

6. Infancy: Physical and Motor Development



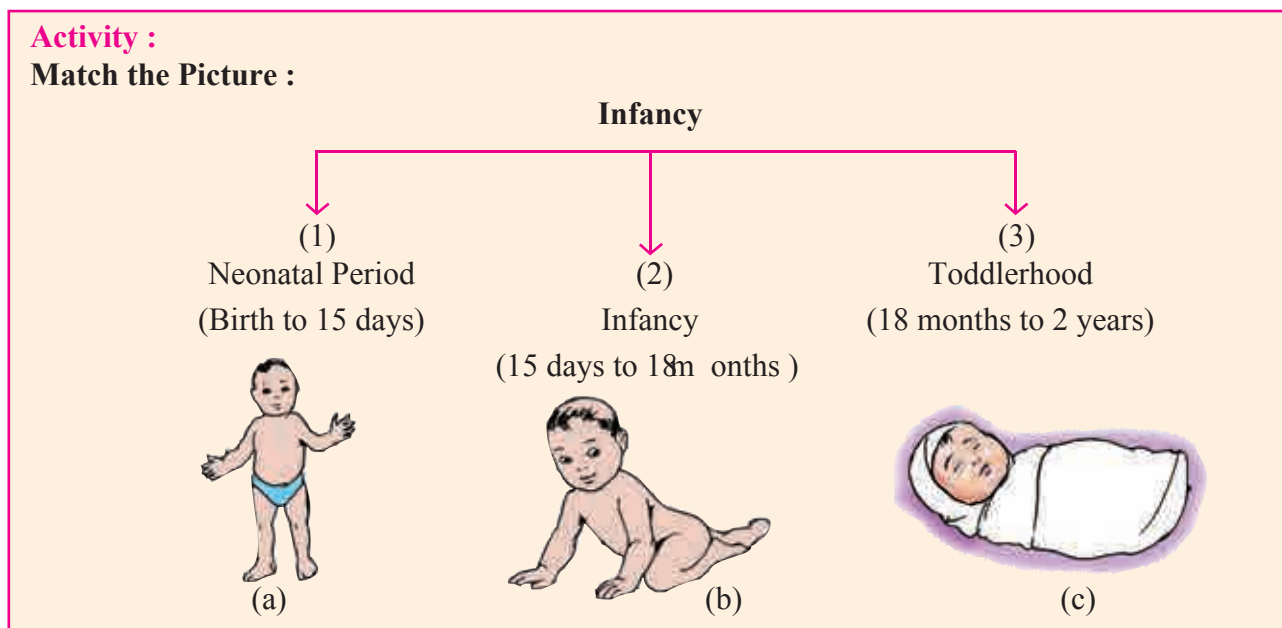
The word Infancy is derived from the Latin word 'Infans'. 'In' means 'not' and 'fans' means 'to speak'. It means the child who is not able to speak is an infant. It is the foundation period during which behaviour patterns, attitudes and patterns of emotional expressions are established. The period of infancy spans from birth to two years. The initial period is characterized by helplessness and radical adjustment; and later by rapid growth and the beginning of socialization.

Infancy can be further divided into three periods :

Neonatal (Birth to 15 days), Infancy (15 days to 18 months), Toddler (18 months to 2 years)

Activity :

Match the Picture :



Now let us see what are the developments that take place during this period.

6.1 Physical Development :

Physical development is the development of the body and its parts. Changes in the body size, brain development, body proportions, development of sensory capacities, functioning of various body systems are all part of physical development. It is essential to know how children develop physically. Physical development influences children's behaviour both directly and indirectly. It also provides them with the opportunities to explore the world around them. Physical development is an important indicator of health and wellness. Although physical growth follows similar pattern in all children, the rate of development differs from individual to individual. It is also different from one stage to another and is affected by genetic, environmental and circumstantial influences.

