**Age at Peak Height Velocity Protocol for the Healthy Bones Study III**

***Paragraph Number 1:*** To be eligible for age at peak height velocity (APHV) calculation, boys in the Healthy Bones Study III (HBS-III) cohort had to have at least one height measurement before 11.5 years of age and after 16.5 years of age with a minimum of five measurements during this time period. These age criteria for boys are approximately equal to the average 10th and 90th percentiles from six well-known growth and development studies ([9](#_ENREF_9), [11](#_ENREF_11), [18-20](#_ENREF_18), [22](#_ENREF_22), [23](#_ENREF_23)). Girls in the HBS-III cohort had to have at least one height measurement before 11.0 years of age and after 13.0 years of age with a minimum of four measurements during this time period. These age criteria for girls are approximately equivalent to the 15th and 85th percentiles of the six aforementioned studies. The less conservative range for girls was necessary due to age of entry limitations in our cohort.

***Paragraph Number 2:*** Due to varying study protocols ([5](#_ENREF_5), [13-17](#_ENREF_13)), the scheduled time between height measurements ranged from 3 to 12 months. Missing and mistimed visits resulted in a maximum measurement interval of 30 months in boys and 36 months in girls. However, we minimized gaps between measures during what was determined to be the critical growth period (11.5 to 16.5 years in boys and 11.0 to 13.0 years in girls), as we required a minimum of five and four measures for boys and girls, respectively. We calculated multiple running annual height velocities as growth during the time interval divided by the time interval (cm/year). From these we retained one calculated velocity, that closest to the ideal measurement interval of 0.85 to 1.15 years ([21](#_ENREF_21)). We then fit an interpolating cubic spline ([2](#_ENREF_2), [4](#_ENREF_4), [6](#_ENREF_6), [7](#_ENREF_7), [10](#_ENREF_10)) on a regular grid (10 grid points/year) to each participant’s height velocity data. We selected non-parametric interpolating cubic spline method that intersects and preserves the individual height measurement points. Splines tend to better fit the data compared with structural models such as the Preece-Baines model 1 ([8](#_ENREF_8)). We identified the provisional APHV as the age associated with the maximum interpolated height velocity. We quantified the magnitude of PHV as the centimeters of growth per year occurring at the provisional APHV.

***Paragraph Number 3:*** We then visually inspected the height velocity curve for each participant. If the first or last velocity point was identified as APHV, the magnitude of PHV had to be ≥ 90th percentile to be accepted as APHV and included in our study cohort. We used data from the six growth and development studies listed above to calculate the 90th percentile of PHV magnitude for boys (10.5 cm/year) and girls (≥9.0 cm/year). We modeled our approach after Little et al. ([12](#_ENREF_12)) who accepted first or last velocity points as APHV only if the magnitude was ≥ 90th percentile of the magnitude identified by Buckler ([3](#_ENREF_3)) and Anderson et al. ([1](#_ENREF_1)). We also used the individual plots to visually inspect the impact of velocity calculations based on time intervals outside the range of 0.85-1.15 years. Although we fit the spline using all velocity data, velocities based on intervals <0.85 years may overestimate velocity due to measurement error and seasonal variation, while velocity calculations based on intervals >1.15 years may underestimate velocity ([12](#_ENREF_12)).

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