



Children with obesity are taller in early childhood with subsequent catch-down growth until adolescence

Elena Kempf¹, Tim Vogel¹, Jürgen Kratzsch², Mandy Vogel³, Kathrin Landgraf^{1,4}, Elena Sergeev¹, Wieland Kiess^{1,3}, Juraj Stanik^{1,5}, Antje Körner^{1,3,4}

¹Center for Pediatric Research Leipzig, Hospital for Children & Adolescents, University of Leipzig, Germany, ²Institute of Laboratory Medicine, Clinical Chemistry and Molecular Diagnostics, University of Leipzig, Germany, ³LIFE – Leipzig Research Center for Civilization Diseases, University of Leipzig, Germany, ⁴Integrated Research and Treatment Center (IFB) Adiposity Diseases, University of Leipzig, Germany, ⁵Department of Pediatrics, Medical Faculty at the Comenius University, and DIABGENE Laboratory, Bratislava, Slovakia

Background & Aim

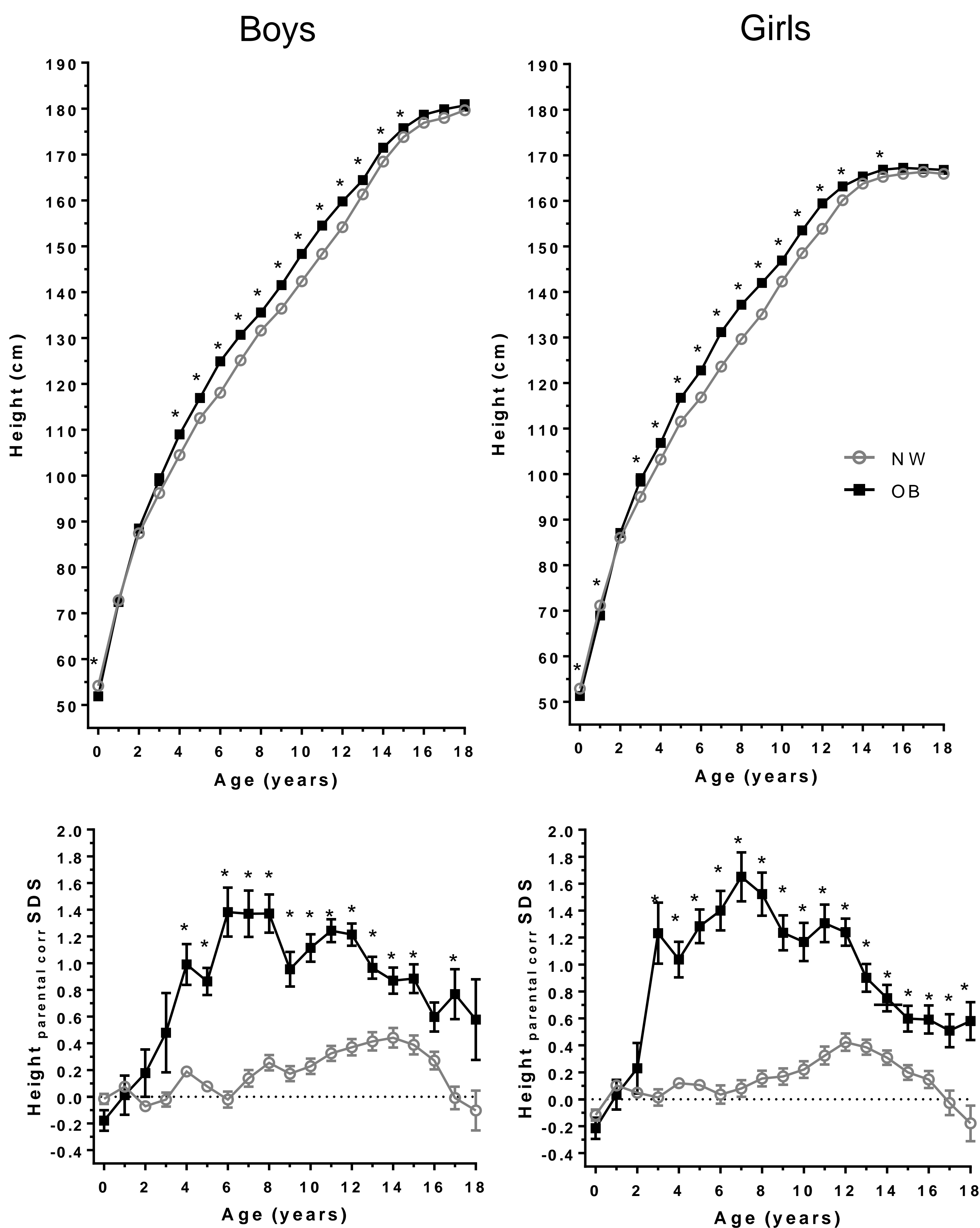
Childhood obesity is supposed to affect growth and development in children^{1,2} but there is uncertainty with regards to dynamics and potential causes. We want to decipher when the obesity-related differences in linear growth are developing and which hormonal factors are most closely related to those differences.

