

RELATION BETWEEN SPECIFIC PUBERTAL GROWTH AND BREAST MATURATION – A LONGITUDINAL STUDY IN HEALTHY GIRLS

S. Bergendahl¹, A. Niklasson², A. S. Aronson^{1*}, A. F.M Nierop^{3,4}, K. Albertsson-Wikland^{3*} and A. Holmgren^{1,2*}

¹Department of Pediatrics, Halland Hospital, Halmstad, Sweden.

²GP-GRC, Department of Pediatrics, Institute of Clinical Sciences, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden.

³Department of Physiology/Endocrinology, Institute of Neuroscience and Physiology, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden.

⁴Muvara bv, Multivariate Analysis of Research Data, Leiderdorp, The Netherlands. *ESPE members



UNIVERSITY OF
GOTHENBURG

INTRODUCTION

Few studies have investigated in detail how the pubertal breast maturation in girls is related to the pubertal growth spurt in a longitudinal setting. The golden standard for assessment of secondary sex characteristics for girls includes breast development (B1-B5)¹. The different maturation stages follow the increasing estradiol production from the ovaries also giving rise to the pubertal growth spurt. The QEPS-growth model makes it possible to conduct detailed analyses of pubertal growth and separate total growth into specific pubertal height gain (P-function) and basal/prepubertal growth (QES-functions) (fig 1)^{2,3}.

