



POSNA

The Core Curriculum

Growth

Objectives

1. Discuss the rate of growth in height and weight at different ages prior to skeletal maturity
2. Discuss changes in body proportion that occur with growth
3. Describe the development of sagittal plane posture
4. Describe a simple method for estimating growth remaining in the lower limbs of boys and girls

Discussion

At birth, the baby is about 50cm long, or about 5000 times larger than the human ovum. By skeletal maturity, height may be 175 cm, or over three times of length of the baby. The rate of height and weight increase is uneven prior to the adolescent growth spurt (man is apparently alone in this arrangement), with a prolonged period of relatively quiescent growth until the pubertal spurt. In general, there is a higher growth rate the first couple years of life, which is followed by a slower rate. By age 2, the toddler is about one-half of the ultimate height. Individual height measurements, however, even in a child may be influenced by the time of day the measurement is made, even children lose discal height during the day. Posture has a further effect. Standardized charts are available for determination of progress in height and weight. Generally, measurements within two standard deviations are regarded as normal; which by definition makes 1 child out of 33 abnormally short or tall. Gain in weight generally follows the same pattern as gains in height, with an adolescent spurt.

Body proportions are substantially different from birth to adulthood. The head is disproportionately large at birth, with a ratio of head height to total height of 1:4. At adulthood, the ratio is 1:7 1/2. The lower limbs account for 15% of total height at birth, and about 30 % in the adult. There is thus a downward shift in the center of gravity, from about T12 in the infant to about L5 in the adult. In the adolescent growth spurt, the feet and hands initially accelerate, then the calf and forearm, then hips and chest, and then the shoulders. Last of all is the trunk and depth of the chest; there is about a year between the peak height velocity of the lower limbs and that of the trunk. The spurt in trunk length is greater than the spurt in lower limb growth, so the increase in height in the adolescent growth spurt is more derived from the trunk than the limbs. Gender differences in growth become evident during adolescence with proportionally greater growth of the male shoulders and the female pelvis.

In the sagittal plane, the entire infant spine is kyphotic. By 6 months, cervical lordosis develops. At about a year of age, the secondary lumbar lordosis develops.

Westh and Menelaus describe the following method of assessing growth remaining:

- Girls stop growing at 14, boys at 16
- Distal femur grows 10mm/yr
- Proximal tibia grows 6mm/yr

References

1. Falkner F, Tanner JM. Human growth. New York: Plenum Press; 1986.
2. Sinclair D. Human growth after birth. Oxford: Oxford University Press; 1989.
3. Westh RN, Menelaus MB. A simple calculation for the timing of epiphysial arrest: a further report. Journal of Bone & Joint Surgery - British Volume 1981;63-B(1):117-9.