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Original Article

Association between aerobic fitness and high blood pressure in adolescents in Macedonia evidence for criterion-referenced cut-points

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Abstract:
There is a lack of criterion reference standards for assessing health fitness in children and adolescents. The research was intended to determine the link between fitness and high blood pressure (HBP) and determine the cut-points that best predict high blood pressure (HBP) among adolescents. This cross-sectional study included 1261 adolescents, which were defined as a population of healthy adolescents at the age of 11-14 years, from Macedonian ethnicity and urban origin. The aerobic fitness is evaluated with the three-minute step test. The systolic and diastolic blood pressure were measured with oscillometric method, whereby is used digital sphygmomanometer Omron. Analyses controlled for age, body fat, socioeconomic status and biological maturation. Receiver Operating Characteristic (ROC) curves demonstrated that three minute step test could discriminate high blood pressure in both sexes (male: AUC = 0.63; female: AUC = 0.64). The cut-points with the best discriminatory power for high blood pressure were 41 mL•kg-1•min-1 for males and 36 mL•kg-1•min-1 for females. Males (OR = 1.7; 95% CI: 1.3-3.0) and famales (OR: 2.2; CI 95%: 1.2-4.1) with low aerobic fitness levels were more likely to have high blood pressure. Three minute step tests are inversely associated with blood pressure and cut-points from ROC analyses have good discriminatory power for high blood pressure.
Key Words: - blood pressure, diagnosis, hypertension, physical fitness, aerobic fitness, sensitivity

Introduction

The findings from cross-sectional studies have shown that the low level of cardiorespiratory fitness is not only associated with an increased risk of cardiovascular disease but also in reducing mental and skeletal health (Ortega et al., 2008; Hillman et al., 2008). Furthermore, the results of longitudinal studies show that there is strong evidence that low level of cardiorespiratory fitness in childhood and adolescence is a risk factor of cardiovascular disease in adulthood (Ruiz et al., 2009). Low level of cardiorespiratory fitness in childhood and adolescence is also associated with an increased risk of metabolic syndrome (Carnethon, et al. 2003), arterial stiffness (Boreham et al., 2004; Ferreira et al., 2003) and infarction years later (Högström et al., 2014). Levels of cardiorespiratory fitness tend to track from childhood to adolescence, (Bugge et al., 2013; Kristensen et al., 2006) as well as from adolescence to adulthood. (Ortega et al., 2013; Andersen & Haraldsdottir, 1993). Having in mind these findings, the need is for children to be educated at the earliest age for physical activity benefits and cardiorespiratory fitness (Ortega et al., 2013). Although there are clear health benefits from aerobic fitness and the temporal trends are of public health concern, criterion-referenced evidence supporting health-related cut points or thresholds of aerobic fitness in childhood and adolescence are lacking.

The aerobic fitness can be assessed through direct and indirect methods. Indirect methods, although less precise than direct, have certain advantages, including increased feasibility, simplicity and low cost, and on the other hand acceptable accuracy (Cureton & Warren, 1990; Silva et al., 2014).

Tests of progresive Shuttle runs have been shown to be quite valid and resilient to estimate the maximum oxygen consumption in children and adolescents (Liu et al., 1992; Suminski et al., 2004). Also, tests for estimating cardiorespiratory fitness on cycle ergometer with a heart rate of 170 to 195 beats per minute have proven to be valid predictor for assessing VO_2peak (Boreham et al.,1990; McMurray et al., 2000). Shuttle run and cycle ergometer testing required facilities to conduct testing and trained technicians to conduct the testing which are not always available in the field setting. One of the submaximal tests that does not limit the above mentioned is YMCA Step Test (Golding, 2000). Bench stepping protocols can be applied in a relatively small space in less then ten minutes and do not require expensive material conditions, while at the same time quite sensitive to changes in cardiorespiratory fitness in randomized clinical trials (Trevino et al., 2005; Yin et al., 2005). Despite the easy applicability and widespread diffusion of the various bench stepping protocols (e.g., YMCA Step Test, Canadian Home Fitness Test, Harvard Step Test), they have no defined criterion reference

