

# MATURATION LEVEL IN ADOLESCENTS: EFFECTS ON BODY COMPOSITION AND PHYSICAL ACTIVITY CHANGES

Benítez-Porres J.<sup>1</sup>, Alvero-Cruz J.R.<sup>2</sup>, Moore J.B.<sup>3</sup>, Carnero E.A.<sup>1</sup>



UNIVERSIDAD DE MÁLAGA



1. Biodynamic and Body Composition Laboratory. University of Malaga. Spain

2. Exercise Physiology Laboratory. University of Malaga. Spain.

3. Department of Health Promotion, Education, and Behavior. University of South Carolina. USA.



## Introduction

Longitudinal studies help move researchers closer to understanding determinants and mediators of maturation, physical activity (PA) and adiposity.

## Purpose

The aim of this study was to longitudinally explore the influence of maturation on PA and adiposity changes in adolescents.

## Methods

Eighty healthy adolescents (42 girls and 38 boys) were followed over three academic years. A PA score was estimated using the Physical Activity Questionnaire (PAQ-A). Fat mass percentage (FMP) was assessed by anthropometric measurements. Sexual maturity was estimated by percentage of predicted adult stature and adolescents were classified into three changes groups: C0, change from on time to late maturation; C1, no change; C2, change from late/on time to on time/early maturation. A stepwise linear regression was conducted in order to estimate the predictors of PA and FMP changes.

**Table 1.** Comparison of characteristics of participants at baseline and years 1 and 2 by sex (n=80).

	S1		S2		S3		S1-S2 sig.	S2-S3 sig.
	Girls	Boys	Girls	Boys	Girls	Boys		
Age (years)	14.5±1.8	14.6±2.6	14.8±1.7	15.1±2.4	16.2±1.6	16.1±2.3	†††	†††
Weight (Kg)	52.1±12.7	55.4±12.2	52.4±12.1*	59.6±12.8	54±11.3**	60.8±10.1	†††	
Height (cm)	157.5±7.1	162.4±13.7	159.5±7.0**	166.2±11.7	161.1±6.1***	168.7±10.7	†††	†††
BMI (Kg/m <sup>2</sup> )	20.9±4.5	20.8±3.0	20.4±3.7	21.4±3.1	20.8±4.0	21.3±2.5	†††	
FMP (%)	25.6±7.0*	21.0±8.9	24.6±6.8**	19.5±8.0	25.5±6.8***	18.2±7.6		§§
Predicted adult stature (cm)	162.5±5.0***	172.9±6.9	164.3±4.5***	173.8±5.6	163.9±5.2***	173.5±5.4		§§
Predicted adult stature (%)	97.1±4.4*	93.5±9.3	97.2±4.1	95.5±8.4	98.6±2.3	97±6.8	†††	†††
PA Total Score (PAQ-A)	2.3±0.9**	2.8±0.7	2.2±0.6***	3.0±0.6	2.1±0.7**	2.6±0.6	§§§	§§§
FFQ variables								
Carbohydrate (%)	44.7±6.8	46.6±5.8	-	-	45.8±7.2	46.5±6.7		
Protein (%)	15.4±3.1	14.3±2.4	-	-	15.7±4.2	15.1±3.9		
Fat (%)	39.7±6.7	39±5.6	-	-	38.4±5.3	38.1±6.0		
Energy (kcal/day)	3186±1540	3427±1757	-	-	2197±998	2565±1501	†††	§§§

Note: S1, S2, S3 (September 2011, 2012 and 2013 respectively); BMI, Body mass index; FMP, Fat Mass

Percent; PA, Physical activity; FFQ, Food frequency questionnaire.

