ORIGINAL ARTICLE

Weight Velocity Percentiles in Children Aged 4-17 Years from Pune During 2007-2013

Vaman Khadilkar,[1,2] Chirantap Oza,[1] Sushil Yewale,[1] Anuradha Khadilkar[1,2]

[1]Department of Growth and Pediatric Endocrinology, Hirabai Cowasji Jehangir Medical Research Institute, Jehangir Hospital, Pune, Maharashtra, India

[2]Interdisciplinary School of Health Sciences, Savitribai Phule University, Pune, Maharashtra, India

Correspondence to: Dr Anuradha Khadilkar, Deputy Director and Consultant Pediatrician, Hirabai Cowasji Jehangir Medical Research Institute, Pune, Maharashtra, India.
Email: anuradhavkhadilkar@gmail.com

Received: 05 Dec 2023; Initial Review: Jan 21, 2024; Accepted: Apr 15, 2024

PII: S097475591600641

ABSTRACT

Objective: To assess weight velocity and the age at peak weight velocity and to construct weight velocity percentiles in 4-17-year-old apparently healthy Indian children.

Method: This longitudinal study enrolled 1045 children (588 boys) from Pune belonging to middle and upper socioeconomic class aged 4-17 years. The study parameters included annual height and weight measurements recorded longitudinally from 2007 to 2013. A total of 5225 weight velocity measurements (2940 on boys) were computed. Age- and gender-specific smoothened weight velocity percentiles (3rd, 10th, 25th, 50th, 75th, 90th and 97th) were constructed using LMS chart maker.

Results: The median weight velocity was low in boys and girls at 4 years, thereafter it increased to a peak of 4.6 kg/year at 13 years in boys, then declined to 1.1 kg/year at 17.5 years. In girls, median weight velocity peaked to 4.0 kg/year at 11 years, then declined to 0.8 kg/year at 17.5 years. Peak velocity-centred analysis revealed higher peak velocities of 7.5 kg/year at 13.1 years and 6.6 kg/year at 12 years in boys and girls respectively.

Conclusion: Weight velocity percentiles are presented for 4-17-year-old apparently healthy Indian children.

***Keywords*:** Anthropometry, Growth velocity Cut-off, Malnutrition, Obesity, Peak Weight, Serial Growth.

INTRODUCTION

Cross-sectional height and weight distance charts based on reference populations are generally used for assessment of growth failure in children [1]. These charts do not represent individual differences in rate of growth or timing of onset of puberty. Longitudinal references are more suitable for tracking the growth of individuals and more applicable for the assessment of growth failure [2].

Many low and middle-income countries (LMIC) are now facing a double burden of malnutrition wherein there is a sharp increase in childhood obesity while the problem of undernutrition remains unresolved [3]. It has recently been reported from many LMIC's including India, that the trend of reduction in undernutrition has slowed or stagnated while the increase in child overweight has accelerated [3]. The prevalence (range) of moderate and severe underweight was highest in India, at 22.7% (16.7–29.6) among girls and 30.7% (23.5–38.0) among boys while the pooled data after 2010 estimated a combined prevalence of 19.3 per cent of childhood overweight and obesity [4,5]. Thus, it is essential to ascertain optimum amount of weight gain at various stages in growing years to prevent malnutrition.

Weight velocity charts can be useful to set weight goals for children requiring nutrition support and those who are chronically ill. The concept of phase difference has been previously described in relation to peak height velocity (PHV), wherein the timing and magnitude of PHV varied during adolescence according to the timing of pubertal onset, that resulted in flattening of the true peak, spreading it along the age axis [2,6]. Similarly, the timing of peak weight velocity may also differ among individuals and this should be

acknowledged for obtaining a true picture of the weight velocities of the population being examined. Weight velocity references from birth to 20 years based on data from WHO Growth Standards (2006) and revised Centers for Disease Control and Prevention (CDC) growth charts (2000) were made available in 2009 [7–9]. However, velocity plots for weight are less uniform, as weight represents a composite of several differently growing tissues and is heavily influenced by fat content, as against height, which is primarily a measure of growth in bone [6].

Indian data for 5-17-year-old children for height, weight, body mass index and height velocity is available [2,10], however, there are no data on weight velocity. In this study, we aimed to assess weight velocity and construct weight velocity percentiles of 4-17-year-old apparently healthy Indian children and to estimate the magnitude and age at peak weight velocity.

