



The specific pubertal height gain is higher in boys as well as in children with lower BMI_{SDS}

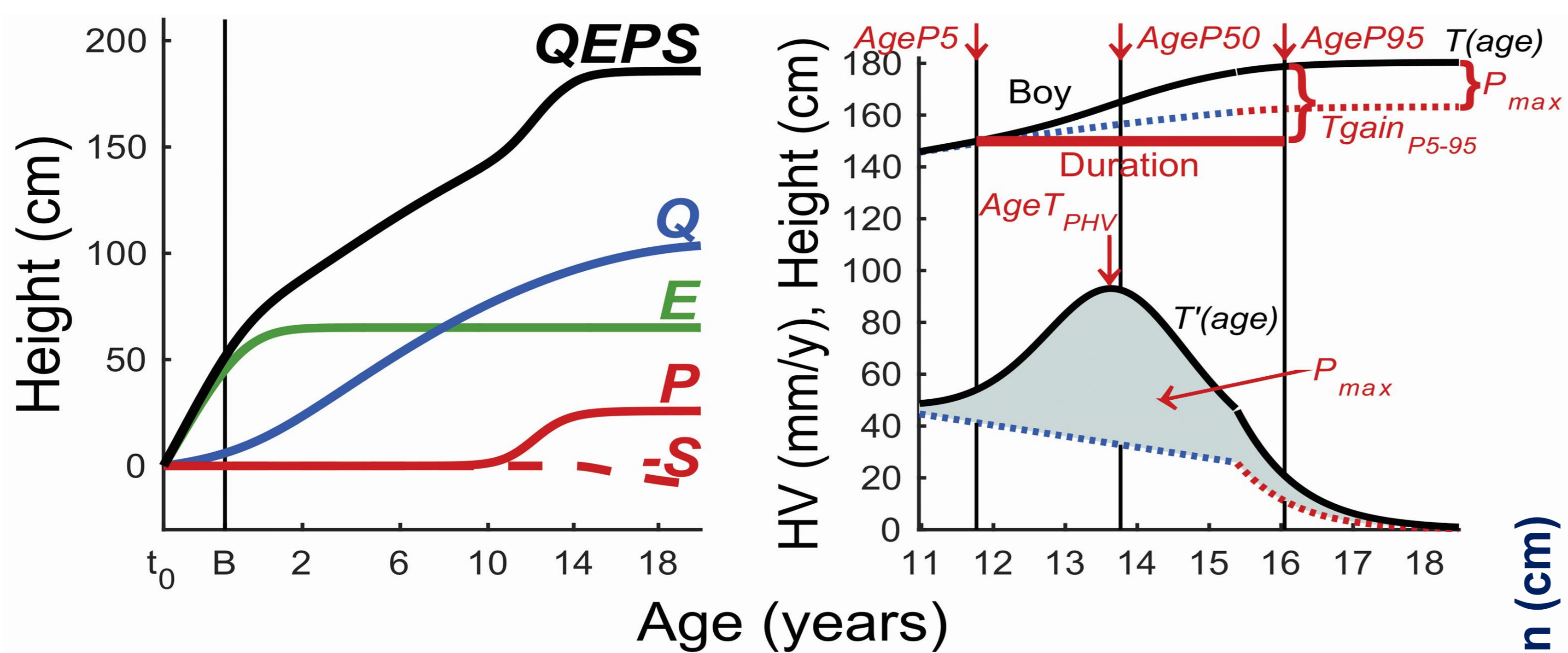
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Introduction