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standards, especially for the child and adolescent population. To determine the criteria for aerobic fitness an anchor to some established chronic disease risk factor is often used (Katzmarzyk et al., 2007). This helps in monitoring morbidity and is useful for professionals concerned with health-related fitness. Surveys with adolescents and adults have proposed cut-points for aerobic fitness tests through this strategy (Katzmarzyk et al., 2007; Lobelo, et al. 2009) and are used in different tests of health-related aerobic fitness.
Therefore, this study aimed to determine the associations between aerobic fitness and high blood pressure levels (HBP) to determine the population-specific, criterion-referenced cut-points for aerobic fitness among Macedonian adolescents.

Methods

Sample of participants

This cross-sectional study included 1261adolescents, which were defined as a population of healthy adolescents at the age of 11-14 years, from Macedonian ethnicity and urban origin. The children were selected according to the method of random choice and they were from several primary schools in Skopje.The sample is divided into two subsamples according to gender and that is 719 male respondents and 542 female respondents. The average age of the respondents of both gender is 12,5±1,1 years.
The study included students for whom their parents had given consent to take part in the research, who were psychically and physically healthy and who regularly attended the classes of physical and health education. The respondents were treated in accordance with the Helsinki Declaration. Measurements were realized in March, April and May 2013, in standard school conditions at regular classes of physical and health education. The measurement was realized by experts from the area of kinesiology and medicine, previously trained to perform functional tests and blood pressure.

Blood Pressure

The blood pressure measurement (systolic and diastolic) is realized by experts from the medicine, doctor-specialists pediatrician fields. Blood pressure measurements were performed using the oscillometric method through a calibrated Omron (Kyoto, Japan) electronic and digital device model HEM 742, with cuffs of appropriate size to fit the arms of adolescents. This device has been validated for use with adolescents (Christofaro et al. 2009). Participants were informed about the procedures and were instructed to remain at quiet rest for at least five minutes in a quiet environment and without noise, with emptied bladder, not having performed exercise 90 min before the tests or smoked or ingested food, coffee, alcoholic drinks or mate at least 30 min before data collection. The atmosphere was quiet and with no noise. Blood pressure was measured three times at intervals of 60 seconds, and the result was the median value of the three measurements. In the age group studied, the High Blood Pressure (HBP) was regarded as the average (from three measurements) of systolic and/or diastolic pressure at the 95^{th} percentile for age and gender, adjusted to height percentile. We adopted the methodological recommendations of the Update on the Task Force Report on High Blood Pressure in Children and Adolescent (Falkner, 2004; Ekelund et al, 2007). Blood pressure was measured on the same day of aerobic ftness test. Resting blood pressure was measured before the aerobic ftness test.

Aerobic Fitness Test

The aerobic capacity is evaluated with the three-minute step test. The participant had a task to go up and down of the bench which is 30,5 cm high for three minutes in four cycles (up, up, down, down) with standardized rhythm from 96 beats per minute (bmp) which was dictated by the metronome. After the completion of the test (in response to a signal) the participant supposed to sit on the bench in order to measure the heart rate, and as well after the first and second minute at rest. If the participant felt dizziness, losing breath, sickness and headache, the test was aborted. The heart rate is measured by monitor for registration of the hearth rate (Polar RS800). The heart rate at rest, heart rate immediatelly after completion of the test, heart rate after the first minute at rest and the rate after the second minute at rest was considered as final result. The maximum oxygen consumption was calculated by the formula: VO_2 max = -2,045 + (Height in cm * 0,025) + (Resting Heart Rate * 0,01) + (Step Test Heart rate load + Heart rate recovery first minute + Heart rate recovery second minute)/Resting Heart Rate) * -0,405). The aerobic ftness test used in this study has been validated for use with adolescents (Topp et. al., 2011).

