Making adult height prediction complete:
Forecasting the age of the growth spurt and the height & velocity trajectories until adulthood

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Background

- Adult height prediction (AHP) based on bone age appears as an incomplete procedure, as it does not reveal the path from the present to the end-point.

- Growth charts offer little help in this respect because they average over children with different age of growth spurt (AGS).

Aim

To extend AHP by also forecasting AGS and the entire height and velocity trajectories until adulthood and displaying this in a growth chart made from the same data as the AHP model.
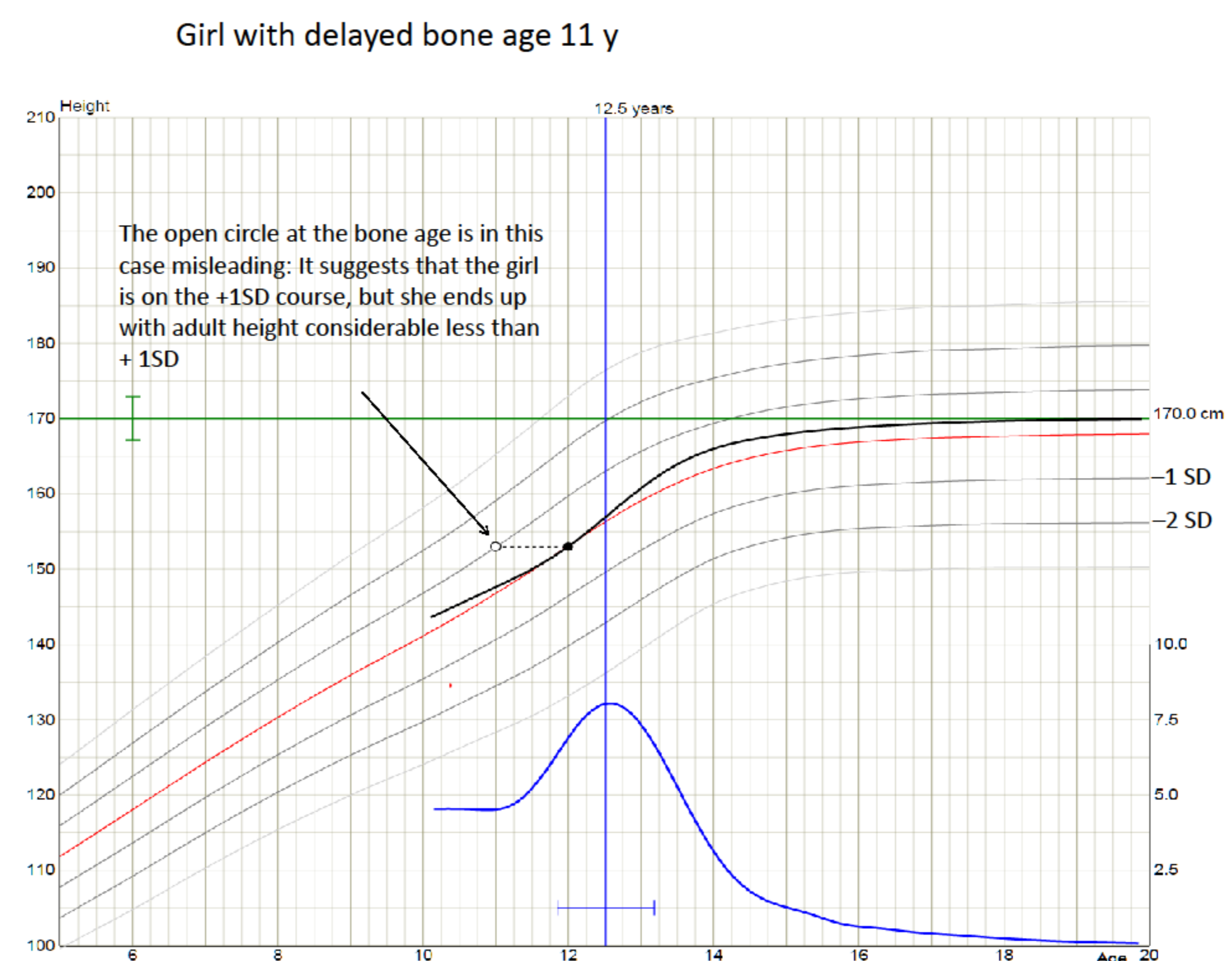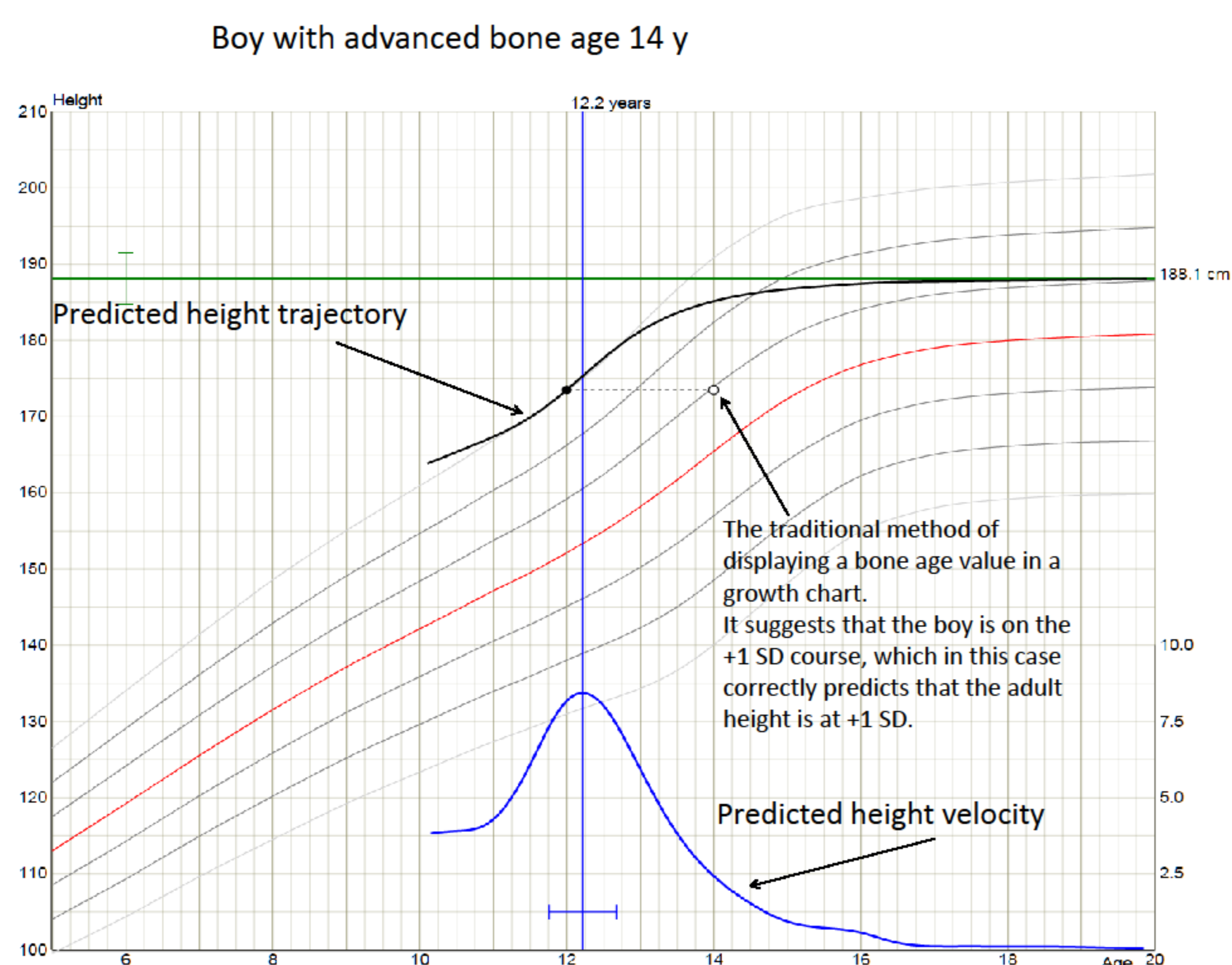
Methods and material