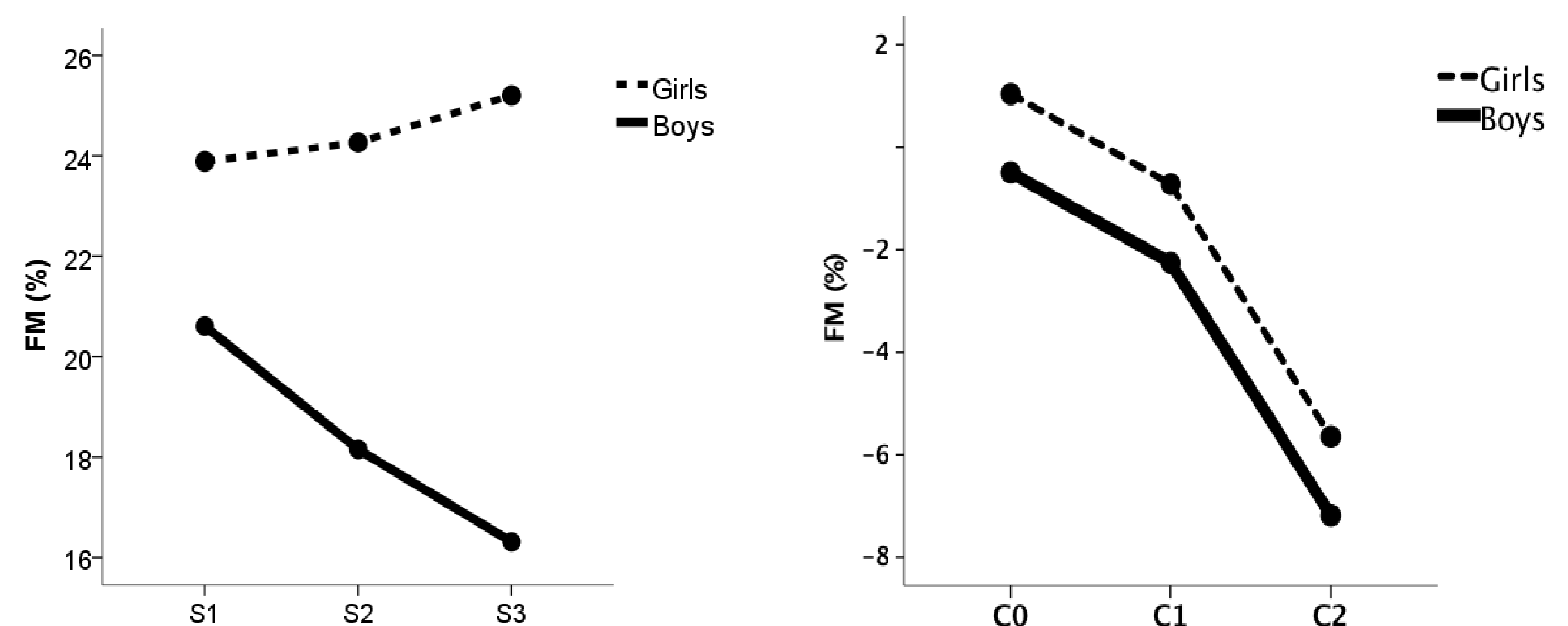
\* P<0.05; \*\* P<0.01, \*\*\* P<0.001; independent sample t test between boys and girls.

††† P<0.001; repeated measures among three moments (time factor).

§§ P<0.01; §§§ P<0.001; interaction between time and sex.

## Results

An interaction between PA and maturation was statically significant (P<0.05). A non-significant trend was observed between three stages of change with a progressive reduction of FMP across the three stages of change in maturation level (C0 = 0.275±2.70%; C1= -1.490±1.10%; C2= -6.417±2.57%; pairwise comparisons: C0 - C2 = 6.69%, P=0.081 and C1-C2 = 4.93%, P=0.080).



**Figure 1.** Changes in fat mass percentage after a 2-year follow-up across change in maturation status.

## Conclusions

Our results suggest that body composition changes observed during adolescence are not driven by changes in PA. PA alteration patterns were influenced by maturation but not by sex.

## 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 University of Málaga (Campus of International Excellence Andalucía Tech).

## References

- International Society for The Advancement In Kinanthropometry (2001). *International Standards for Anthropometric Assessment*. Australia: ISAK.
- Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). Growth, maturation, and physical activity. Champaign, IL: Human Kinetics.
- Reilly, J. J., & Kelly, J. (2011). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. *International Journal of Obesity*, 35(7), 891-898. 2.
- Slaughter, M. H., Lohman, T. G., Boileau, R. A., Horswill, C. A., Stillman, R. J., Van Loan, M. D., & Bembien, D. A. (1988). Skinfold equations for estimation of body fatness in children and youth. *Hum Biol*, 60(5), 709-723.