Control Variables

Maturity status was determined using the predictive noninvasivemethods of Sherar et al. (Sherar et al., 2005). The prediction equationrequires measurements of stature, sitting height, and bodymass together with date of birth and gender. This methoduses a maturity-offset protocol, allowing for the predictionof time before or after peak height velocity from age, age atpeak height velocity, and an estimation of percentage of adultstature attained. Maturity is then classified as “early”, “average”or “late”. This allows for a simple grouping variable to beused in expressing relative maturity status.
The socioeconomic status of the students is evaluated with the help of the international scale, named Family Affluence Scale (FAS), which includes four questions for the examinees: Does your family own a car/van/truck?

Do you have your own bedroom? How many times have you traveled with your family in the last 12 months? How many computers do you have in your family? According to the answers, the examinees are divided into three categories: low (0-2), middle (3-5) and high (6-8) socioeconomic status. The scale had been formulated by WHO- Health Behavior and School Aged Children Study, in 1997 (Currie et al., 1997; Wardle et al., 2002).
The measurement of anthropometric measures was implemented by the recommendations of the IBP - International Biological Program (Lohman et al., 1988). For assessment of morphological characteristics the following anthropometric measures were applied: height of the body in a standing position (cm), weight (kg), and body mass index (BMI).

Percentage of adipose tissue (%BF) is determined by the method of bioelectric impedance, (Dwyer & Blizzard, 1996), where 25% and 30% represented overweight for boys and girls, respectively. These %BF thresholds were selected as they have been related to cardiometabolic risk in children and adolescents inprevious research (Dwyer & Blizzard, 1996). The measurement is realized by Body Composition Monitor, model "OMRON - BF511". Before starting the measurement, in Body Composition Monitor were entered the parameters of gender, age and body height of the respondent. In order to ensure better accuracy of the results obtained from the assessment of body composition, before each measurement were fulfilled prerequisites recommended by ACSM (2005) and Heyward (2006).

Statistical Analysis

The data are presented as frequencies (percentage) for categorical variables and mean (SD) for continuous variables. Gender differences in fitness, blood pressure and anthropometric characteristics were analyzed by one-way analysis of variance (ANOVA). Categorical data (socioeconomic status, biological maturation, BP classification, BMI classification, body fat (%) classification) were analyzed using the Chi-square test. Pearson correlation coefficient was calculated between aerobic fitness and blood pressure. Receiver-operating characteristics (ROC) were calculated to compare their predictive validity and to identify optimal cut-points ROC curves were plotted using sensitivity and specificity measures based on aerobic fitness test cut-points. A diagnostic test with AUC value equal to 1 is perfectly accurate, and another with value equal to 0.5 has no discrimination power. Optimal sensitivity and specificity were the values yielding maximum AUC from the ROC curves.

Associations between low aerobic fitness levels and HBP levels were analyzed by logistic regression and expressed as odds ratio and 95% confidence intervals, adjusted for age, socioeconomic status, body adiposity, and biological maturation.All the analyses were performed using the Statistical Package for Social Sciences software (SPSS, v.22.0 for WINDOWS; SPSS Inc., Chicago, IL, USA), and values of $p < 0.05$ were considered statistically significant

Results

The research was conducted on a sample of 1261 respondents from which 719 (57.02%) males and 542 (42.98%) and females at the age of 11 to 14 years. The average age of the respondents is 12,5±1,1years.
In Table 1 are shown the characteristics of the sample. From the view Table 1 in which are shown the values of the arithmetic means, the standard deviations and the level of statistical significance, it can be seen that there are statistically significant differences among the male and female respondents in the variables: Maturity Offset (years), Predicted age at PHV (years), Height (cm), Weight (kg), Body fat (%), Systolic blood pressure (mmHg). From the view of the obtained results, it can be seen that males are higher, heavier and have lower percentage of fatty tissue, higher systolic pressure, compared to females.

The distribution of the overweight/obesity status estimated through the percentage of adipose tissue, hypertensiuon, social status and bilogical maturation in adolescents relative to gender are shown in Table 1. The analyisis of Table 1 and the ovreview of χ^2 test ($\chi^2 = 8.73$, $p = 0.013$) indicate that there are statistically significant differences in the degree of malnutrition among males and females. The percentage values indicate that a greater percentage of boys are overweight. Also, from the values of χ^2 tests ($\chi^2 = 263.8$, $p = 0.000$) can be seen that statistically significant differences among males and females are determined and in the biological maturation. The percentage values show that a greater percentage of males are classified as within the “early” maturity boundary in terms of females. Statistically significant differences between males and females were no determined in hypertension ($\chi^2 = .086$, $p = 0.415$) and the social status ($\chi^2 = 1.69$, $p = 0.109$).

