The more obese -the less pubertal height gain

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Introduction

The QEPS growth model can describe pubertal growth[1,2] (Fig 1).
In a population of a community-based setting, (GrowUp 1990 Gothenburg) BMI_{SDS} range -3.5 to +4.1, there is a negative linear correlation between childhood BMI_{SDS} and pubertal height gain (Fig 2) , together with earlier onset of pubertal growth with higher BMI_{SDS} for both sexes[3].

Objective

To investigate the impact of BMI in childhood on the pubertal pattern of growth for obese children in a clinical setting.

Fig.1 QEPS growth model (left), with pubertal growth functions (right).

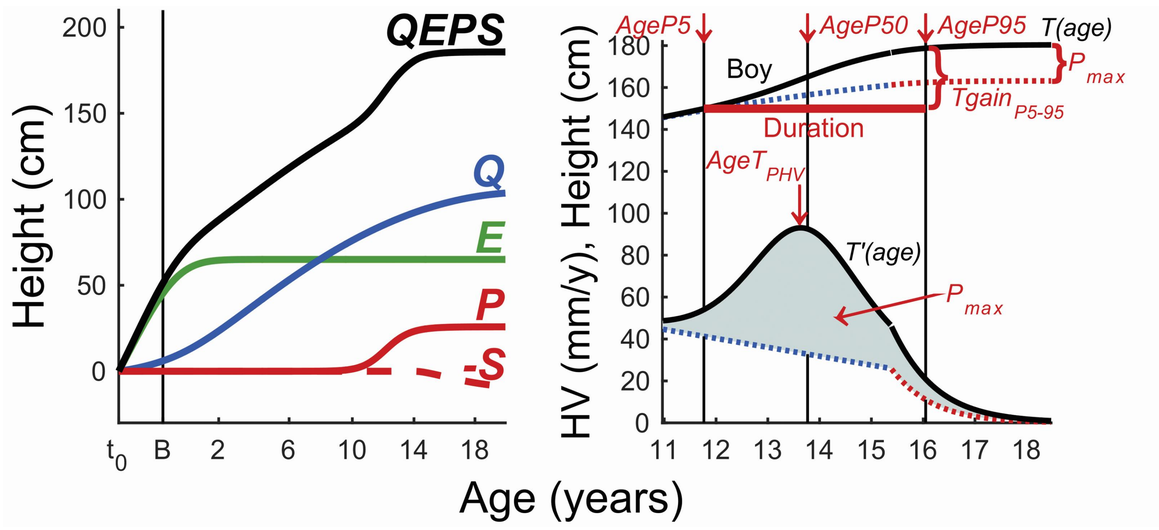
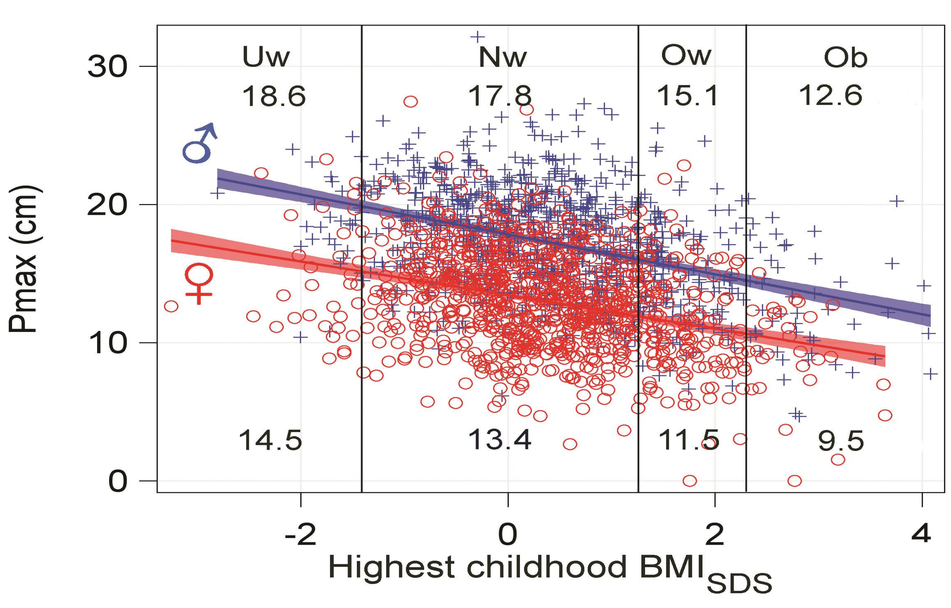


Fig.2 GrowUp 1990 Gothenburg. The specific pubertal gain in adult height in cm due to P-function growth, (*Pmax)* is related to the highest BMI_{SDS} during childhood for each girl (red circles) and boy (blue cross).



Material/methods

Pubertal growth in obese children in a clinical setting (University hospital, Madrid) were analyzed and compared with the longitudinally followed population, the GrowUp1990 Gothenburg cohort (community-based setting). The obese study-group from Madrid included 47 children (26 females) with BMI_{SDS} at diagnosis of +2.0 to +7.4. Analyses were done with the QEPS growth model[1]. Individual BMI_{SDS} values were related to individual growth functions from QEPS-model; *Pmax* (specific pubertal gain, cm) and *AgeP5* (age in years at 5% of the specific pubertal growth, representing onset of pubertal growth)[2].