The First Zurich Longitudinal study of 231 normal children born in 1955 was previously used to derive the AHP model (JCEM 2009). We used the same data

- To derive a model to predict AGS.

- To derive height velocity curves corresponding to different AGS values.

- To estimate a standard growth chart, which like the AHP model can be scaled to any mean population height.

For a new child, the method does this:

- AGS is predicted

- AGS is used to select the most likely height velocity trajectory.

- The velocity trajectory is integrated (and normalised) to form the most likely height trajectory that ends up in the most likely value predicted by the previously developed AHP model.

Boy with advanced bone age 14 y

Predicted height trajectory

The traditional method of displaying a bone age value in a growth chart. It suggests that the boy is on the +1 SD course, which in this case correctly predicts that the adult height is at +1 SD.

Predicted height velocity

Girl with delayed bone age 11 y

The open circle at the bone age is in this case misleading: It suggests that the girl is on the +1SD course, but she ends up with adult height considerable less than + 1SD

Results

The method is implemented as a freely available, interactive tool available on www.BoneXpert.com/adult-height-predictor

Gender:	● Male ○ Female		
Ethnicity:	Caucasian European ▾		
	Population height: 181.0 cm		
Age:	12	APHV:	12.2 ± 0.5 y
Bone Age:	14	Bone Age SDS:	2.06
Height:	173.5 cm	AHP (x-ray):	188.1 ± 3.4 cm
Father's Height:	189 cm	AHP (parental):	184.5 ± 5.9 cm
Mother's Height:	168 cm	AHP (x+p):	188.1 ± 3.2 cm

Conclusions

The tool can provide a useful illustration in clinical practice and in the patient consultation.

It conveys the important message that the shape of an individual's growth curve is quite different from the shape of the growth chart.

At the same time the illustration is anchored in the well-validated AHP model

Reference

Thodberg HH, Jenni OG, Caflisch J, Ranke MB, Martin DD: **Prediction of Adult Height Based on Automated Determination of Bone Age**, JCEM 94: 4868-74 (2009)

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Growth

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