From the view of Table 2 it can be seen that in both gender aerobic fitness test showed satisfactory descriptive power for high blood pressure (i.e., area under the ROC curve >01). For females cut-point for the aerobic fitness test that best discriminates the respondents with HBP is 36 $mL \cdot kg^{-1} \cdot min^{-1}$ (10,4 METs; sensitivity of 48.9% and specificity of 75.9%). For males the best cut-point was 41 $mL \cdot kg^{-1} \cdot min^{-1}$ (11,8 METs; sensitivity of 80.0% and specificity of 53.5%; Table 2, Figure 1).

The cut-point for an aerobic fitness test for females shows a higher percentage of true positives (PPV = 19%) in terms of males. On the other hand, the cut-point of the aerobic fitness test for males show a greater percentage of straight negative (NPV = 94%) in terms of females. In addition, this cut-point for girls was what best expressed (LR+ = 2.04) how likely a positive result would be correct (aerobic fitness test values below the cut-point) in individuals with measured HBP when compared with normotensive ones.

From the view of the Table 3 of the crude analysis, it can be seen that females who have low levels of aerobic fitness have 2.5 times higher likelihood of increased blood pressure than those who have an optimal level of aerobic fitness. After partialization of potential cofounders, the likelihood of increased blood pressure is 2.2 times. In the crude analysis it can be seen that males with low levels of aerobic fitness have 2.7 times more chance of having increased blood pressure. In the adjusted analysis, this likelihood was 1,8 times.

Table 1 Descriptive Characteristics of the Study Sample

	Boys (n=719)		Girls (n=542)		Total (n=1261)		p-value
	Mean	SD	Mean	SD	Mean	SD	
Chronological age (years)	12.50	1.12	12.47	1.13	12.49	1.13	0.627
Maturity Offset (years)	-0.68	1.36	0.80	0.99	-0.04	1.42	0.000
Predicted age at PHV (years)	13.55	0.89	12.03	0.55	12.89	1.07	0.000
Height (cm)	159.36	10.90	156.24	8.15	158.02	9.93	0.000
Weight (kg)	54.62	14.98	51.44	11.52	53.26	13.69	0.000
BMI	21.24	4.11	20.88	3.92	21.09	4.03	0.119
Body fat (%)	20.41	8.12	25.02	7.41	22.40	8.15	0.000
Aerobic fitnesstest (ml·kg^{-1}·min^{-1})	41.30	8.13	41.28	7.89	41.29	8.02	0.965
Aerobic fitnesstest (METs)	11.80	2.32	11.79	2.25	11.80	2.29	0.965
Diastolic blood pressure (mmHg)	69.26	9.17	70.02	8.36	69.59	8.84	0.135
Systolic blood pressure (mmHg)	115.46	12.78	112.05	11.85	113.98	12.50	0.000
Socioeconomic status							
high	536	75.5 %	423	78.6%			
low	174	24.5 %	115	21.4%			0.109
Biological maturation							
average/ late maturers	228	32.6 %	428	79.0%			
early maturers	472	67.4 %	114	21.0%			0.000
BP classification							
Normotensive	553	81.7 %	429	82.3%			
Hypertensive	124	18.3 %	92	17.7%			0. 415
BMI classification							
Normal weight	447	63.0 %	380	70.4%			
Overweight	184	26.0 %	121	22.4%			
Obese	78	11.0 %	39	7.2%			0.013
Body fat (%) classification							
normal	506	71.5 %	480	89.6%			
overweight	202	28.5 %	56	10.4%			0.000

Data are shown as mean (SD). unless otherwise indicated. Sex differences were analysed by one-way analysis of variance.with sex group as fixed factors. and anthropometric or physical fitness measurements as dependent variables.