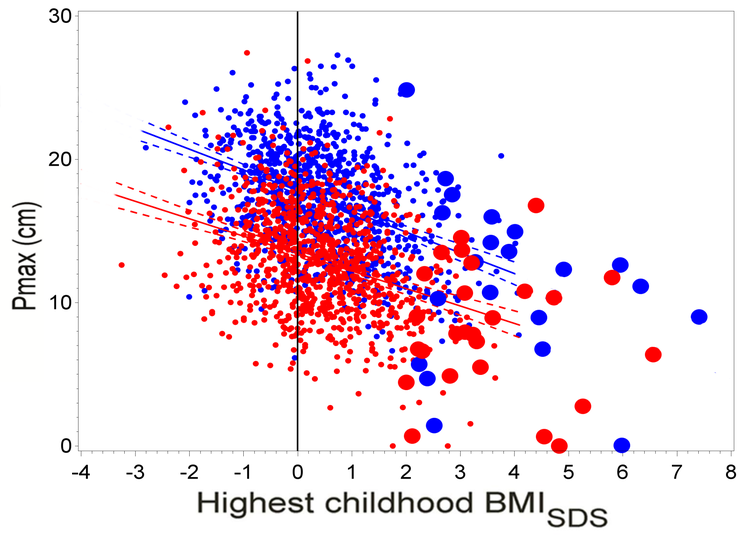
References:
1. Nierop et al, Journal of Theoretical Biology 2016;406:143–65
2. Holmgren et al, BMC Pediatrics 2017;17:107
3. Holmgren et al, Pediatric Research 2017;81,448–454

Conclusion

The higher BMI_{SDS} in childhood; the less the specific pubertal gain,
the earlier the onset of pubertal growth.

BMI is an important modifier of pubertal growth in both normal-weight & obese children.

Fig.3 Specific pubertal height gain (*Pmax)* in community based setting (Gothenburg, small circles) and in obese children (Madrid, large circles) is related to highest BMI_{SDS} in childhood. Girls red, boys, blue.



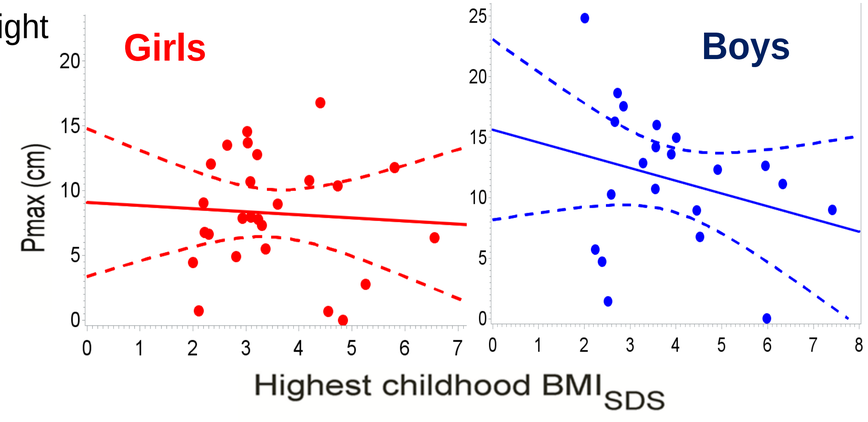
Results –specific pubertal height gain

In obese children (Madrid), as well as in the population study (Gothenburg), BMI_{SDS} showed a negative correlation with specific pubertal gain (Fig 3).

Pmax was 9.07 cm - 0.24 x BMI_{SDS} in females, 15.61 cm - 1.05 x BMI_{SDS} in males, meaning that every increase in BMI_{SDS} by 1 is equal to 0.24 cm less pubertal height gain for females and 1.05 cm for males. (Fig 4).

There were differences when compared to the population study; however, the patterns were similar as seen in Figs 3 & 4. (*Pmax* = 13.66-1.35 x BMI_{SDS}, in girls, 18.05-1.61 x BMI_{SDS} in boys, population study).

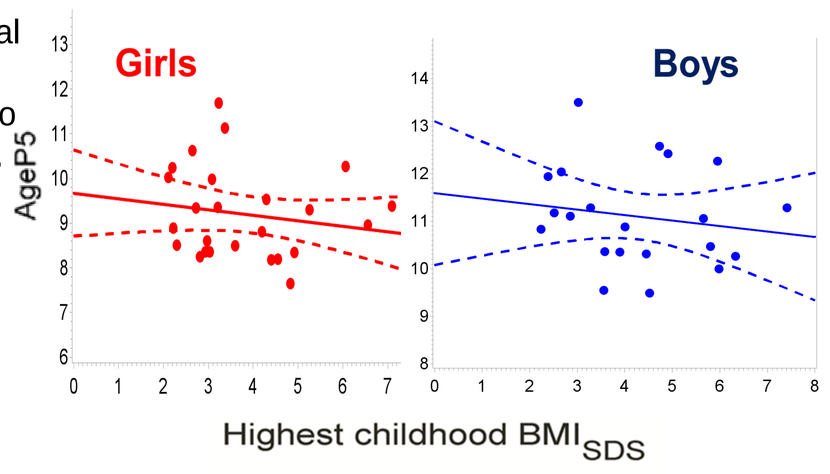
Fig.4 Specific pubertal height gain (*Pmax)* in obese children (Madrid) is related to highest BMI_{SDS} in childhood.



Results –age at onset of pubertal growth

There was a linear correlation of obesity degree (BMI_{SDS}) and onset of pubertal growth (*AgeP5*): 9.67 years - 0.121 x BMI_{SDS} in girls, 11.59 years - 0.115 x BMI_{SDS} in boys (Fig 5). The results were similar to the results from the population study (with *AgeP5* 9.82 years - 0.137 x BMI_{SDS} in girls, 11.81 years - 0.127 x BMI_{SDS} in boys), meaning that every increase in BMI_{SDS} by 1 SD-score give an earlier onset of pubertal growth by 1.4-1.6 month (both sexes, both study groups).

Fig.5 Age at onset of pubertal growth (*ApeP5*) in obese children (Madrid) is related to highest BMI_{SDS} in childhood.



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