

Growth & Development

Curriculum

- Normal growth from conception to maturity
- Anthropometry measurement and interpretation of weight, length/height, head circumference, mid-arm circumference.
- Use of weighing machines and infantometer
- Interpretation of growth charts: Road to health card & percentile growth curves
- Psychological & behavioral problems

- Approach to child with developmental disabilities
- Abnormal growth patterns: FTT, short stature
- Growth patterns of different organ systems such as lymphoid, brain & sex organs
- Normal patterns of teeth eruption
- Principles of normal development
- Important milestones

- Preventable causes & assessment of developmental retardation
- Measurement & interpretation of sitting height, US/LS ratio & arm span
- Sexual maturity rating
- Age independent anthropometric measurement

Growth & Development

Growth

Denotes a net increase in the size or mass of tissues.

Attributed to multiplication of cells

increase in intracellular substance

hypertrophy

Development

- Specifies to maturation of functions
- Attributed to maturation & myelination of nervous system

Nature vs Nurture

- The brain comprises 100 billion neurons at birth, with each neuron developing on average 15,000 synapses by 3 yr of age
- Frequently used pathways are preserved, whereas less-used ones are deleted
- The idea that a child's developmental course is essentially set by 3, 6, or 16 yr of age is not supported by the evidence

Factors affecting Growth

Genetic Factors:

- Phenotype
- Characteristics of parents
- Race
- Sex
- Biorhythm & Maturation
- Genetic Factors
- Children of multiple pregnancies

- Environmental Factors:

Antenatal factors

Hormonal factors

Postnatal period

Temperament

- 9 dimensions: activity level
rhythmicity
approach & withdrawal
adaptability,
threshold of responsiveness,
intensity of reaction quality of mood,
distractability,
attention span & persistence

Common constellations

- (1) Easy, highly adaptable child with regular biological cycles
- (2) Difficult child who withdraws from new stimuli & is easily frustrated
- (3) Slow-to-warm-up child who needs extra time to adapt to new circumstances.

Goodness of fit

Psychologic Influences: Attachment and Contingency

- Attachment refers to a biologically determined tendency of a young child to seek proximity with the parent during times of stress and also to the relationship that allows securely attached children to use their parents to re-establish a sense of well-being after a stressful experience.
- Insecure attachment may be predictive of later behavioral and learning problems.

- In early infancy, such contingent responsiveness to signs of overarousal or underarousal helps maintain infants in a state of quiet alertness and fosters autonomic self-regulation. Contingent responses to nonverbal gestures create the groundwork for the shared attention and reciprocity critical for later language and social development. Children learn best when new challenges are just slightly harder than what they have already mastered, a degree of difficulty dubbed the "zone of proximal development."

Social Factors: Family Systems and the Ecologic Model.

- In families with rigidly defined parental subsystems, children may be denied any decision-making at all, exacerbating rebelliousness.
- The birth of a new child, attainment of developmental milestones such as independent walking, the onset of nighttime fears, and the death of a grandparent are all changes that require renegotiation of roles within the family and have the potential for healthy adaptation or dysfunction.

- The ecologic model depicts these relationships as concentric circles, with the parent-child dyad at the center and the larger society at the periphery. Changes at any level are reflected in the levels above and below. The shift from an industrial economy to one based on service and information is an obvious example of societal change with profound effects on families and children

Unifying Concepts: The Transactional Model, Risk, and Resilience.

- The transactional model proposes that a child's status at any point in time is a function of the interaction between biologic and social influences

Developmental Domains and Theories of Emotion and Cognition.

- gross motor, fine motor, social, emotional, language, and cognition.