METHODS

This longitudinal study was conducted on 1045 children (588 boys) from Pune (West Zone). This dataset was used by the authors for the synthesis of height velocity charts earlier, and data collection was performed simultaneous to the study on Indian reference growth data, to ensure similar methods of school and sample selection [2,11]. Three private schools in nutritionally well-off areas of the city catering to children belonging to middle and upper socioeconomic class (so that the children had minimum constraints to growth) were randomly selected, their yearly fees being approximately Rs. 10000 (as per Indian per capita income Rs. 2021/month for the year 2007-2008, corresponding to the year of initiation of the study) [10–12].

Annual height and weight measurements were recorded from 2007 to 2013, and only children with a minimum of six readings (ie. measurements for at least six consecutive years) were included, thus excluding children who were ≥ 13 years at baseline. References were to be constructed for ages 4-17 years, and the longitudinal nature of data collection provided information over 7 years for each child, youngest being 3 years and oldest being 13 years at baseline. For instance, a child who was 3 years of age at baseline, was measured from 3-9 years and weight velocity was computed from 4 years, and so on. The study was approved by the Institutional Ethics Committee. In addition to permission and consent from the schools, written informed consent was obtained from the parents for the use of de-identified data. Children over 7 years of age gave written or verbal assent as appropriate. The date of birth of children was obtained from the school registers. Height measurements were performed using portable stadiometer (Leicester Height Meter; Child Growth Foundation, London, range, 60-207 cm) and weight using electronic scale (Salter, Faridabad, India) with daily calibration of both instruments. For measuring height, every child was made to stand on the flat base of the stadiometer with the back of the head, shoulder blades, buttocks and heels touching the vertical rod, and head in Frankfurt plane, with gentle traction applied to the mandibular process. An average of two readings taken to the last completed millimetre was used in the analysis. The make and model of the stadiometers used was consistent throughout the study. The mean inter-observer and intra-observer coefficients of variation of difference in height measurement among observers was < 0.01 (1%) (P = 0.34). Weight measurement was performed in light clothes without shoes, accurate to 100 g on an electronic scale with coefficient of variation < 0.01 (1%). Annual measurements were performed during the same time period of July to September every year by the same set of observers. Children with any major illness or disorders that may affect their growth were measured but excluded from the analysis.

Statistical Analysis: Age- and gender-specific means with standard deviation (SD) for height, weight and body mass index (BMI) were calculated for all children at the beginning of the study. Children's records with height and weight Z-scores above +5 and below -5 at the time of their baseline measurements were excluded at analysis [8,10,11,13,14].

Annualised weight velocity was computed using the formula: change in weight in kilograms divided by change in time in years [7]. Age- and gender-specific smoothed weight velocity percentiles (3rd, 10th, 25th, 50th, 75th, 90th and 97th) were constructed using the Lambda-Mu-Sigma (LMS) method (LMS Chart Maker Pro version 2.3). Three smooth curves that summarized variables of interest representing the median (M), coefficient of variation (S) and skewness (L) of the measurement distribution were plotted against age. After checking the models with detrended Q-Q plots, Q tests and worm plots, LMS values were generated for weight velocity at six-month intervals. Pearson's correlation was calculated using SPSS for Windows software, version 26 to study the relationship between age of maximum height and weight velocity.

Peak velocity centered analysis was performed in a subset of adolescent boys and girls in whom data were available for a minimum of two preceding and succeeding years around the peak, and mean peak weight velocity values were generated [6,15].

This longitudinal study had a minimum of six time points with a group difference of 0.5 standard deviation units at each time point, hence the required sample size was determined to be 72 per group for two group comparisons, assuming no attrition during the seven years of data collection, all pairwise correlations of the six repeated measures to be $r = 0.5$, and power to be 0.8 at 0.05 level of significance [16]. Additionally, WHO recommends a minimum of 200 subject recordings (in our case, weight velocity records) per age-sex group for constructing percentiles, which was satisfied in this mixed longitudinal study with a minimum of six time points per individual [17].

RESULTS

A total of 5225 weight velocity measurements on 1045 children from Pune were computed (2285 measurements on girls) from 4 to 17 years.

Table I summarizes age and gender specific mean (SD) for height, weight and BMI in boys and girls at the beginning of the study. The baseline mean (SD) height z-scores in boys was - 0.1 (1.0) and girls was 0.0 (1.0), and similarly, weight z-scores in boys was - 0.2 (1.0) and girls - 0.2 (1.0); these were near to the median of Indian reference growth data [11]. **Table II** and **III (Fig. 1 and Fig. 2)** demonstrate the weight velocity percentiles for boys and girls, respectively. The median weight velocity was low in boys (1.5 kg/year) and girls (1.7 kg/year) at 4 years of age. Median weight velocity in boys increased thereafter to peak at 13 years (4.6 kg/year) and then declined to 1.1 kg/year at 17.5 years. In girls, median weight velocity began to rise at 4 years of age to peak at 11 years (4.0 kg/year) following which it declined to 0.8 kg/year by 17.5 years of age.