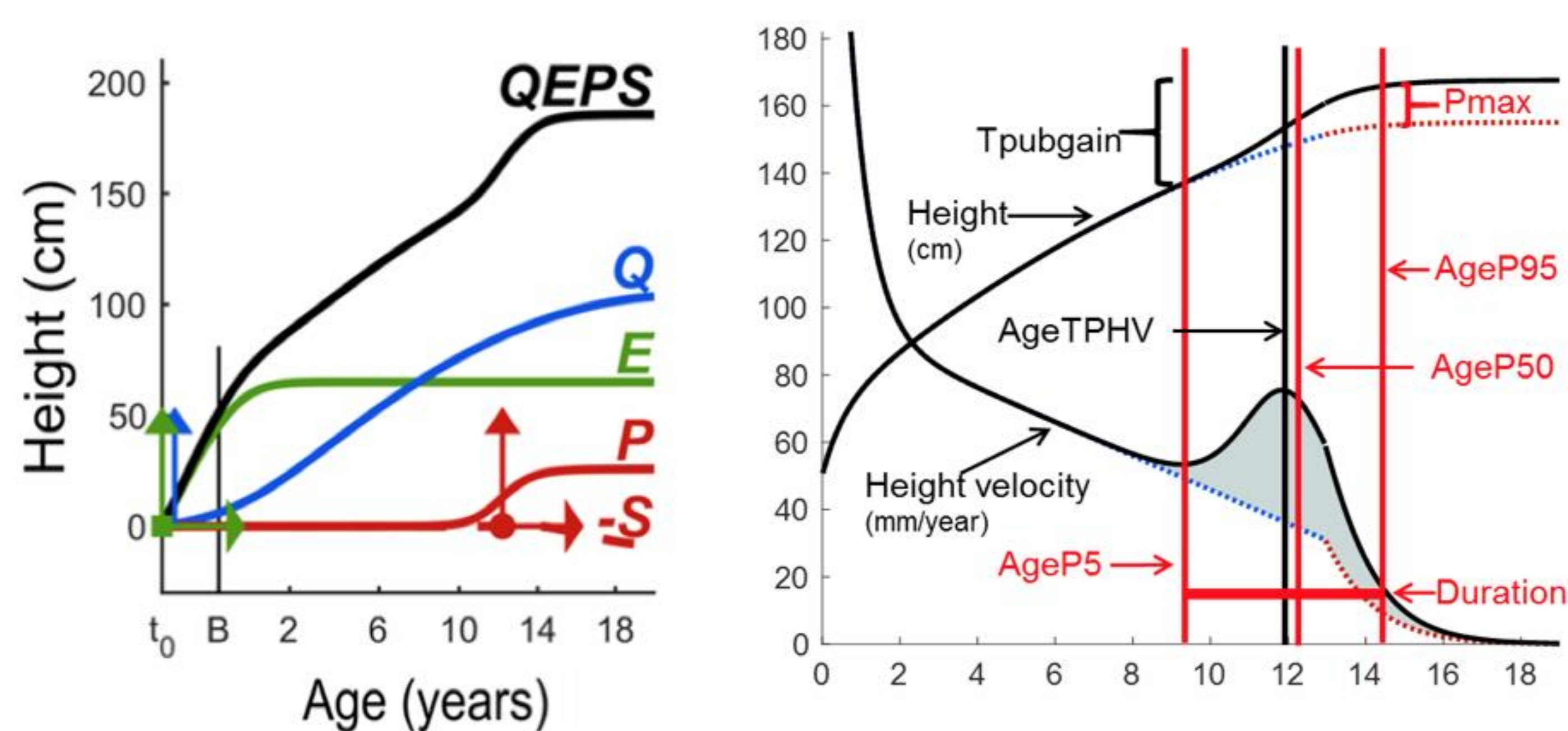


Fig 1. QEPS Growth model (left), with pubertal growth functions (right).