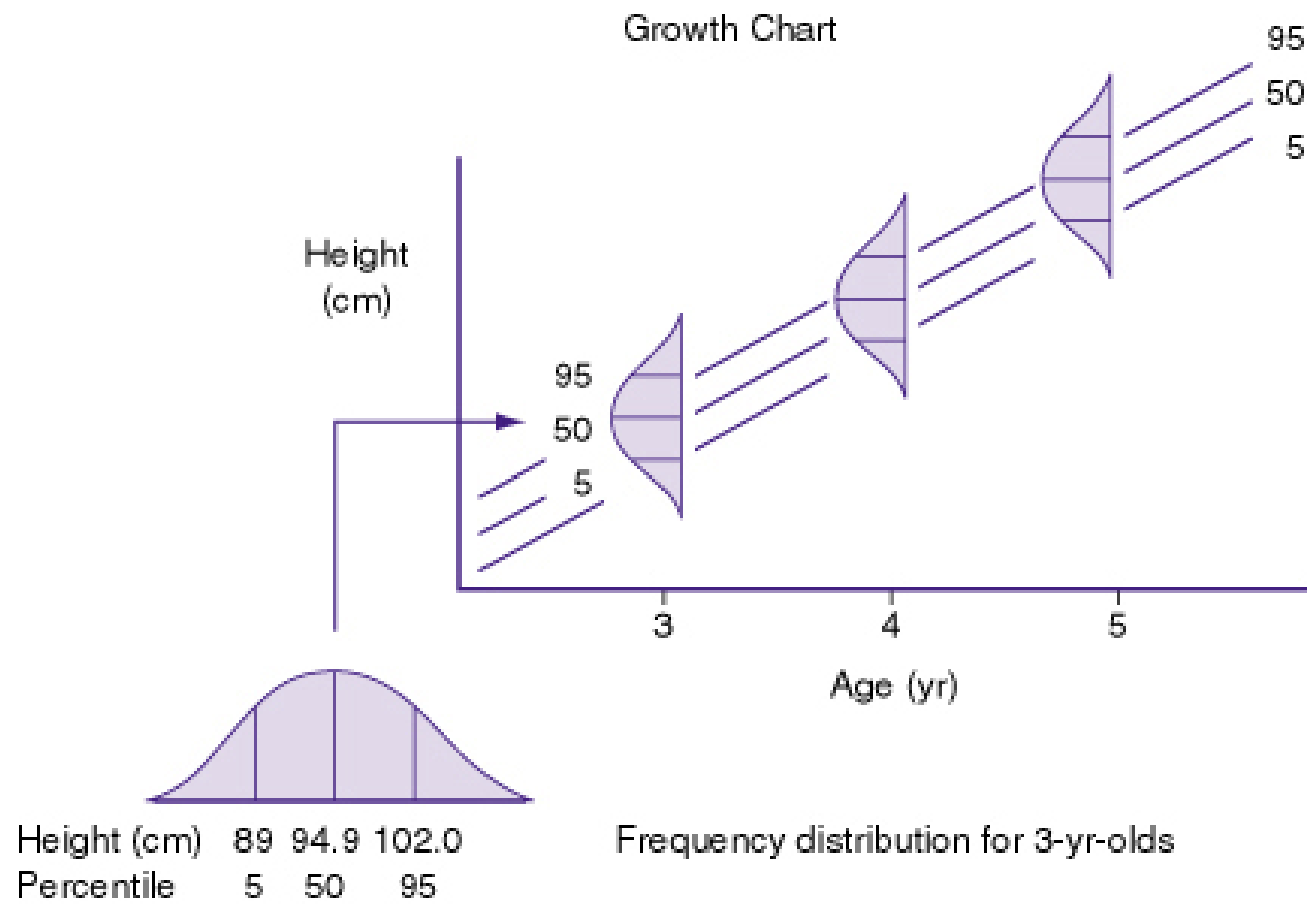
Statistics Used in Describing Growth and Development

- *normal* means that a set of values generates a normal (bell-shaped, or gaussian) distribution.
- For a normally distributed measurement, a histogram with the quantity (e.g., height, or age) on the *x*-axis and the frequency (the number of children of that height, or the number who stand on their own at that age) on the *y*-axis generates a bell-shaped curve

- In an ideal bell-shaped curve, the peak corresponds to the arithmetic mean of the sample, and to the median and the mode as well. The median is the value above and below which 50% of the observations lie; the mode is the value having the highest number of observations. Distributions are termed *skewed* if the mean, median, and mode are not the same number.
- The extent to which observed values cluster near the mean determines the width of the bell and can be described mathematically by the standard deviation (SD).
- For any single measurement, its distance away from the mean can be expressed in terms of the number of SDs (also called a *z score*);