Peak weight velocity during adolescence was analyzed in a subset of 91 boys and 61 girls in whom data were available for a minimum of two preceding and succeeding years around the peak. Mean peak velocities of 7.5 kg/year at 13.1 years and 6.6 kg/year at 12 years in boys and girls respectively were observed. The comparison of height velocity and weight velocity curve is shown in **Web Fig. 1 and 2**. The correlation coefficient between age of maximum height and weight velocity was 0.83. The boys peaked in weight 0.38 years later than in height; the girls peaked 0.55 years later.

DISCUSSION

We present weight velocity percentiles as per age for Indian children and adolescents from 4 to 17 years residing at Pune. The peak median weight velocity was observed to be 4.6 kg/year at 13 years in boys and 4.0 kg/year at 11 years in girls. Peak weight velocity-centred analysis during adolescence showed higher weight velocity in boys and girls, a finding that could be attributable to the phase difference during adolescence. Weight velocity charts were published for the first time by Tanner and colleagues in 1966 that reported peak weight velocity during pubertal development at about 14.3 years in boys and 12.9 years in girls [8]. We report these ages to be 13 years in boys and 11 years in girls which are similar to those reported in the weight velocity charts based on CDC 2000 data [7]. This difference in age of peak weight velocity may signify a secular trend.

A close relationship was found between the age at peak weight velocity and age of peak height velocity. Tanner et al. reported the correlation coefficients as 0.93 for boys and 0.82 for girls [8]. The peak weight velocity occurred at a slightly older age than peak height velocity, with a higher difference in girls than in boys. This is similar to the difference of 0.25 years in boys and 0.63 years in girls reported by Tanner et al [8]. A higher peak weight velocity of 9.8 kg/year in boys and 8.8 kg/year in girls was reported during adolescence [8] as compared to the present study. This variation could be explained as peak weight velocity was generated after elimination of phase difference during adolescence [8]. This could be a major factor in addition to differences in ethnicity [6]. The mean weight velocity reported by Danner et al [9], based on WHO/CDC data at 4 years were 2.1 kg/year and 2.2 kg/year in girls and boys respectively. Similar to our findings, the weight velocity began to increase from 2 years of age in both genders and peaked at 13 years in boys 5.4 kg/year and 11 years in girls 4.4 kg/year, however with a greater magnitude. The magnitude of the peaks coincided with those seen in Thai children, both references based primarily on cross-sectional data [7,18]. Sudanese children had peak velocities similar to the present study but at more older ages [19]. These differences may be explained by variation in physique based on ethnicity. The lower age of peak weight velocity of girls than boys, was perhaps a result of earlier onset of puberty in girls.

Weight gain in children may occur in a two-phase manner; the first phase starting from 5 years to 8 years in girls and 10 years in boys primarily governed by an increase in fat, followed by a plateau, until the second phase begins alongside the adolescence spurt [6]. The crossing of centiles in the first phase may be an early clue of childhood overweight and obesity.

Over shorter time intervals, weight velocity plots can serve as a more sensitive marker of obesity or undernutrition as compared to serial plots on distance charts [7]. In the initial few years of life, weight-for-age percentiles are spaced too close to each other on the distance charts, making it challenging to recognise the marginally abnormal deviations in growth trajectory. Weight velocity charts are more efficient in identification of these deviations [7]. They can also serve as a useful tool in differentiating adequate catch-up from excessive weight catch-up in children born small for gestational age [20].

With an increase in prevalence of obesity, descriptive charts for weight may under-diagnose obesity as these charts tend to normalise overweight and obesity [4,21,22]. Weight velocity charts may prove to be a more reliable tool in such scenarios. However, unlike height velocity, there are currently no cut-offs for defining abnormal weight velocity. Rapid weight gain in childhood has been defined as crossing one major

percentile or 0.67 SD on a distance chart [23]. The crossing of a major percentile on the Indian Academy of Pediatrics growth charts corresponds to the 75th percentile on the weight velocity data presented in the current study (data not shown), we propose a weight velocity of 75th percentile and above for screening for excessive weight gain [10]. Median weight velocities in pre-school children from India from a previous report were significantly lower than those reported in the present study; this could be attributed to an improvement in nutritional status over the last couple of decades [24]. Similar findings were observed in Ethiopian children [25].

Weight velocity charts present greater uncertainty than height velocity charts due to seasonal and emotional variations in fat content, particularly in girls. National weight velocity charts are useful in LMIC like India with double burden of malnutrition. To the best of our knowledge, this is the first study on weight velocity in India reporting velocities in the pubertal ages.