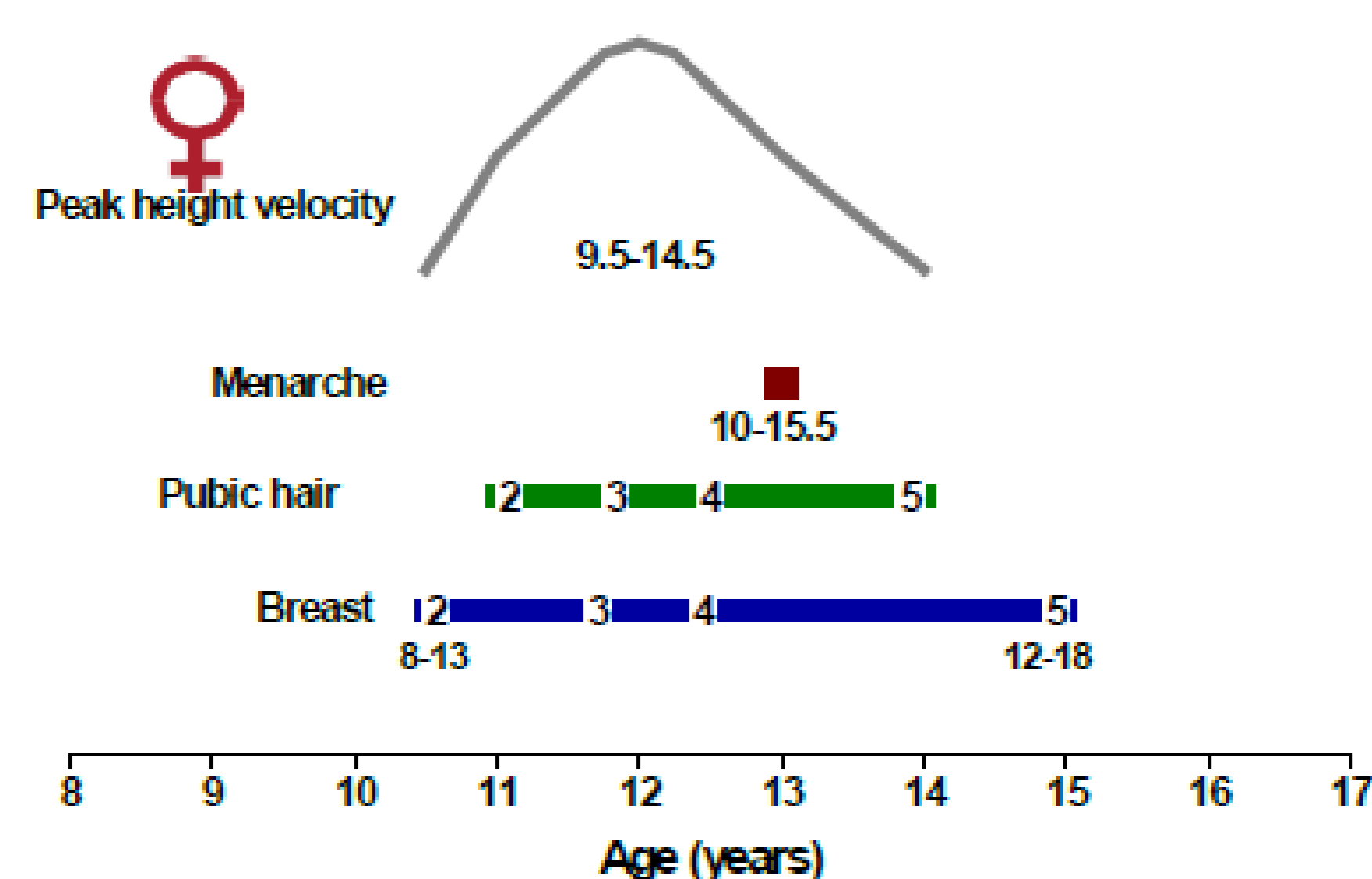


Fig 2. Pubertal development in girls (modified from Tanner¹)

AIM

The aim of this study was to investigate the relationship between the development of breast maturation in healthy girls and their pubertal growth spurt. It was also to visualize the individual variation in the relation between breast maturation and the attained specific pubertal height gain.

RESULTS

As expected, with increasing stages of breast maturation the specific P-function, pubertal height gain, increased, and each girl followed an individual trajectory. However, the individual variation was considerable as seen by the range in the Table below (table 1). At B2 median P-percent (%) was 28 with a range 4-83%. Corresponding values at B3, B4 and B5 were 61%, 85% and 96% as seen in table 1.

Table 1. Median and range of P-percent (P%); percent of specific P-function pubertal height gain, attained at different Pubertal Stages B by Tanner. Also median age for each pubertal stage.

Pubertal Stage	Median P%	Range P%	Median age
B2	28	4-83	12,1
B3	61	25-82	12,9
B4	85	65-96	14,1
B5	96	83-100	15,9