Study Design

In the LIFE Child and Leipzig Obesity Childhood Cohort including 35134 data sets from 7961 children we compared cross-sectional and longitudinal anthropometric, parental and endocrine data from birth to adulthood in one-year intervals between normal-weight (NW) and obese (OB) children.

Results

1. Obese children are taller in early childhood



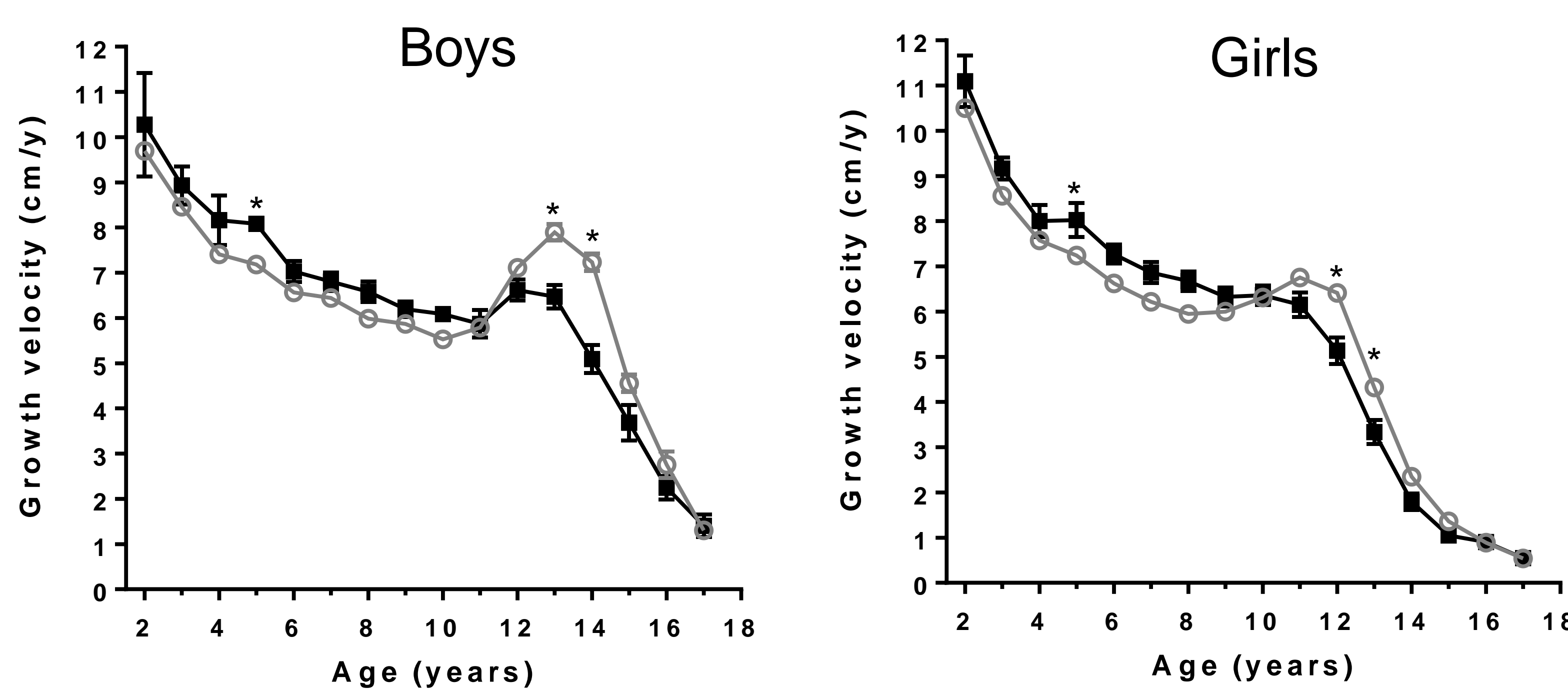
Obese children were up to 7.6 cm (1.4 standard deviation scores (SDS) taller than normal-weight children at ages 6-7 years independently from familial predisposition.