** The respondents were categorized according to the international genderand age-specific BMI (kg/m^2)cut-off points (Cole et al., 2000). $P < 0.010$ for difference between boys and girls (Chi-Square Tests)

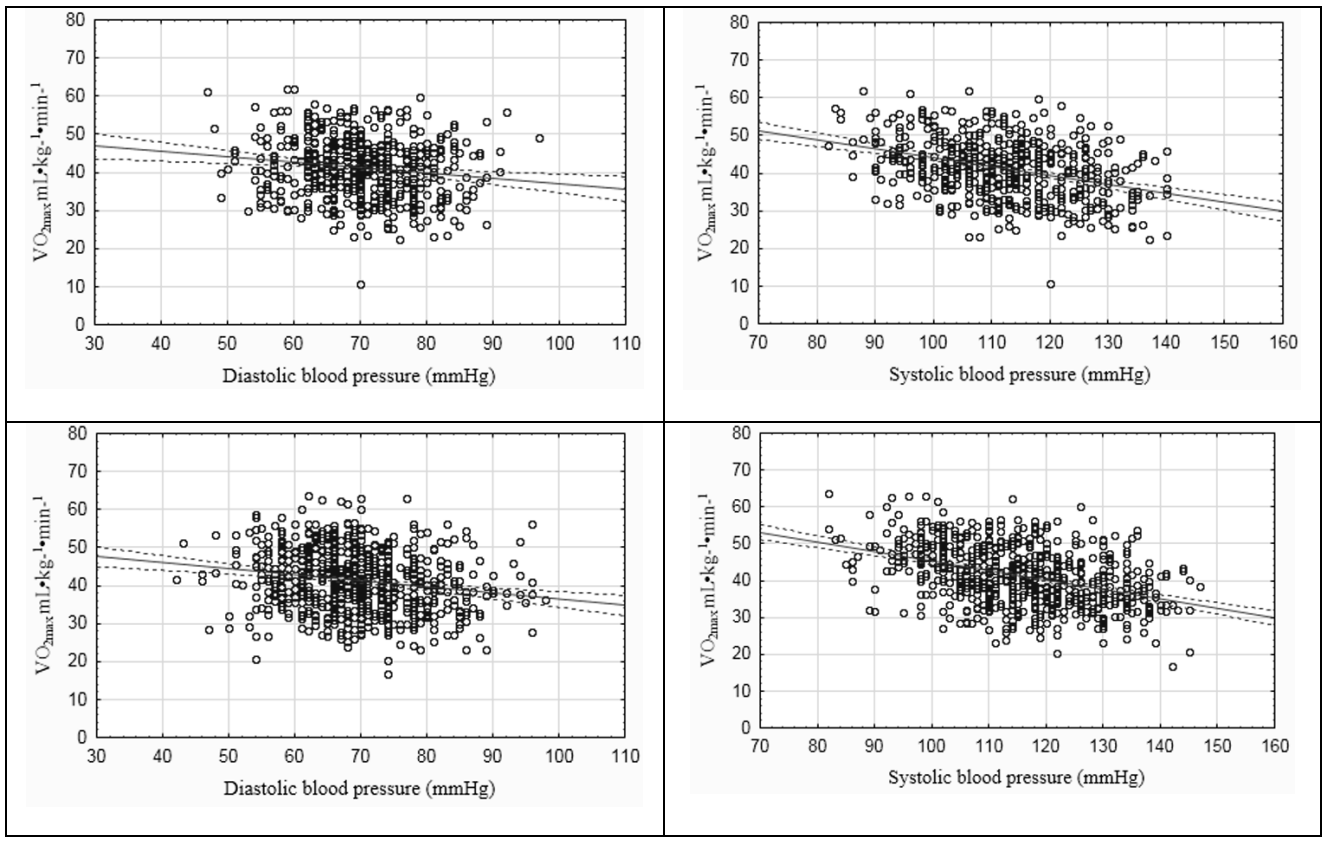

Figure 1 Scatterdiagram to illustrate the association between aerobic fitness and blood pressure.Diastolic Blood Pressure (DBP); Systolic Blood Pressure (SBP); DBP*vs.*VO_{2max} - Male(r=-0.14.*p*<.01). Female(r=-0.18.*p*<.01); SBP*vs.*VO_{2max} - Male (r = -0.34. $p < .01$). Female (r = -0.41. $p < .01$).

