

Growth and Development

1st lecture

by

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The field of pediatrics is dedicated to optimizing the growth and development of each child. It is important to require knowledge of normal growth and development in order to effectively monitor children's progress, identify delays or abnormalities, obtain needed services, and counsel parents and caretakers.

Growth means physical changes in size and body proportions, whereas development means functional changes.

Development

Infancy and childhood are dynamic periods of growth and change. Neurodevelopmental and physical growth proceed in a sequential and predictable pattern that is intrinsically determined. Skills progress from cephalic to caudal; from proximal to distal; and from generalized, stimulus-based reflexes to specific, goal-oriented reactions that become increasingly precise.

Milestones

Milestones provide a framework for observing and monitoring a child over time. A thorough understanding of the normal or typical sequence of development in many domains to allow the clinician to formulate a correct overall impression of a child's true developmental status.

The **physical milestones** pertain to the development of both the large and fine motor skills. The **Gross motor skills** are typically the first to develop in young children and are used in sitting, turning over, crawling, standing, and walking. The **fine motor skills** develop later and require greater precision for tasks such as using an eating utensil, drawing with a crayon, and picking up small or delicate objects.

Cognitive milestones refer to the child's developmental abilities to think, learn, and solve problems. A two-year-old being able to point at pictures in a book and give them the correct names and a four-year-old being able to do basic counting are examples of cognitive milestones.

Social and emotional milestones refers to the child's ability to express their own emotion and respond to the social interaction they have with other people. For example, a six-month-old child should begin to recognize familiar faces, while a two-year-old is moving from playing alone to showing interest in playing with other children.

Finally, there are communication and language milestones. **Communication and language milestones** refer to a child's developing verbal and nonverbal communication skills. For example, a one-year-old is typically learning how to say single words, while a five-year-old can speak in complete sentences and even tell simple stories.

Denver Developmental Screening Test

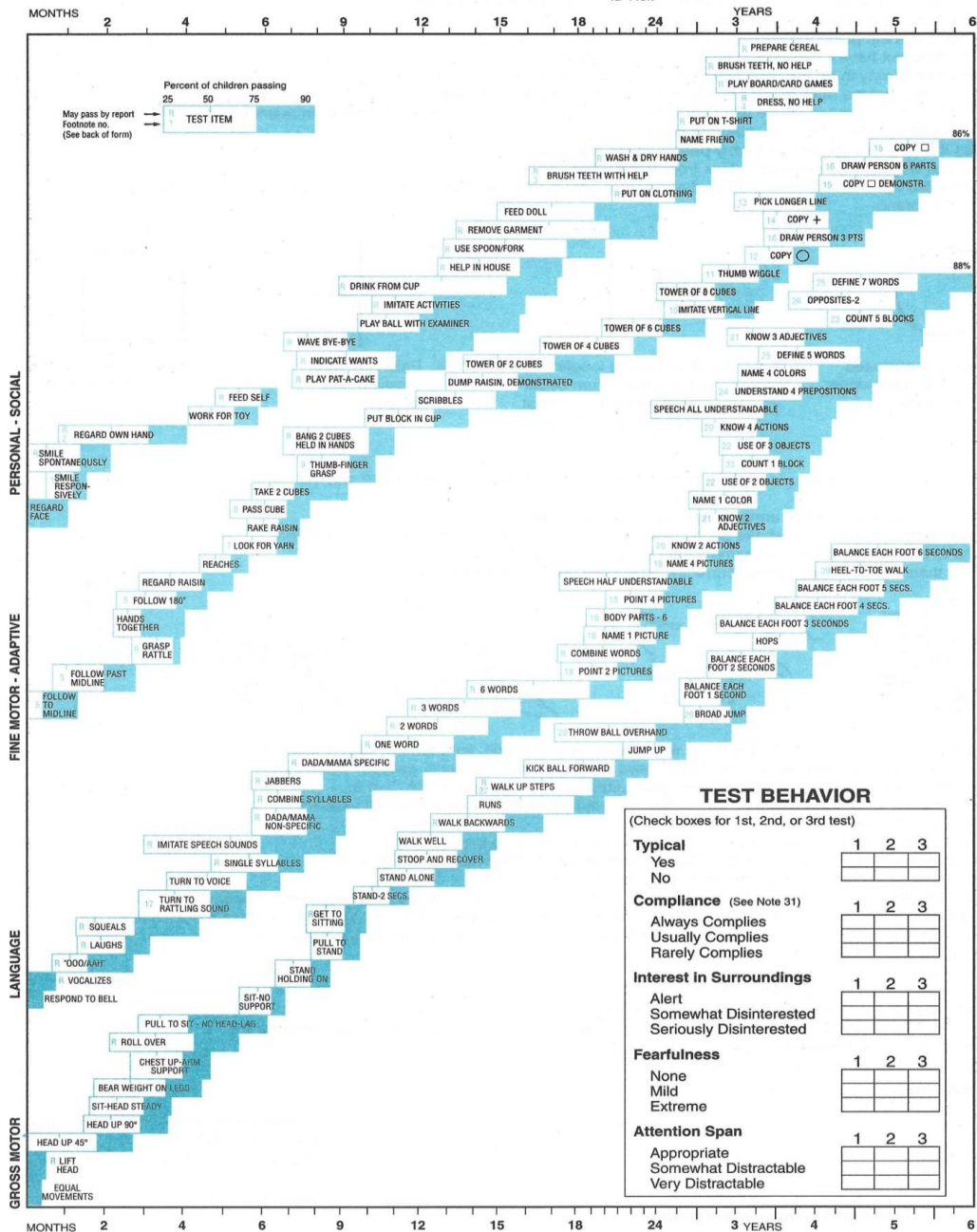
an efficient and reliable method for assessing development. Rapidly assesses 4 different components of development:

- Gross motor
- Fine motor - adaptive.
- Language.
- Personal - social.

DENVER II

Examiner:
Date:

Name:
Birthdate:
ID No.:



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Gross motor:

- 1 month: turns head from side to side
- 4 month: no head lag.
- 5-6 month: rolls over, from stomach to back, then back to stomach.
- 7 month: sits with support.
- 8 month: sits without support, crawls.
- 10 month: Pulls to standing position, walks holding on to furniture.

- 15 month: Walks alone; crawls up stairs.
- 18 mo: Runs stiffly.
- 24 mo: Runs well, walks up and down stairs, 1 step at a time; jumps
- 30 mo: Goes up stairs alternating feet.
- 36 mo: Rides tricycle.
- 48: Hops on 1 foot.
- 60 mo: skip.

Fine motor

- 4 mo: Grasps rattle (palmer).
- 7 mo: transfers objects from hand to hand.
- 9 mo: Thumb-finger grasp.
- 12 mo: Turns pages of book.
- 15 mo: imitates vertical stroke.
- 24 mo: imitates horizontal stroke, scribbles in circular pattern.
- 36 mo: copies circle.
- 48 mo: copies square.
- 60 mo: Draws triangle.

Language

- 3 mo: says “aah, ngah”.
- 6 mo: Monosyllabic babble.
- 7 mo: polysyllabic vowel sounds.
- 10 mo: Repetitive consonant sounds (“mama,” “dada”).
- 12 mo: Speaks first real word besides “mama,” “dada”.
- 15 mo: Speaks 4-6 words
- 22 mo: Speaks 2-word sentences (e.g., “Mommy shoe”).
- 24 mo: Puts 3 words together.
- 30 mo: Refers to self by pronoun “I”; knows full name.
- 36 mo: Knows age and sex; counts 3 objects correctly.
- 48 mo: Makes full sentence.
- 60 mo: Names 4 colors.

Social

- Neonate: Visual preference for human face.
- 2 mo: Smiles on social contact; listens to voice and coos.
- 4 mo: Laughs out loud.

- 7 mo: responds to emotional changes of social contact
 - 10 mo: waves bye-bye.
 - 12 mo: makes postural adjustment to dressing.
 - 18 mo: Feeds self; kisses parent with pucker.
 - 24 mo: Handles spoon well.
 - 36 mo: Plays simple games with other children.
 - 48 mo: goes to toilet alone
 - 60 mo: Dresses and undresses; asks questions about meaning of words.
- **Handedness** is usually established by the 3rd yr. Frustration may result from attempts to change children's hand preference.
- **Bowel and bladder control** Girls tend to train faster and earlier than boys. Bed-wetting is normal up to age 4 yr in girls and age 5 yr in boys.

Growth

The prenatal period and the 1st yr of life provide the most remarkable growth, setting the trajectory for a child's life.

The average term newborn:

- weighs approximately 3.4 kg; boys are slightly heavier than girls.
- The average length is about 50 cm.
- head circumference is about 35 cm+/- 2.

Each newborn's growth parameters should be plotted on growth curves specific for that infant's gestational age to determine the appropriateness of size.

Weight

A newborn's weight may initially decrease 10% below birth weight in the 1st wk as a result of excretion of excess extravascular fluid and limited nutritional intake. As the nutrition improved, the infants regain or exceed birth weight by 2 wk of age and should grow at approximately 30 g per day during the 1st mo. This is the period of fastest postnatal growth.

- Between 3 and 4 mo of age, the rate of growth slows to approximately 20 g/day.
- By age 4 mo, birth weight is doubled.
- By the 1st birthday, birth weight has tripled.

