The pubertal gain in height is inversely related to body mass index (BMI) in childhood

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Background/Objective

Weight in childhood may influence the pubertal timing and pattern of growth. The objective of our study was to investigate the impact of body mass index (BMI) in childhood on further pattern of growth. The objective of our study was to investigate the longitudinally followed birth cohort (N=1,901), 45,349 measurements.

Methods

Birth weight (g) 3712 3491 221 p <0.0001 3760 3638 122 p =0.0029

Adult height (cm) 168.3 168.2 0.037 NS 181.9 181.6 0.29 NS

Material

Figure 3. Individuals with complete longitudinal data in the longitudinally followed GrowUpGothenburg1990 birth cohort (N=1,901), 45,349 measurements. Individual BMIxSDS values, from 3.5-8 years of age were calculated for linear and subgroup analyses (normal/underweight – NWUW, overweight/obese – OWOB), based on the IOTF 2012 reference1.

Results

Figure 1. Qmax (the "childhood component" of growth) related to the highest childhood BMIxSDS1. Vertical lines, shows the borders for underweight (UW), normal weight (NW), overweight (OW) and obesity (OB).

For girls: Qmax =97.47 + 2.02 x BMIxSDS, adjusted r² =0.046. For boys: Qmax =104.32 + 2.02 x BMIxSDS, adjusted r² =0.049.

Figure 2. Pmax (the specific pubertal gain) related to the highest childhood BMIxSDS1. Across the whole BMI range a negative dose-response effect of childhood BMI on pubertal gain (Pmax) was found.

For girls; Pmax= 13.66 - 1.35 x BMI SDS, adjusted r² = 0.11. For boys; Pmax= 18.05 - 1.61 x BMIxSDS, adjusted r² = 0.13.

OWOB children were heavier at birth, and they grew faster in height in the pre pubertal period compared to NWUW, as evidenced by an increased Q max.

OWOB children had earlier puberty, boys/girls, 91-117 days, reduced pubertal growth, boys/girls 3.13/2.26 cm less pubertal gain from the specific pubertal growth function (Pmax). The adult height was not related to BMI in childhood.

Conclusions

The higher BMI in childhood, the faster the pre pubertal growth, the earlier onset of puberty, the less pubertal gain. This was evident across the whole BMI-range, making weight status an important modifier of longitudinal growth.