Table 2 Cut-Points of Aerobic Fitness to Detect High Blood Pressure in Adolescents According to Sex

	AUC (95% CI)	Cut-point (mL.kg-1.min-1)	Cut-point (METs)	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV	LR+	LR-
Male									
Aerobic fitness test	0.63 (0.60 - 0.67)*	41.40	11.83	70.97 (62.1 - 78.8)	53.35 (49.1 - 57.6)	15%	94%	1.52	0.54
Female									
Aerobic fitness test	0.64 (0.60 - 0.68)*	36.26	10.36	48.91 (38.3 - 59.6)	75.99 (71.7 - 80.0)	19%	93%	2.04	0.67

Note: The aerobic fitness test do not have unit. because it generated a aerobic fitness score. AUC—area under the curve; 95% CI—95% confidence interval;PPV –positive predictive value; NPV—negative predictive value; LR—likelihood ratio.*$p < .01$.

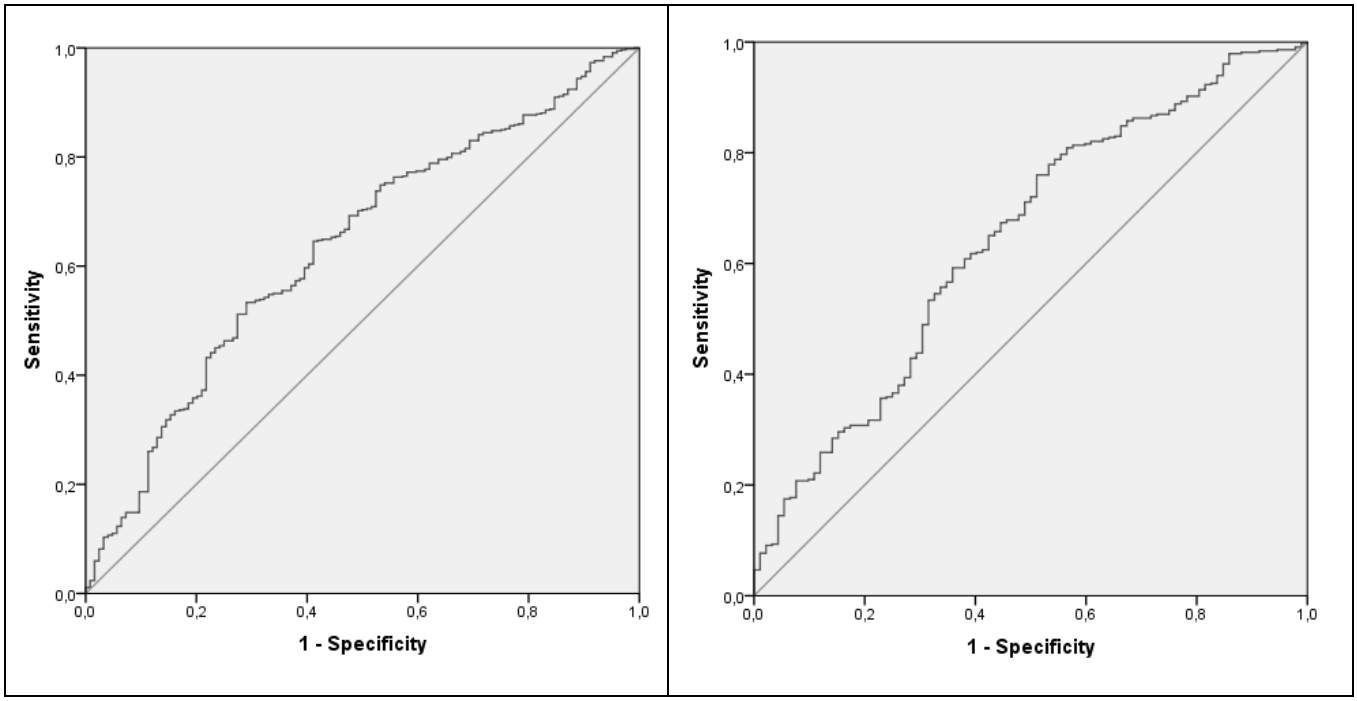

Figure 2 Receiver-operating characteristic curve of aerobic fitness test in males ($p < .01$) and females ($p < .01$).

