

# ASSOCIATIONS OF PHYSICAL ACTIVITY WITH BLOOD PRESSURE, BODY COMPOSITION AND MATURATION LEVEL IN ADOLESCENTS: THE GEOS STUDY



Javier Benítez-Porres<sup>1</sup>, Lorena Correas-Gómez<sup>1</sup>, Margarita Carrillo<sup>2</sup>, Norma Martín-Sanz<sup>1</sup>, José Ramón Alvero-Cruz<sup>2</sup>, Elvis A. Carnero<sup>1</sup>

1. Biodynamic and Body Composition Laboratory, University of Malaga.  
2. Exercise Physiology Laboratory, University of Malaga.



## Introduction

The association between physical activity (PA) and resting blood pressure (BP) is poorly understood in adolescents (Kelley, Kelley, & Tran, 2003), since several variables such as body composition, maturation level or sex, which interfere with, must be analyzed (Muntner, He, Cutler, Wildman, & Whelton, 2004).

## Objective

The aim of this study was to explore the association of PA, body composition, blood pressure, and maturation in adolescent boys and girls.

## Materials & Methods

Two hundred and nine (n=114 boys, n=95 girls) healthy adolescents were volunteers. A PA score was estimated by Physical Activity Questionnaire (PAQ-A). BMI, waist circumference (WC) and fat mass percent (%FM) were assessed by anthropometric measurements as adiposity markers. Tanner's maturation stages were evaluated and systolic and diastolic blood pressure (SBP and DBP) were measured by OMRON sphygmomanometer. SBP and DBP indexes (SBPI and DBPI) were calculated as mmHg/height (cm). The cut-off values developed to detect 90th percentile from SBPI and DBPI were used to perform two groups: healthy or risk groups (Galescu et al., 2012).

Spearman rank order correlations were used to explore associations between variables after control to maturation. Additionally, independent sample T-test were carried out to compare healthy and risk groups on body composition and PA variables.