The present study had a few limitations. A complete longitudinal follow-up over the entire duration of growth was lacking. Data on sexual maturity rating was not available. As a result, we were unable to report the correlation between peak weight velocity and age at onset of puberty. This study was limited to children from a single city (i.e. Pune) above 3 years of age, representing only a single major zone (West) in the country. As we wanted to study growth in children with minimum constraints, we have reported data on children belonging to middle and upper socioeconomic class.

In conclusion, the present study reports weight velocity percentiles constructed on 4-17-year-old apparently healthy Indian children from Pune. These references may be used to monitor weight and may further aid in prevention of childhood obesity.

Ethics clearance: Institutional Ethics Committee, Hirabai Cowasji Jehangir Medical Research Institute, Pune, No. EC-CT-2018-0023 dated June 26, 2007.

Contributors: VK, AK, CO: Conception and design, acquisition of data, analysis and interpretation of data; VK, AK, CO, SY: Drafting of the manuscript, critical revision of the manuscript for important intellectual content and final approval of the version to be published; VK, AK: Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding: None. *Competing interests:* None stated.

WHAT THIS STUDY ADDS?

Age- and gender-specific weight velocity percentiles are presented for 4-17-year-old apparently healthy Indian children from Pune.

REFERENCES

1. Khadilkar V, Khadilkar A. Growth charts: A diagnostic tool. Indian J Endocrinol Metab. 2011;15:166.

2. Khadilkar V, Khadilkar A, Arya A, et al. Height velocity percentiles in Indian children aged 5–17 years. Indian Pediatr. 2019;56:23–8.

3. Varghese JS, Gupta A, Mehta R, Stein AD, Patel SA. Changes in child undernutrition and overweight in India from 2006 to 2021: An ecological analysis of 36 states. Glob Health Sci Pract. 2022;10:e2100569.

4. Ranjani H, Mehreen TS, Pradeepa R, et al. Epidemiology of childhood overweight & obesity in India: A systematic review. Indian J Med Res. 2016;143:160-74.

5. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. Lancet. 2017;390:2627-42.

6. Tanner JM, Whitehouse RH, Takaishi M. Standards from birth to maturity for height, weight, height velocity, and weight velocity: British children, 1965. I. Arch Dis Child.1966;41:454-71.

7. Danner E, Joeckel R, Michalak S, Phillips S, Goday PS. Weight velocity in infants and children. Nutr Clin Pract. 2009;24:76-9.

8. WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards based on length/height, weight and age. Acta Paediatr Suppl. 2006;450:76-85.

9. Centers for Disease Control and Prevention. Growth Charts - 2000 CDC Growth Charts. Accessed Sep 22, 2023. Available from: https://www.cdc.gov/growthcharts/cdc_charts.htm

10. Indian Academy of Pediatrics Growth Charts Committee, Khadilkar V, Yadav S, Agrawal KK, et al. Revised IAP growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. Indian Pediatr. 2015;52:47–55.

11. Khadilkar V, Khadilkar A, Cole T, Sayyad M. Cross-sectional growth curves for height, weight and body mass index for affluent Indian children, 2007. Indian Pediatr. 2009;46:477-89.

12. Kumar N, Shekhar C, Kumar P, Kundu A. Kuppuswamy's socioeconomic status scale-Updating for 2007. Indian J Pediatr. 2008;74:1131-2.

13. Cole TJ, Freeman JV, Preece MA. British 1990 growth reference centiles for weight, height, body mass index and head circumference fitted by maximum penalized likelihood. Stat Med. 1998;17:407-29.

14. Mansourian M, Marateb HR, Kelishadi R, et al. First growth curves based on the World Health Organization reference in a Nationally-representative sample of pediatric population in the Middle East and North Africa (MENA): the CASPIAN-III study. BMC Pediatr. 2012;12:149.

15. Tanner JM, Whitehouse RH, Takaishi M. Standards from birth to maturity for height, weight, height velocity, and weight velocity: British children, 1965. II. Arch Dis Child. 1966;41:613-35.

16. Hedeker D, Gibbons RD, Waternaux C. Sample size estimation for longitudinal designs with attrition: Comparing time-related contrasts between two groups. J Educ Behav Stat. 1999;24:70-93.

17. Waterlow JC, Buzina R, Keller W, Lane JM, Nichaman MZ, Tanner JM. The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of 10 years. Bull World Health Organ. 1977;55:489-98.

18. Chavalittamrong B, Vathakanon R, Walsripong R, Rungrith W. Height, weight, height velocity and weight velocity in school-age Bangkok children. J Trop Pediatr. 1980;26:139-43.

19. Sukkar MY, Kemm JR, Ballal MA, Ahmed TS. Growth velocity in children in rural Khartoum, Sudan. Ann Hum Biol. 1980;7:473-9.