Table 3 Multivariable Logistic Regression Models Showing Relationships Between Low Cut-Points of Aerobic Fitness Score and High Blood Pressure Levels in Macedonian Adolescents

	OR (95% CI)*†		OR (95% CI)‡†	
Male				
Low aerobic fitness	2.69	(1.77-4.09)†	1.77	(1.03-3.04)†
Age§	1.29	(1.09-1.53)†	1.28	(1.05-1.56)†
Body fat (overweight)	1.96	(1.31-2.94)†	1.72	(1.03-2.86)†
Low socioeconomic status	0.61	(0.37-1.01)	0.62	(0.37-1.04)
Early maturers	1.25	(0.81-1.93)	1.11	(0.67-1.83)
Female				
Low aerobic fitness	2.49	(1.58-3.94)†	2.24	(1.24-4.07)†
Age§	0.91	(0.75-1.10)	0.92	(0.72-1.18)
Body fat (overweight)	2.79	(1.50-5.19)†	1.31	(0.61-2.81)
Low socioeconomic status	0.82	(0.46-1.47)	0.85	(0.46-1.55)
Early maturers	2.77	(1.69-4.52)†	2.17	(1.18-4.01)†

Note.OR—oddsratio;95%CI—confidenceinterval;*CrudeAnalyses;‡Adjusted analyses for age. socioeconomic status. body fat and biological maturation; †p-value <0.05; § continuous variable

Discussion

The research results show that the low level of aerobic fitness is associated with increased blood pressure in Macedonian adolescents. Furthermore, it provided evidence to support criterion-referenced aerobic fitness cut-points for Macedonian adolescentsthe results are in accordance with previous researches, which indicate that the low level of aerobic fitness is one of the determinants of early morbidity in this population (Anderssen et al., 2007; Ekelund et al., 2007; Kokkinos et al., 2010).

Recent systematic review provides indications that the level of aerobic fitness in adolescents changes in relation to the place of living and several direct and indirect factors associated with low levels of aerobic fitness such as: gender, economic status, insufficient level of physical activity and a growing percentage of body fats (de Andrade et al., 2015). The results of our research suggest that after partitioning of some of the above mentioned factors, females with low level of aerobic fitness have 2.2 time higher blood pressure in comparison to males who have an optimal level of aerobic fitness. Boys with low level of aerobic fitness have a 1.8 times higher likelihood of high blood pressure compared to those who have an optimal level of aerobic fitness, regardless of age, economic status, body fat and biological maturation. The size of the joint action indicates that the low level of aerobic fitness, in itself, is a factor in predicting high blood pressure among Macedonian adolescents.

Although the previous researches indicate that both gender, the excessive body weight, physical inactivity, sedentary lifestyle, poor eating habits, represent a health risk, the impact of these factors varies from one place of

living to another, and these conditions can affect the prevalence of high blood pressure in adolescents (Goldfield et al., 2011; Gray et al., 2014; Silva et al., 2012; Silva et al., 2013). The results of the multivariate logistic regression analysis suggest that boys who have a percentage of fat tissue above 25% have a 1.72 times higher likelihood of hypertension that those with lower percentage of fat tissue. Also, the increase in age in boys increases the likelihood of hypertension. On the other hand, girls who are in the early stage of the biological maturation have a 2.2% higher likelihood of hypertension than those in the middle and/or late stages of biological maturation.