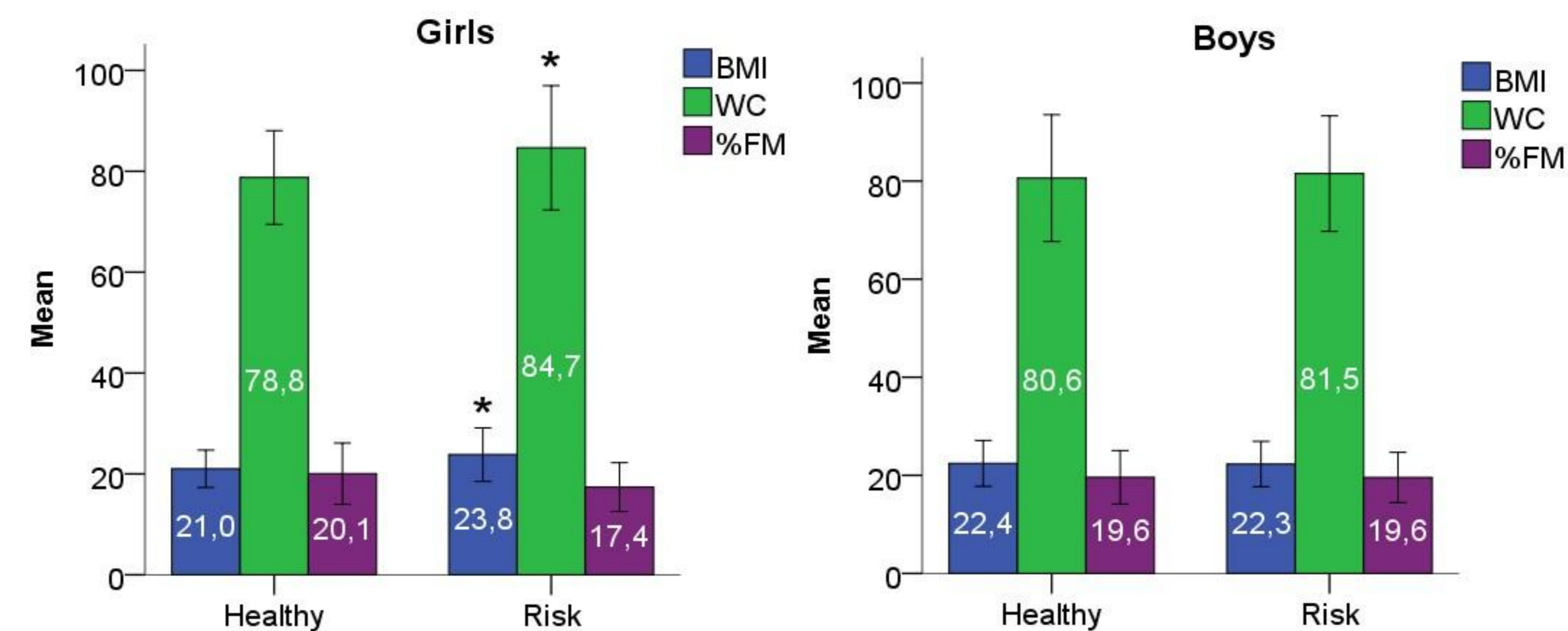
## Results

All the relationships between parameters showed a positive correlation. There were significant associations between BP variables and BMI (SBP  $r=0.202$ ,  $P<0.01$ ; DBP  $r=0.305$ ,  $P<0.001$ ), and WC (SBP  $r=0.197$ ,  $P<0.01$ ; DBP  $r=0.295$ ,  $P<0.001$ ). PA score was only related with body composition variables either girls or boys. Also, there were significant correlations between %FM and BP variables (SBP  $r=0.332$ ,  $P<0.01$ ; DBP  $r=0.330$ ,  $P<0.01$ ; DBPI  $r=0.308$ ,  $P<0.01$ ) in girls but not in boys. The latter results were similar when variables were compared between healthy and risk group (Graph 1).

**Table 1. Characteristics of participants by sex.**

	All (n=209)	Boys (n=115)	Girls (n=95)
Age (years)	15.6±1.6	15.7±1.4	15.4±1.7
Weight (Kg)	59.8±13.9	63.9±14.7	55.1±11.3
Height (cm)	164.7±8.2	168.8±7.7	159.9±5.8
BMI (Kg/m <sup>2</sup> )	21.9±4.3	22.3±4.5	21.5±4.2
SBP	112.9±16.2	116.9±17.5	108.1±12.7
DBP	64.5±9.5	65.9±9.1	62.8±9.8
PA Total Score	2.4±0.8	2.6±0.7	2.3±0.8
Tanner (≤3/4/5)	51/100/40	41/46/18	10/55/22

Values are presented as mean ± SD, except for Tanner.  
BMI, Body Mass Index; SBP, Systolic blood pressure; DBP, Diastolic blood pressure.



**Graph 1. Independent sample T-test between healthy and risk groups.**

## Discussion & Conclusions

► Our data confirm the relationship between BP and body composition variables as WC and BMI (Rosa, Fonseca, Oigman, & Mesquita, 2006).

► Other studies have reported a negative association between PA measured by accelerometry and BP (Hearst, Sirard, Lytle, Dengel, & Berrigan, 2012; Kelley, Kelley, & Tran, 2003). Nevertheless, we could not find any association between PA and BP. These results should be interpreted carefully since measuring physical activity by objective methods could have changed our conclusions.

► The recently developed SBPI and DBPI were not better associated with any variable than simple BP. This lack of relationship must be a consequence of the statistical procedures since the partial adjusted to maturation would removed the effect of height on BP.

► Further prospective studies using accelerometry or larger samples must be need in order to explore deeply the impact of PA on BP in adolescents.

## Acknowledgments

This work was supported by the Spanish Ministry of Education, Culture and Sport (AP2010-0583), Spanish Ministry of Economy and Competitiveness (DEP2011-30565) and the University of Málaga (Campus of International Excellence Andalucía Tech).

## References

- Galescu, O., George, M., Basetty, S., Predescu, I., Mongia, A., Ten, S., & Bhangoo, A. (2012). Blood Pressure over Height Ratios: Simple and Accurate Method of Detecting Elevated Blood Pressure in Children. *Int J Pediatr*, 253497.
- Hearst, M. O., Sirard, J. R., Lytle, L., Dengel, D. R., & Berrigan, D. (2012). *J Phys Act Health*, 9(1), 78-85.
- Kelley, G. A., Kelley, K. S., & Tran, Z. V. (2003). *Prev Cardiol*, 6(1), 8-16.
- Muntner, P., He, J., Cutler, J. A., Wildman, R. P., & Whelton, P. K. (2004). *JAMA*, 291(17), 2107-2113.
- Rosa, M. L., Fonseca, V. M., Oigman, G., & Mesquita, E. T. (2006). *Arq Bras Cardiol*, 87(1), 46-53.