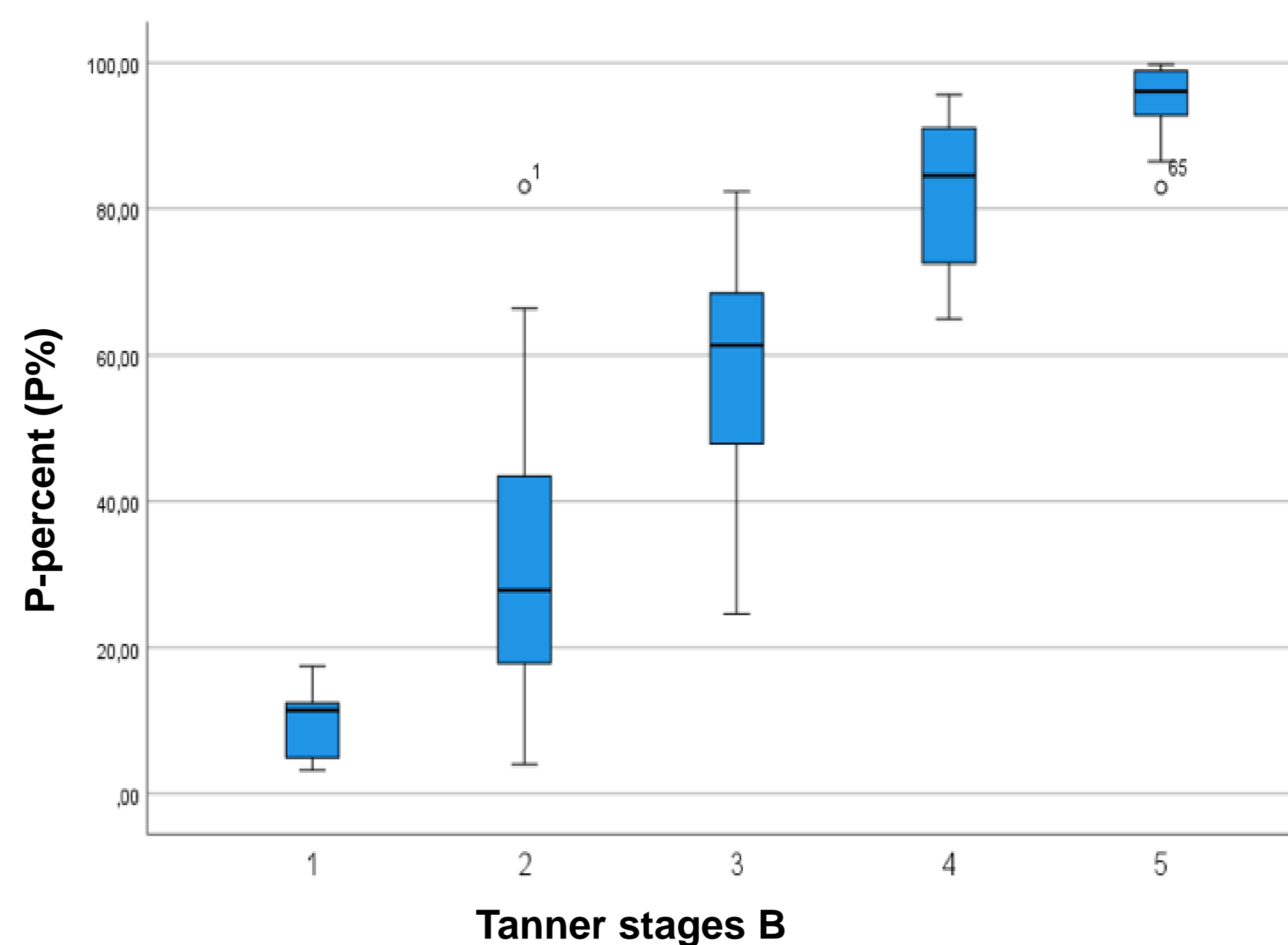


Fig 3. Median values with inter-Quartile-range for specific pubertal height gain in P-percent related to pubertal stages B. Outliers marked as o.