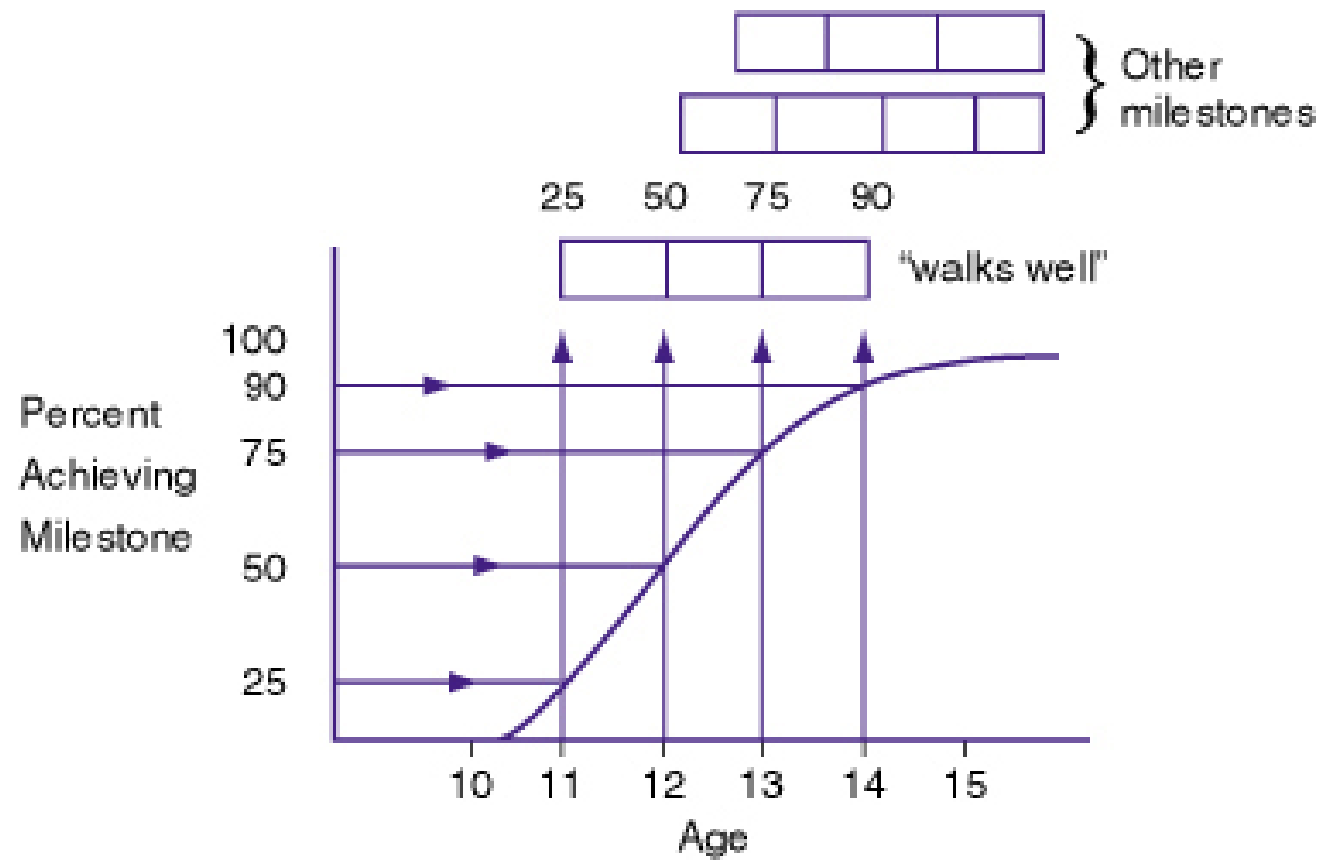
STANDARD DEVIATION (SD)	%
± 1SD	68.3
± 2SD	95.4
± 3SD	99.7

- The 5th, 10th, and 25th percentiles correspond to -1.65 SD, -1.3 SD, and -0.7 SD,



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Figure 7-2 Relationship between percentile lines on the growth curve and frequency distributions of height at different ages.