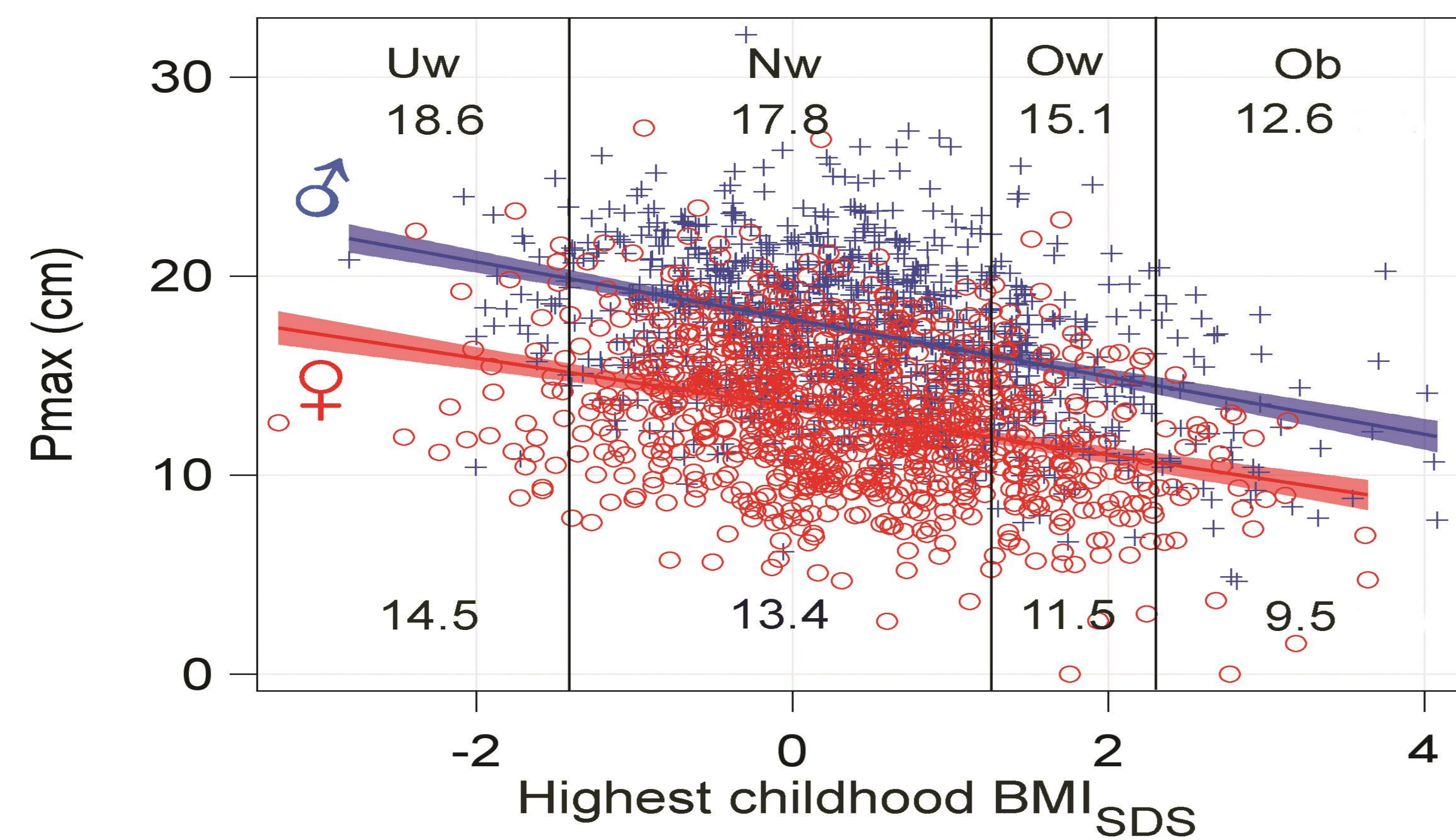
Growth in height during puberty can be described by the QEPS-model as the sum of the continuous basal growth expressed by the, Q, E, and S functions and the specific pubertal growth function, P. $T_{pubgain} = QESgain + Pgain$.

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).



Childhood BMI is inversely related to pubertal height gain. Thus Ow/Ob children have less specific pubertal height gain. (Pubertal height gain is inversely related to peak BMI in childhood, Holmgren A. et al, Pediatric Research, 2016, resubmitted).

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).



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.

