The specific pubertal height gain is higher in boys as well as in children with lower BMI SDS

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Introduction

Growth in height during puberty can be described by the QEPS-model as the sum of the continuous basal growth expressed by the, Q, E, and S functions and the specific pubertal growth function, P. $T_{pubgain} = QES_{gain} + P_{gain}$.

Fig.1 The QEPS growth model (left), with pubertal growth functions (right). (Modelling individual longitudinal human growth from fetal to adult life QEPS I. Nierop et al. Journal of theoretical biology 2016;406:143–65).

Fig.2 The specific pubertal gain in adult height in cm due to P-function growth. $P_{max}$ is related to the highest BMI SDS for each girl (red circles) and boy (blue cross).

Fig.3 The pubertal growth by different QEPS functions related to BMI SDS in childhood, Underweight (blue cross), normal (blue open circles), overweight (red open circles), obese (red circles).

Fig.4 Height at onset of pubertal growth ($T_{AgeTon}$), related to BMI SDS in childhood.

Material/methods

The longitudinally followed GrowUpGothenburg1990 birth cohort (Sjöberg A. et al. Acta paediatrica 2012;101:964-72), was analyzed by the QEPS-model.

Individual maximal BMI SDS values, from 3.5-8.0 years of age (n=1901, 45349 measurements) were calculated for linear and subgroup analyses.

Underweight (Uw), normal (Nw), overweight (Ow), obese (Ob), were based on the IOTF 2012 reference (Cole TJ, Lobstein T. Pediatric obesity. 2012;7(4):284-94).

Objectives

To study the relationship between childhood BMI SDS and the pubertal gain related to growth functions from the QEPS-model in detail.

Results and conclusions

For girls, total pubertal gain ($T_{pubgain}$) depended more on $QES_{gain}$ during puberty.

For boys, total pubertal gain depended more on specific $P_{gain}$.

With higher BMI SDS this balance was shifted towards less $P_{gain}$ for both girls and boys.

Before puberty, children with higher BMI SDS were taller, with a linear correlation over the whole BMI–range.

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