2. Obese children were born with increased birth length

	NW		OB		p
	birth length (cm) ± SD	N	birth length (cm) ± SD	N	
Boys (4-14 years)	51.11 ± 2.18	1033	51.38 ± 2.36	465	0.032
Girls (4-14 years)	50.12 ± 2.08	818	50.61 ± 2.61	448	<0.001

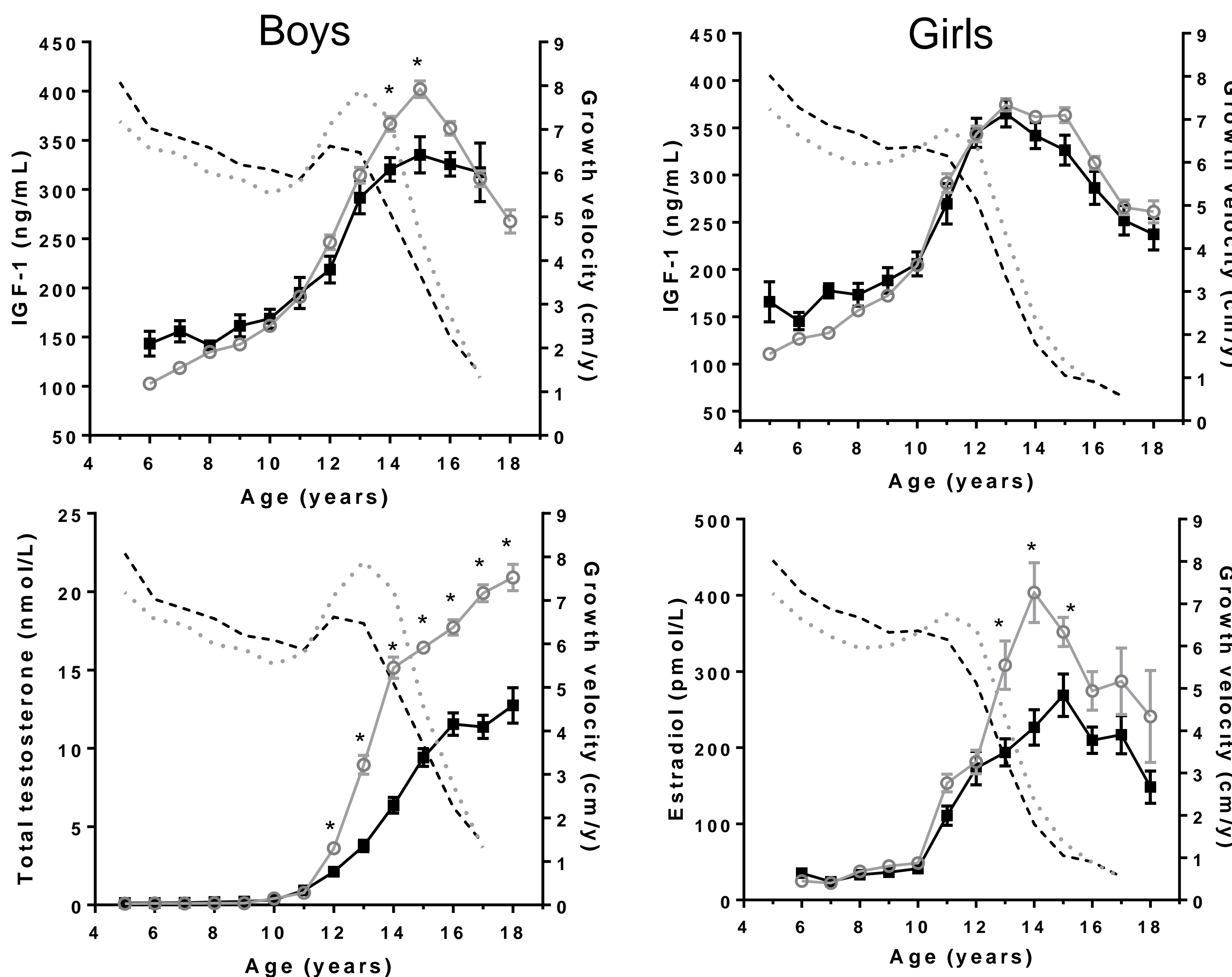
Obese children were up to 0.5 cm taller at birth than normal-weight children.

3. Growth velocities are altered in obese children



Obese children grew faster at the age of 5 years and slower during puberty. The pubertal growth spurt is almost lacking.

4. Differences in growth velocities coincide with differences in serum levels of IGF-1 and sex hormones



In obese children IGF-1 levels tend to be elevated in early years and are decreased during puberty. Simultaneous with the decrease in growth velocity obese boys present up to 58% reduced testosterone and obese girls up to 43% reduced estrogen levels during puberty.

Conclusion

Dynamics of linear growth and circulating hormone levels in obese children are distinct from those of normal-weight peers. In future studies we aim to investigate the underlying molecular mechanisms of how obesity contributes to changes in serum hormone levels in children and to assess potential risks for sequelae emanating from those hormonal imbalances.

The authors declare they have no conflict of interest.