20. Hokken-Koelega ACS, van der Steen M, Boguszewski MCS, et al. International consensus guideline on small for gestational age: Etiology and management from infancy to early adulthood. Endocr Rev. 2023;44:539-65.

21. Khadilkar V, Khadilkar A, Kajale N. Indian growth references from 0-18-year-old children and adolescents - A comparison of two methods. Indian J Endocrinol Metabol. 2019;23:635.

22. Khadilkar VV, Khadilkar AV, Cole TJ, Chiplonkar SA, Pandit D. Overweight and obesity prevalence and body mass index trends in Indian children. Int J Pediatr Obes. 2011;6:e216-24.

23. Ekelund U, Ong K, Linné Y, et al. Upward weight percentile crossing in infancy and early childhood independently predicts fat mass in young adults: The Stockholm Weight Development Study (SWEDES). Am J Clin Nutr. 2006;83:324-30.

24. Agarwal DK, Agarwal KN. Physical growth in Indian affluent children (birth-6years). Indian Pediatr. 1994;31:377-413.

25. Alemu T, Lindtjørn B. Growth velocity among preschool Ethiopian children. Acta Paediatrica. 1996;85:616-9.

Table I Baseline Anthropometric Characteristics of the Population

Age (y)	*n*	*Gender*	*Height (cm)*	*Weight (kg)*	*BMI (kg/m^2)*
3-4	13	M	101.7 (6.7)	15.9 (2.8)	15.3 (1.8)
	10	F	100.1 (2.7)	15.6 (1.0)	15.6 (1.4)
4-5	43	M	104.5 (4.4)	16.3 (2.0)	14.9 (1.2)
	29	F	104.2 (4.7)	17.0 (3.1)	15.6 (1.9)
5-6	78	M	111.1 (5.5)	18.1 (3.1)	14.6 (1.7)
	45	F	108.6 (5.8)	17.3 (3.2)	14.6 (2.0)
6-7	51	M	117.4 (5.8)	20.9 (3.9)	15.1 (2.0)
	64	F	116.4 (5.6)	19.9 (3.8)	14.6 (1.9)
7-8	76	M	122.0 (6.0)	23.3 (4.6)	15.5 (2.2)
	63	F	122.3 (5.7)	22.8 (4.8)	15.1 (2.3)
8-9	79	M	129.6 (6.0)	27.7 (7.6)	16.4 (3.5)
	49	F	128.1 (6.3)	26.1 (6.0)	15.8 (2.8)
9-10	75	M	132.6 (5.8)	29.4 (6.2)	16.6 (2.7)
	71	F	134.1 (6.2)	29.4 (6.7)	16.2 (2.7)
10-11	74	M	139.5 (7.3)	33.3 (7.8)	17.0 (3.0)
	49	F	140.1 (5.8)	33.3 (7.4)	16.8 (3.2)
11-12	43	M	143.7 (7.2)	37.1 (9.1)	17.8 (3.5)
	32	F	144.7 (7.7)	36.4 (7.9)	17.3 (2.8)
12-13	44	M	153.5 (7.5)	44.1 (9.4)	18.6 (3.0)
	40	F	151.9 (6.5)	39.7 (6.7)	17.2 (2.5)
13-14	12	M	155.7 (7.2)	46.5 (9.7)	19.2 (3.7)
	5	F	151.9 (6.6)	46.5 (13.1)	19.9 (4.1)

