) is significantly lower ( $p < 0,01$ ) in the group of the no sporting boys and girls with elevated SABP and DABP. It is found that the

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Table 1. PhA of students with different ABP level (in %)

Physical activity	Boys				Girls			
	SABP		DABP		SABP		DABP	
	Normal	High	Normal	High	Normal	High	Normal	High
Go for sport actively	22,2	10,4	21,7	12,8	5,3	-	5,3	2,3
Go for sport as leisure	61,3	18,4	56,5	33,4	54,9	18,2	59,3	14,6
Do not go for sport at all	16,5	71,2	21,8	53,8	39,8	81,8	35,4	83,7
p	<0,001		<0,01		<0,001		<0,001	

level of physical activity in girls in both investigated groups is about 2 times lower compared to that of boys (Fig. 1). The analysis of data shows that boys and girls with EABP are with significantly lower physical activity. The students with EABP who do not go for sport (actively or as leisure)

Pattenberger *et al.* recommend daily based physical activities with moderate intensiveness combined with balanced low caloric diet for adolescents with ABP above 75<sup>th</sup> percentile and increased body mass (12). According to some authors (6,7,15) the PhA by influencing the ABP in adoles-

Table 2. Frequency of sports exercises in students with different ABP level (in %)

Physical activity	Boys				Girls			
	SABP		DABP		SABP		DABP	
	Normal	High	Normal	High	Normal	High	Normal	High
Every day	17,4	2,6	17,5	2,6	8,7	-	9,0	-
4-6 times weekly	20,0	5,3	21,1	10,3	11,2	-	12,2	-
2-3 times weekly	36,5	7,8	33,3	12,8	26,7	3,8	29,1	2,3
Once weekly	9,7	5,3	6,3	20,5	13,6	15,4	14,3	14,0
Do not go for sport at all	16,5	71,1	21,8	53,8	39,8	81,8	35,4	83,7
p	<0,001		<0,01		<0,01		<0,01	

are 2,5 times more than those with normal ABP (more expressed in girls). The tendency we have found confirms the studies which prove that hypokinesia in girls increases the risk of arterial hypertension and obesity (5,14). The results of the study show significant back correlation between ABP and time spared for physical activity, which is found by other authors as well in studying adults and adolescents (5,8). The high level of physical activity leading to good physical condition (fitness) probably through mechanisms of increased minute volume and coronary flow and decreased peripheral vessel resistance have direct hypotensive effect. Hypokinesia is an independent predictor of EABP in boys and EDBP in girls. Boys and girls, normotonic, with low level of physical activity and low fitness respectively are 20 to 50% higher risk to develop arterial hypertension in adults compared to adolescents with higher physical activity (12). In girls hypokinesia more often influences indirectly SABP through increased body mass (13). Data of our study confirms the statement that low physical activity increases the risk for elevated ABP in adolescence and arterial hypertension in adulthood. On this basis all intervention programs having the aim to prevent arterial hypertension include obligatory physical activities with different intensiveness (5). The various forms of physical activity have hypotensive effect and low loading on daily basis is preferred to intensive loading 2-3 times weekly (11).

ence is important for prevention of the cardio-vascular risk.

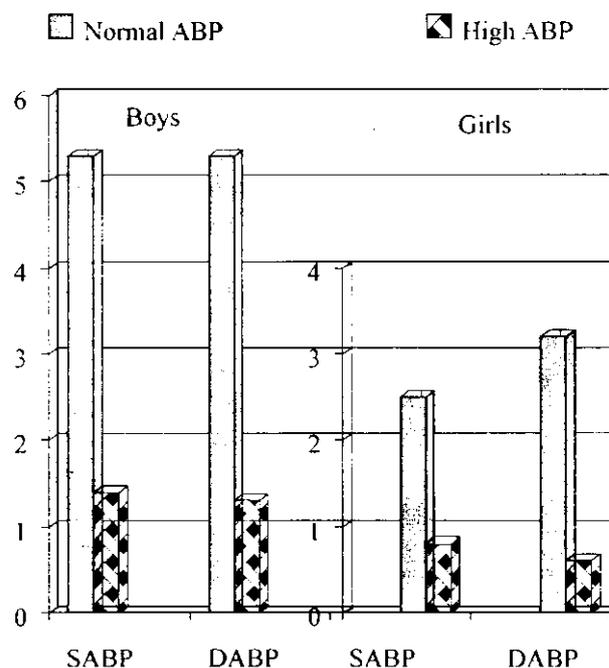


Fig. 1. PhA level of students with normal and high ABP

## CONCLUSIONS

1. Every second girl and third boy does not go for sport in its free time. The level of PhA in adolescents with EABP is significantly lower.
2. The frequency of physical exercises in boys and girls with elevated SABP and DABP is significantly lower than that in adolescents with normal ABP.
3. The level of PhA in girls with normal or elevated ABP is by 2 times lower than that in boys.
4. PhA is a major factor in the primary and secondary prevention of EABP in adolescence because at this age models of PhA with high cardioprotective effect are created.

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