Length/ height

By the 1st birthday, length has increased by 50% (75 cm)

By 4 yr: 100 cm

Toddlers have relatively short legs and long torsos, with exaggerated lumbar lordosis and protruding abdomens.

upper: Lower segment= 1.7:1 at birth
 1.3:1 at 3 yrs
 1:1 at 7 yrs

By the end of the 2nd yr of life, there will be decreases in nutritional requirements and appetite, and the emergence of “picky” eating habits.

The median for certain age and sex is the reading at the 50th percentile on the growth chart, roughly we can calculate approximated median from the following equations:

- Median body weight:

$$\text{(from 2 mo - 12 mo)} = (\text{age in month} + 9) / 2$$

$$\text{(above 1 yr)} = \text{age in year} \times 2 + 8$$

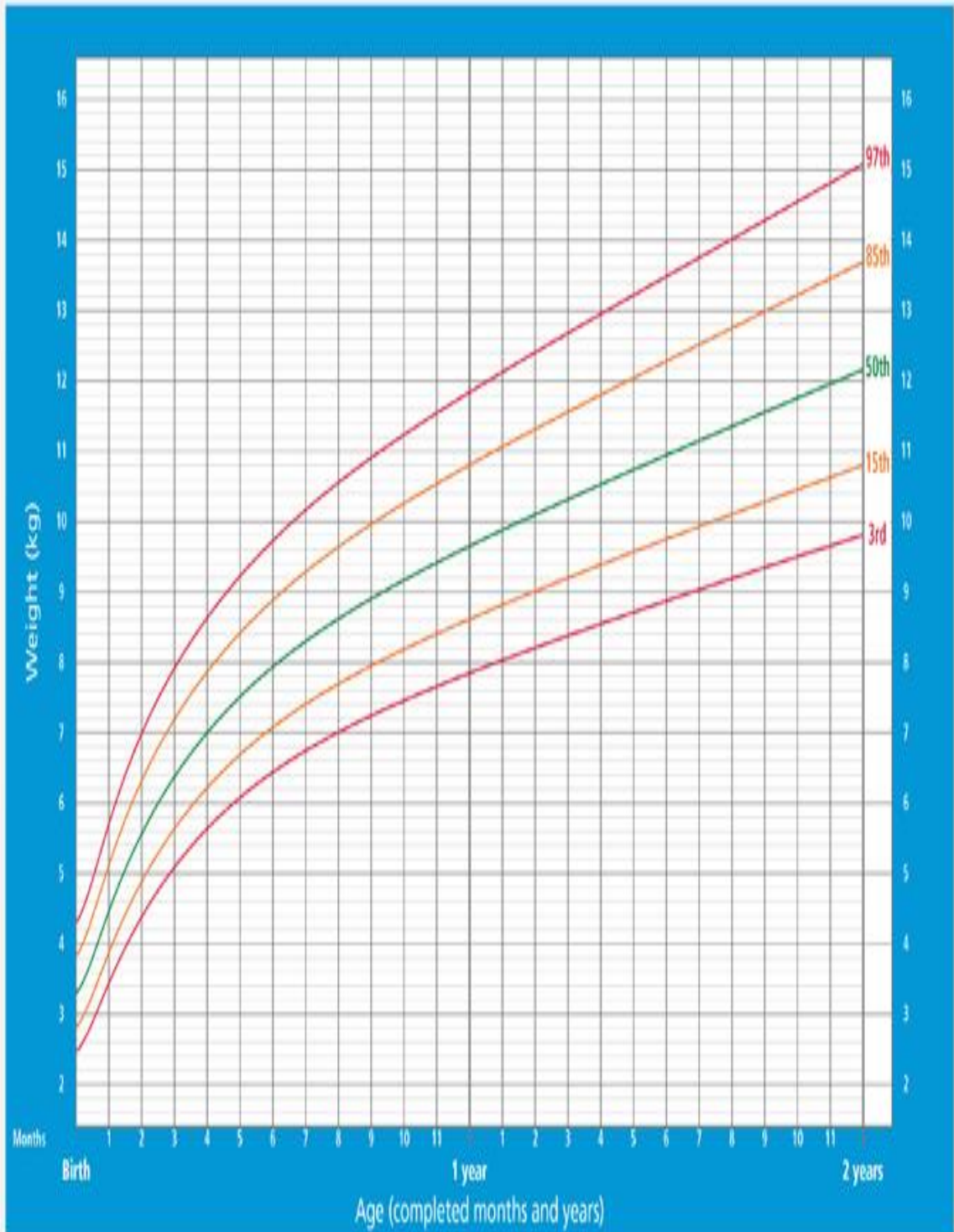
- Medians height= age in year \times 6 +77

- The best way to recognize a certain child growth measure is by plotting to growth charts (WHO or CDC growth charts).

Weight-for-age BOYS



Birth to 2 years (percentiles)



WHO Child Growth Standards