Data presented in mean (SD); BMI Body Mass Index, F Female, M Male

TABLE II Weight Velocity Percentiles (kg/year) for Boys

Age (y)	*Percentile*						
	3rd	*10th*	*25th*	*50th*	*75th*	*90th*	*97th*
4	0.3	0.6	1.0	1.5	2.2	3.1	4.2
4.5	0.3	0.6	1.1	1.7	2.4	3.4	4.5
5	0.4	0.7	1.2	1.9	2.8	3.8	5.2
5.5	0.4	0.8	1.4	2.1	3.1	4.3	5.8
6	0.5	0.9	1.5	2.3	3.4	4.7	6.4
6.5	0.5	1.0	1.6	2.5	3.7	5.1	6.9
7	0.6	1.0	1.8	2.7	3.9	5.5	7.4
7.5	0.6	1.1	1.8	2.8	4.1	5.7	7.7
8	0.6	1.2	1.9	3.0	4.3	5.9	8.0
8.5	0.7	1.2	2.0	3.1	4.4	6.1	8.2
9	0.7	1.3	2.1	3.2	4.6	6.3	8.5
9.5	0.8	1.4	2.2	3.3	4.8	6.6	8.8
10	0.8	1.4	2.3	3.5	5.0	6.9	9.2
10.5	0.9	1.5	2.5	3.7	5.3	7.2	9.6
11	0.9	1.6	2.6	3.9	5.6	7.6	10.2
11.5	1.0	1.7	2.8	4.1	5.9	8.0	10.7
12	1.1	1.8	2.9	4.3	6.1	8.4	11.2
12.5	1.1	1.9	3.0	4.5	6.4	8.7	11.6
13	1.2	2.0	3.1	4.6	6.5	8.8	11.7
13.5	1.2	2.0	3.1	4.5	6.4	8.7	11.6
14	1.1	1.9	3.0	4.3	6.1	8.4	11.1
14.5	1.1	1.8	2.8	4.1	5.7	7.8	10.3
15	1.0	1.6	2.5	3.7	5.1	7.0	9.3
15.5	0.9	1.4	2.2	3.2	4.5	6.1	8.0
16	0.8	1.2	1.8	2.7	3.7	5.1	6.7
16.5	0.6	1.0	1.5	2.2	3.0	4.0	5.3
17	0.5	0.8	1.1	1.6	2.3	3.0	4.0
17.5	0.3	0.5	0.8	1.1	1.5	2.1	2.7

TABLE III Weight Velocity Percentiles (kg/year) for Girls

Age (y)	*Percentile*						
	3rd	*10th*	*25th*	*50th*	*75th*	*90th*	*97th*
4	0.5	0.8	1.2	1.7	2.3	3.2	4.4
4.5	0.5	0.8	1.2	1.7	2.4	3.4	4.6
5	0.6	0.9	1.3	1.8	2.6	3.6	5.0
5.5	0.6	0.9	1.4	2.0	2.8	4.0	5.5
6	0.7	1.0	1.5	2.2	3.1	4.4	6.0
6.5	0.7	1.1	1.6	2.4	3.4	4.8	6.7
7	0.8	1.2	1.8	2.6	3.7	5.3	7.3
7.5	0.8	1.3	1.9	2.8	4.1	5.8	8.0
8	0.9	1.4	2.1	3.0	4.4	6.3	8.8
8.5	0.9	1.4	2.2	3.3	4.8	6.8	9.5
9	1.0	1.5	2.4	3.5	5.1	7.3	10.3
9.5	1.0	1.6	2.5	3.7	5.4	7.8	10.9
10	1.1	1.7	2.6	3.9	5.7	8.1	11.5
10.5	1.1	1.7	2.6	4.0	5.8	8.4	11.8
11	1.1	1.7	2.6	4.0	5.9	8.5	12.0
11.5	1.0	1.7	2.6	3.9	5.8	8.4	11.9
12	1.0	1.6	2.5	3.8	5.7	8.2	11.7
12.5	1.0	1.5	2.4	3.7	5.4	7.9	11.2
13	0.9	1.4	2.3	3.5	5.1	7.5	10.6
13.5	0.8	1.3	2.1	3.2	4.8	6.9	9.9
14	0.7	1.2	1.9	2.9	4.3	6.3	9.0
14.5	0.7	1.1	1.7	2.6	3.9	5.7	8.1
15	0.6	0.9	1.5	2.3	3.4	5.0	7.2
15.5	0.5	0.8	1.3	2.0	3.0	4.3	6.2
16	0.4	0.7	1.1	1.7	2.5	3.7	5.3
16.5	0.3	0.6	0.9	1.4	2.1	3.0	4.4
17	0.3	0.4	0.7	1.1	1.6	2.4	3.5
17.5	0.2	0.3	0.5	0.8	1.2	1.8	2.6