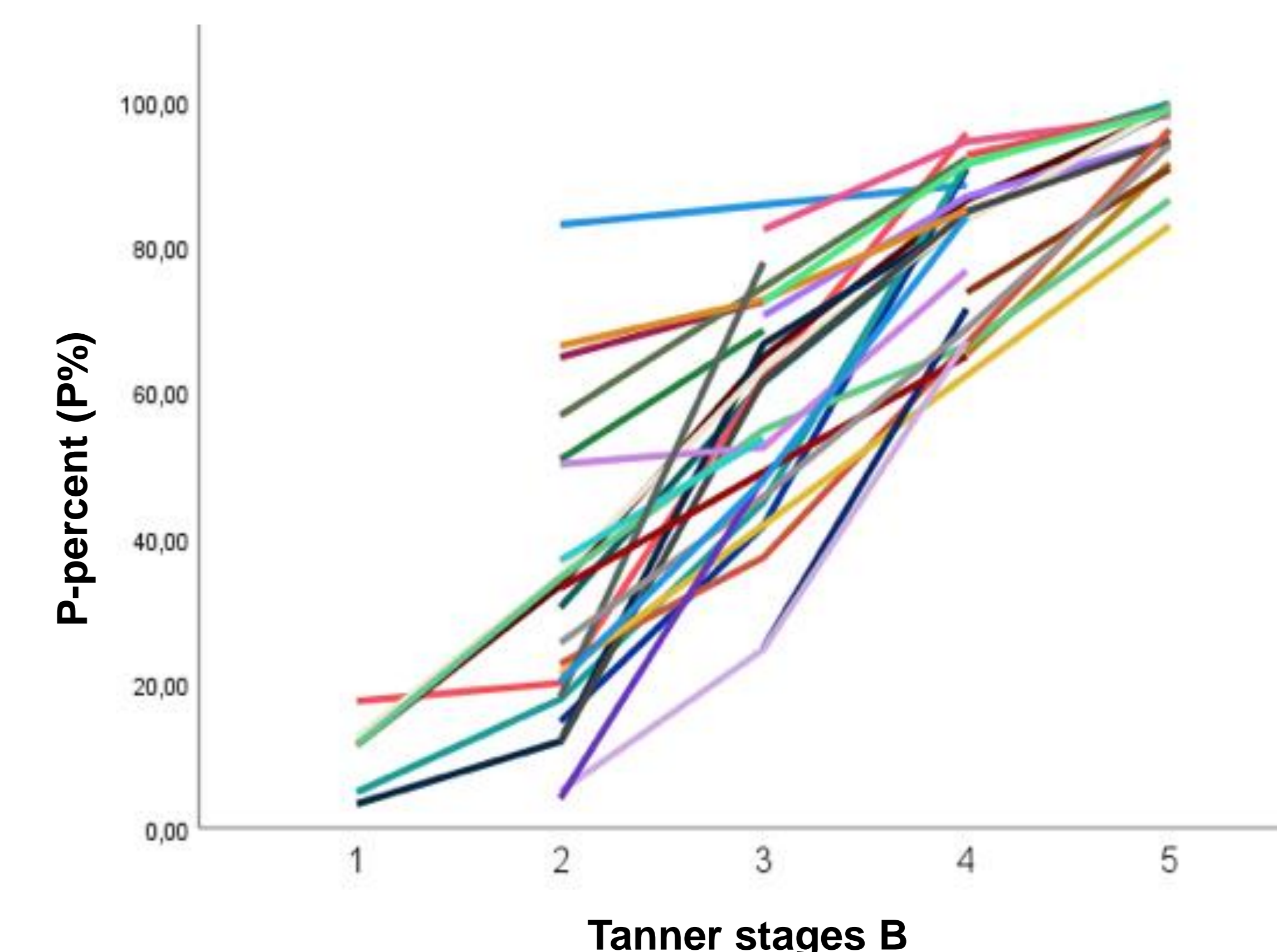


Fig 4. Specific pubertal height gain in P-percent related to Tanner stages B, all individual trajectories are displayed in an individual color.

METHOD

The study group included 32 healthy girls with normal heights (+/- 3 SD) who were longitudinally followed during puberty with 1-4 yearly visits, including height measurements and assessments by trained paediatric endocrinologists of breast maturation, by the method of Tanner¹. Maturation was assessed 2-9 times for each girl.

Analyses of growth patterns were done with the QEPS-growth model^{2,3}.

Pubertal heights were expressed in both cm and as QEPS-growth estimates, i.e. how many % of Pmax, the specific P-function-pubertal growth, that was attained at each visit. Breast maturation was related to % of the specific P-function-pubertal gain attained (P%).

CONCLUSIONS

The specific pubertal gain in height has for the first time been analysed and visualized in relation to breast maturation during puberty in girls.

We describe graphically the breast maturation in relation to the specific pubertal height gain, demonstrating the validity of the QEPS-model in this new research question.

Each girl followed her trajectory, with broad inter-individual variation in breast maturation versus P%, percent of the specific P-function-pubertal height gain.

REFERENCES

1. Marshall WA, Tanner JM. Arch Dis Child 1969 Jun;44(235):291-303.
2. Nierop A.F.M, et.al. J.Theoretical.Biology,406(2016)143-165.
3. Holmgren A, et.al. BMC.Pediatrics,2017;Apr19;17(1):107

Contact: sophie.bergendahl@regionhalland.se