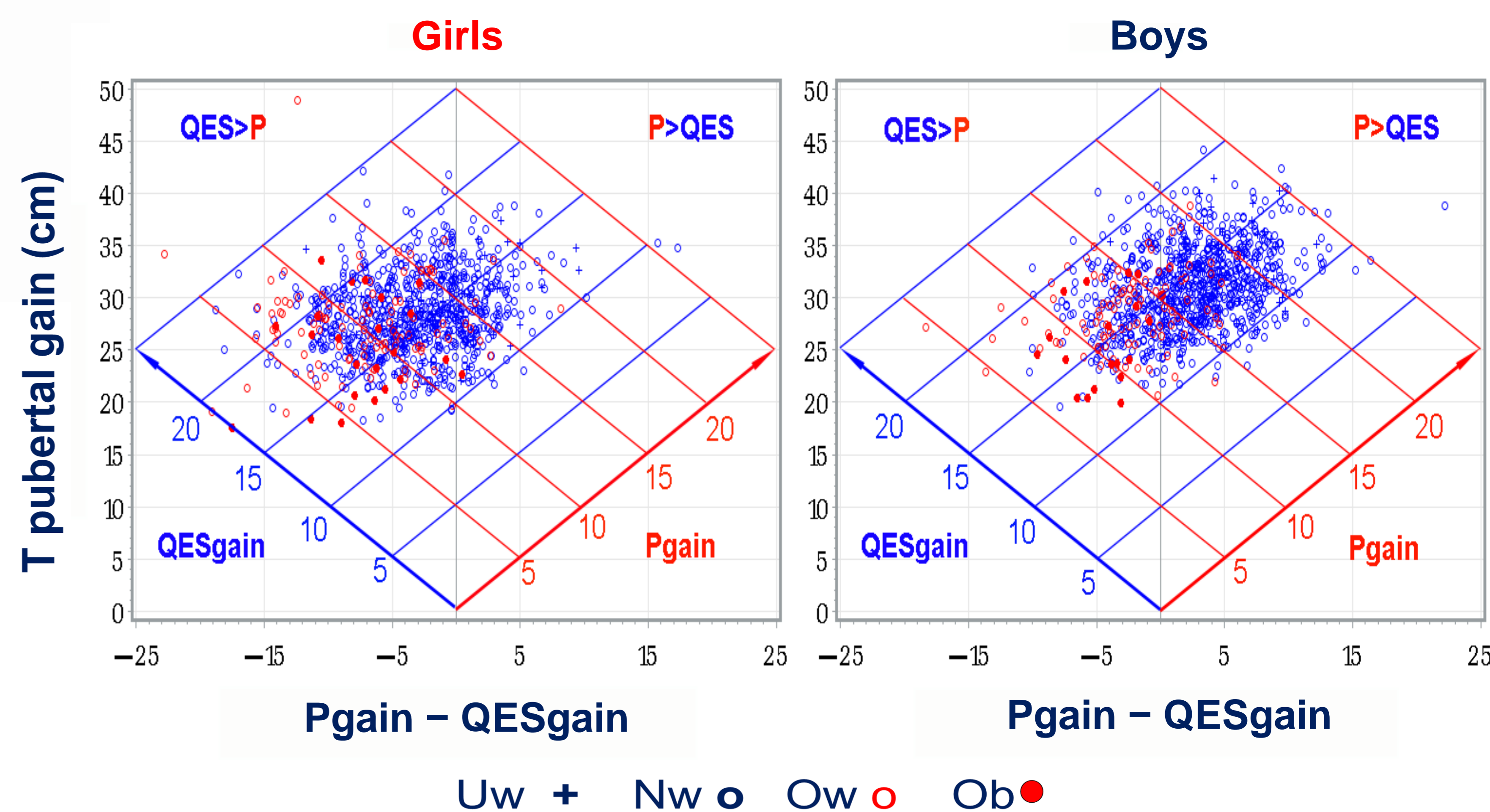
Results and conclusions

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

For boys, total pubertal gain depended more on specific **Pgain**.