In the research are also calculated the cut-points in METs in order the obtained results of the research can be compared to other researches in which the aerobic fitness is represented in METs (Katzmarzyk et al., 2007; Lobelo et al., 2009). The Metabolic Equivalent (METs) denotes the energy requirement of the organism in a state of rest and is the most commonly used unit in ergometric testing. One METs is defined as the energy consumption (i.e. caloric demand) of the organism during rest. One metabolic equivalent (METsis approximately equal to 3,5 $mL•kg^{-1}•min^{-1}$. METs are equal for people with different body weight, as is the same as the value of basal metabolism. Thus, the cut-point in METs of the aerobic fitness test for females is equivalent to an approximate caloric expenditure of ten times more than in rest. In boys, this caloric expenditure was equivalent to 11.8 times more.

On the basis of the previous research results that have been working on this issue it can be concluded that the criterion reference standard for girls vary from 32.6 to 43.9 $mL•kg^{-1}•min^{-1}$, and for boys from 40.0 to 47.0 $mL•kg^{-1}•min^{-1}$. (Lang et al., 2017). The criterion reference standards were developed using European, North American or South American samples of children and youth. The health reference criterion standards are based on summative markers that indicate the metabolic and/or cardiovascular health (eg, cholesterol, triglycerides, glucose, body composition, high blood pressure, etc). In general, various protocol tests are used of each studies for the estimation of the maximum oxygen consumption (eg, walk/run field tests, graded treadmill test, cycle ergometry, step test) as well as various formulas for calculating the maximum oxygen consumption. In most research, the oxygen consumption is determined in an indirect way, only in a research study the maximum oxygen consumption is determined by a direct method (Adegboye et al., 2011). In most of the research studies to estimate the maximum oxygen consumption is used 20mSRT (Mesa et al., 2006; Moreira et al., 2011; Boddy et al., 2012; Silva et al., 2012; Ruiz et al., 2015), and only in one is used the step test (Silva et al., 2016).

On the basis of the research Ruiz and the collaborators (Ruiz et al., 2016) in which a meta-analysis is being applied, involving 9280 children and adolescents at the age of 8 to 19 years, the level of aerobic-fitness from 14 countries below 42 and 35 $mL•kg^{-1}•min^{-1}$ for boys and girls, respectively, should raise a red flag. (Ruiz et al,. 2016). The obtained results from the recent research are in accordance with the results obtained in our research. Namely, regardless of the test that will be applied to assess the level of aerobic fitness, if the results is below the minimum threshold (cut-off points) increases the health risk for adolescents, as well as possible health problems in adult period.

The limitation of this research is that as the determinant for determining cut-points for aerobic fitness only the high blood pressure is used. By including a larger number of chronic disease risk factors (e.g., obesity, glucose tolerance, dyslipidemia) may have produced different results. The next limitation of the research was a transversal study that did not allow the establishment of causal linkages between the variables and it was not possible to determine whether adolescents really have chronical hypertension, bearing in mind that blood pressure was measured only on the date of data collection. The advantage of the research is that a simple, practical and cost-effective submaximal test for assessing the aerobic fitness is used, which can be used in school without adequate material space conditions and the development of new criterion-referenced cut-points for use among Macedonian adolescents. The results of this research provide in countries with similar economic, ethnic and social characteristics, such as those in Macedonia to make use of these cut-points. The results of the research can also be used by public health professionals. The great correlation between low aerobic fitness and high blood pressure shows that public health professionals and kinesiologists should promote physical activity in children and adolescents in order to increase their aerobic ability and thus reduce the risk of high blood pressure. Therefore, the promotion of a healthy diet and appropriate physical activity should be part of the general health policy and part of everyday activities directed not only to individuals, but also to families, the collective and population as whole. Regular physical activity is inextricably linked to the previous goal. At least 30-60 minutes of moderate physical activity (walking, running, swimming, football, basketball) is recommended for 5 or more days a week and limiting seating activities to less than 2 hours during the day.

Conclusion

In conclusion, the three-minute aerobic fitness step test was able to predicthigh blood pressure among adolescents in Macedonia and therefore the new cut-points can be used in this population for adolescents aged 11–14years. In addition, regardless of age, sexual maturation, economic status and body fat, adolescents with low aerobic fitness levels were more likely to havehigh blood pressure (HBP) further reinforcing the public health importance of maintaining and improving aerobic fitness.

Conflict of interest

The authors declare that they have no competing interests

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