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Figure 7-3 Method of presenting percentiles for developmental milestones.

WEIGHT	KILOGRAMS	(POUNDS)
At birth	3.25	(7)
3–12 mo	$\frac{\text{Age (mo)} + 9}{2}$	(age [mo] + 11)
1–6 yr	Age (yr) \times 2 + 8	(age [yr] \times 5 + 17)
7–12 yr	$\frac{\text{Age (yr)} \times 7 - 5}{2}$	(age [yr] \times 7 + 5)
HEIGHT	CENTIMETERS	(INCHES)
At birth	50	(20)
At 1 yr	75	(30)
2–12 yr	age (yr) \times 6 + 77	(age [yr] \times 2½ + 30)

- Boys: $(\text{maternal height} + \text{paternal height} + 5)/2$
- Girls: $(\text{maternal height} + \text{paternal height} - 5)/2$
- 13 cm (instead of ± 5 in) if using metric units

TABLE 14-3 -- Severity of Malnutrition: Stunting and Wasting

GRADE OF MALNUTRITION	WEIGHT FOR AGE [f] (WASTING)	HEIGHT FOR AGE [f] (STUNTING)	WEIGHT FOR HEIGHT [f]
0, normal	>90	>95	>90
1, mild	75–90	90–95	81–90
2, moderate	60–74	85–89	70–80
3, severe	<60	<85	<70

TABLE 14-1 -- Growth and Caloric Requirements

AGE	APPROXIMATE DAILY WEIGHT GAIN (g)	APPROXIMATE MONTHLY WEIGHT GAIN	GROWTH IN LENGTH (cm/mo)	GROWTH IN HEAD CIRCUMFERENCE (cm/mo)	RECOMMENDED DAILY ALLOWANCE (Kcal/kg/day)
0-3 mo	30	2 lb	3.5	2.00	115
3-6 mo	20	1.25 lb	2.0	1.00	110
6-9 mo	15	1 lb	1.5	0.50	100
9-12 mo	12	13 oz	1.2	0.50	100
1-3 yr	8	8 oz	1.0	0.25	100
4-6 yr	6	6 oz	3 cm/yr	1 cm/yr	90-100

- **Delayed eruption is usually considered when there are no teeth by approximately 13 mo of age (mean + 3 standard deviations). Common causes include hypothyroid, hypoparathyroid, familial, and (the most common) idiopathic. Individual teeth may fail to erupt because of mechanical blockage (crowding, gum fibrosis). Causes of early exfoliation include histiocytosis X, cyclic neutropenia, leukemia, trauma, and idiopathic factors. Nutritional and metabolic disturbances, prolonged illness, and certain medications (tetracycline) commonly result in discoloration or malformations of the dental enamel. A discrete line of pitting on the enamel suggests a time-limited insult.**

- **The lower body segment is defined as the length from the symphysis pubis to the floor, and the upper body segment is the height minus the lower body segment. The ratio of upper body segment divided by lower body segment (U/L ratio) equals approximately 1.7 at birth, 1.3 at 3 yr of age, and 1.0 after 7 yr of age. Higher U/L ratios are characteristic of short-limb dwarfism or bone disorders, such as rickets.**

SMR STAGE	PUBIC HAIR	BREASTS
1	Preadolescent	Preadolescent
2	Sparse, lightly pigmented, straight, medial border of labia	Breast and papilla elevated as small mound; diameter of areola increased
3	Darker, beginning to curl, increased amount	Breast and areola enlarged, no contour separation
4	Coarse, curly, abundant, but less than in adult	Areola and papilla form secondary mound
5	Adult feminine triangle, spread to medial surface of thighs	Mature, nipple projects, areola part of general breast contour

SMR STAGE	PUBIC HAIR	PENIS	TESTES
1	None	Preadolescent	Preadolescent
2	Scanty, long, slightly pigmented	Minimal change/enlargement	Enlarged scrotum, pink, texture altered
3	Darker, starting to curl, small amount	Lengthens	Larger
4	Resembles adult type, but less quantity; coarse, curly	Larger; glans and breadth increase in size	Larger, scrotum dark
5	Adult distribution, spread to medial surface of thighs	Adult size	Adult size