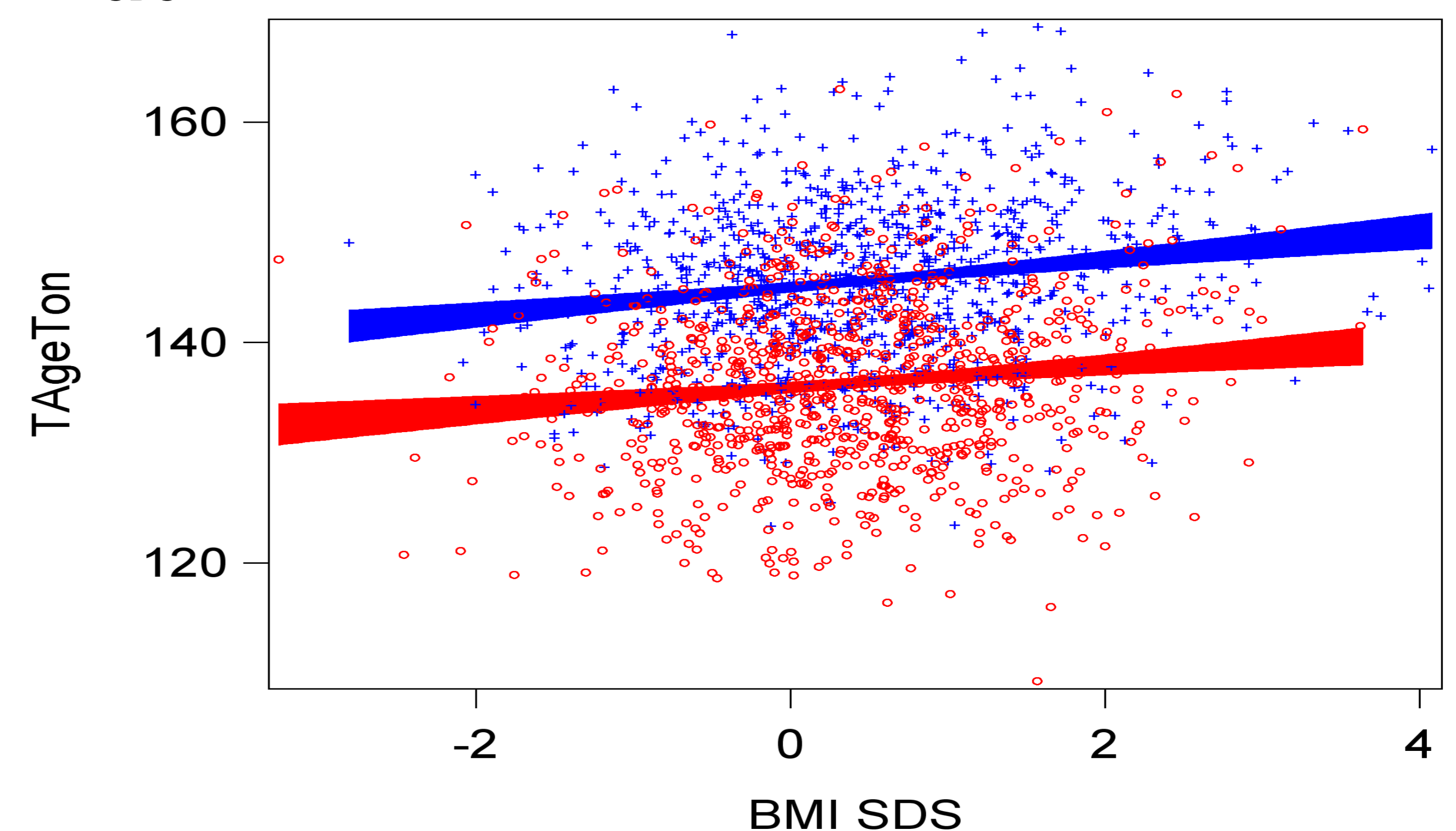
With higher BMI_{SDS} this balance was shifted towards less **Pgain** for both girls and boys.

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).



Before puberty, children with higher BMI_{SDS} were taller, with a linear correlation over the whole BMI-range.

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



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