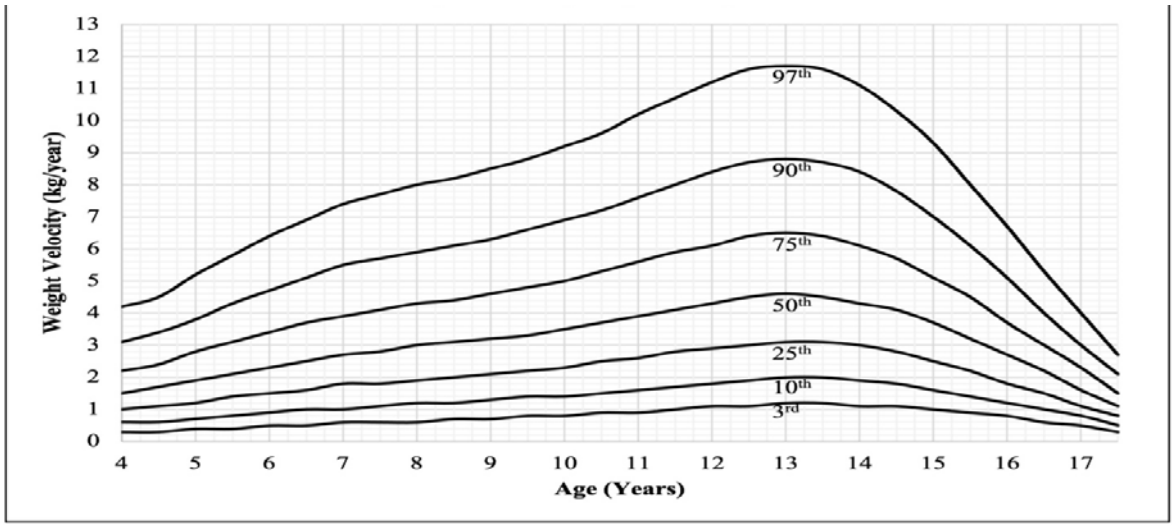


Fig.1 Weight velocity charts for Boys aged 4-17 years

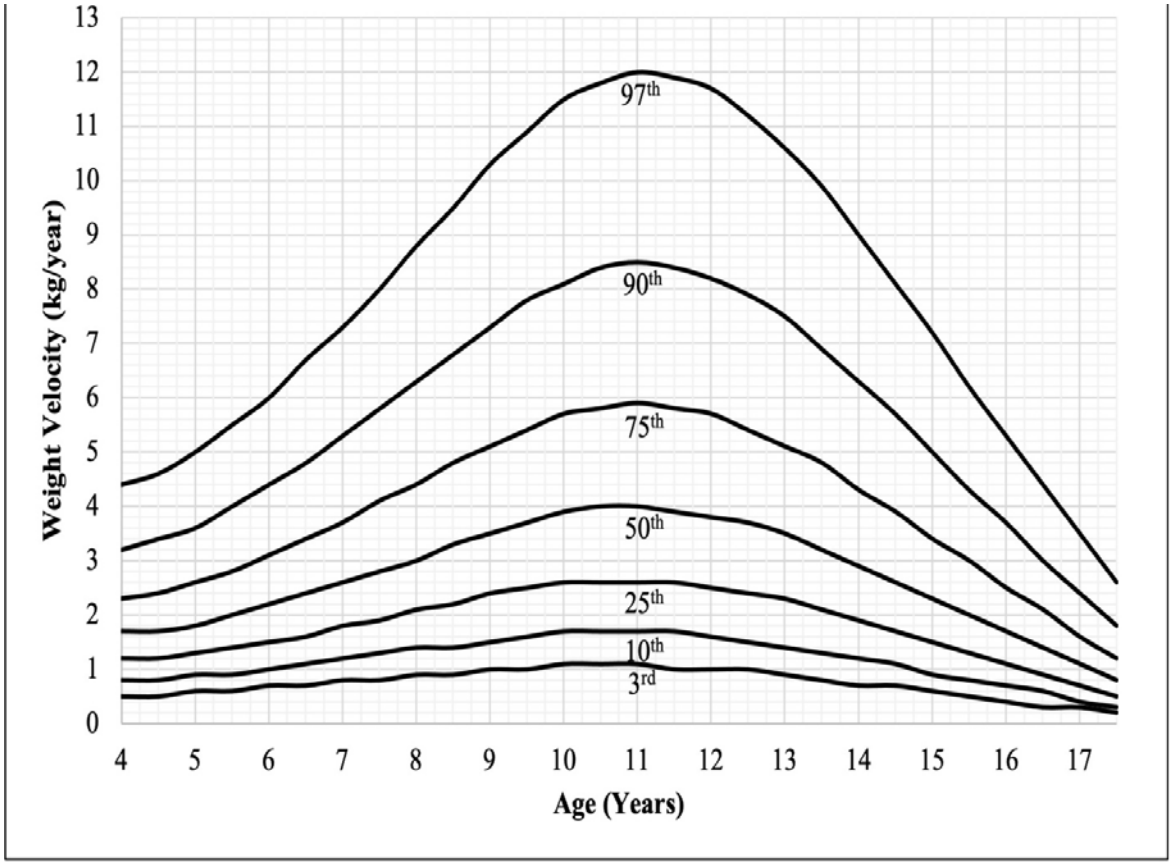
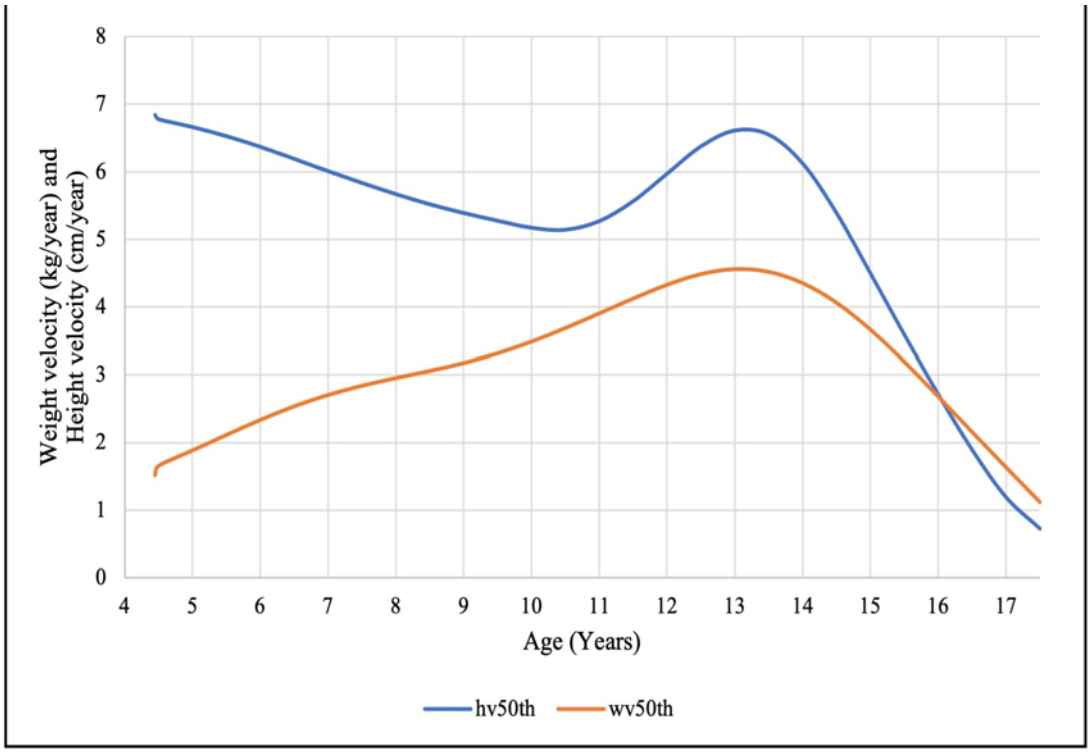
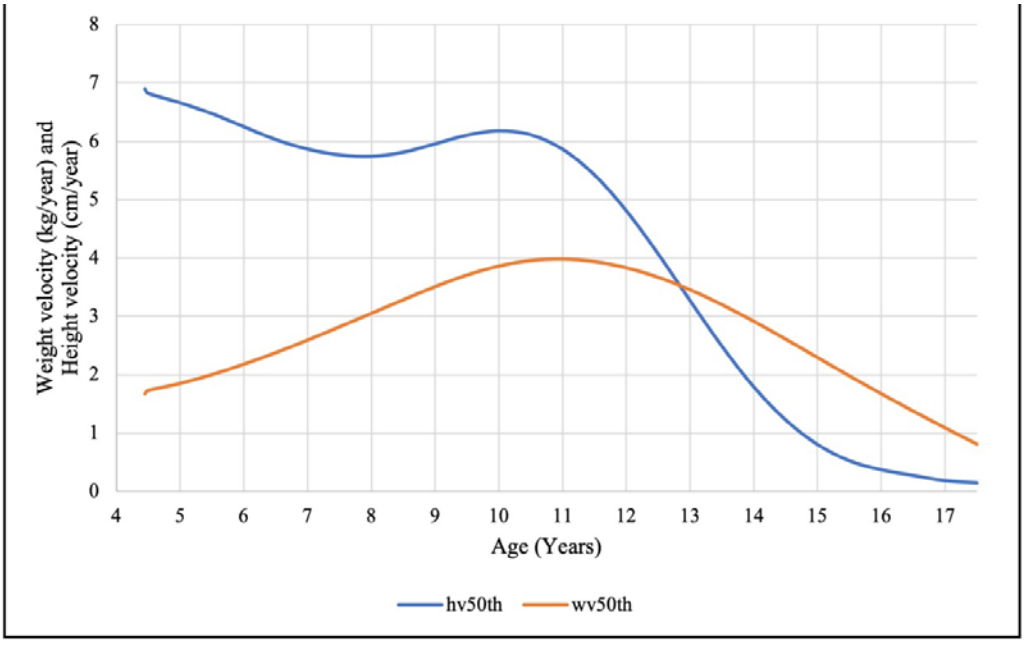


Fig.2 Weight velocity charts for Girls aged 4-17 years



Web Fig. 1 The comparison of height velocity and weight velocity curve for boys



Web Fig. 2 The comparison of height velocity and weight velocity curve for girls