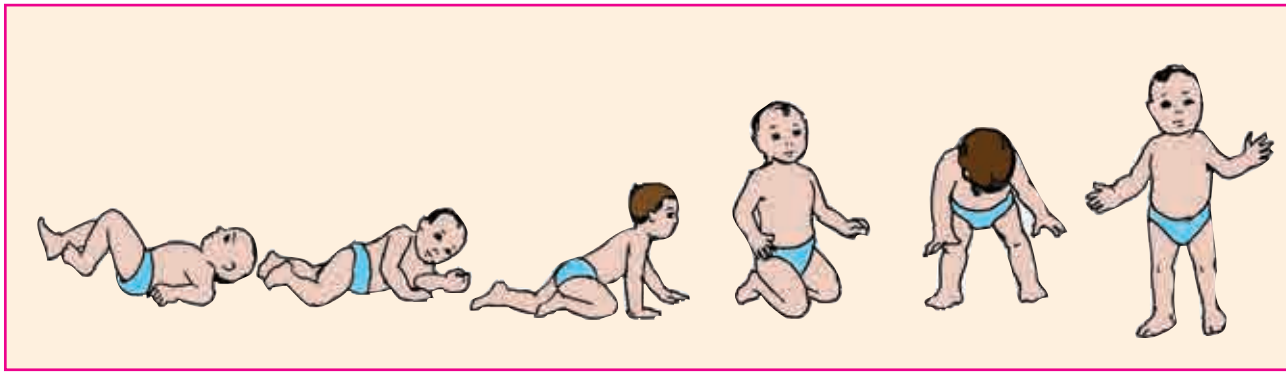


Fig.1 Growth of an infant

Physical Development During Infancy :

During infancy physical development proceeds at a rapid rate than at any other time after birth. However, it slows down at the end of the first year. Although the pattern of growth and development remains the same in all children, there are variations in the aspects of physical development. The general pattern of physical development during infancy is given below:

a) Height :

- The infant's length and weight increases during the first year of life.
- The term length is used for the one-year-old infant because they cannot stand without support. After the completion of one year the term height is used.
- The length of a normal baby at birth is already one third of his/her adult height.
- By the end of the first year, the height of a typical infant is about 50 percent greater than that at birth.
- At two years, infants are about half as tall as they will be as adults.

b) Weight :

- In the first fifteen days of life, most newborn infants lose 150- 200 gms of weight as they are making adjustments to postnatal life.
- After that they grow rapidly and gain about 25-30 gms of weight per day for the first three months.
- At 4-5 months, an infants weight approximately doubles that at birth and at one year, average normal babies weigh three times their birth weight.
- At two years, the weight is 4 times that of the birth weight.
- During infancy boys are generally taller and heavier than girls.

Activity :

Compare the height, weight, body proportion (head circumference, shoulder, waist, length of legs) of young siblings / children (boys and girls) in your family.

Table 6.1 Weight and Height of Boys and Girls from Birth to 24 months according to WHO growth standards:

AGE	GIRLS		BOYS	
	Weight (kg)	Height (cm)	Weight (kg)	Height (cm)
Birth	3.2	49	3.3	50
6 months	7.3	63	7.9	68
12 months	9.8	74	9.6	76
24 months	11.5	88	12.2	88

c) Body Proportion :

- Children's body parts grow at different rates and their relative body proportions change as well.
- Changes in the body proportions of infants occurs in an orderly and predictable pattern following the laws of development as mentioned earlier-the cephalocaudal and the proximodistal laws of development.
- The head, chest and trunk grow fast, followed by the arms and legs and finally the hands and feet.
- However, there are variations in this pattern and that is why children become increasingly dissimilar in their appearance with each passing year.
- During infancy, the head of the infant is approximately one fourth the size of their body length. This is because the brain which is nearly the adult size has to be accommodated.
- The cranial region, the area over the eyes is proportionally larger than the rest of the head.
- The infants have a small chin and nose, tiny mouth, a short neck, large and bulging abdomen and narrow shoulders.
- In proportion to the body, their arms and legs are short.
- By the end of infancy period, head growth slows down, while the trunk and limb growth increases.
- The body proportions of boys and girls are similar during infancy.

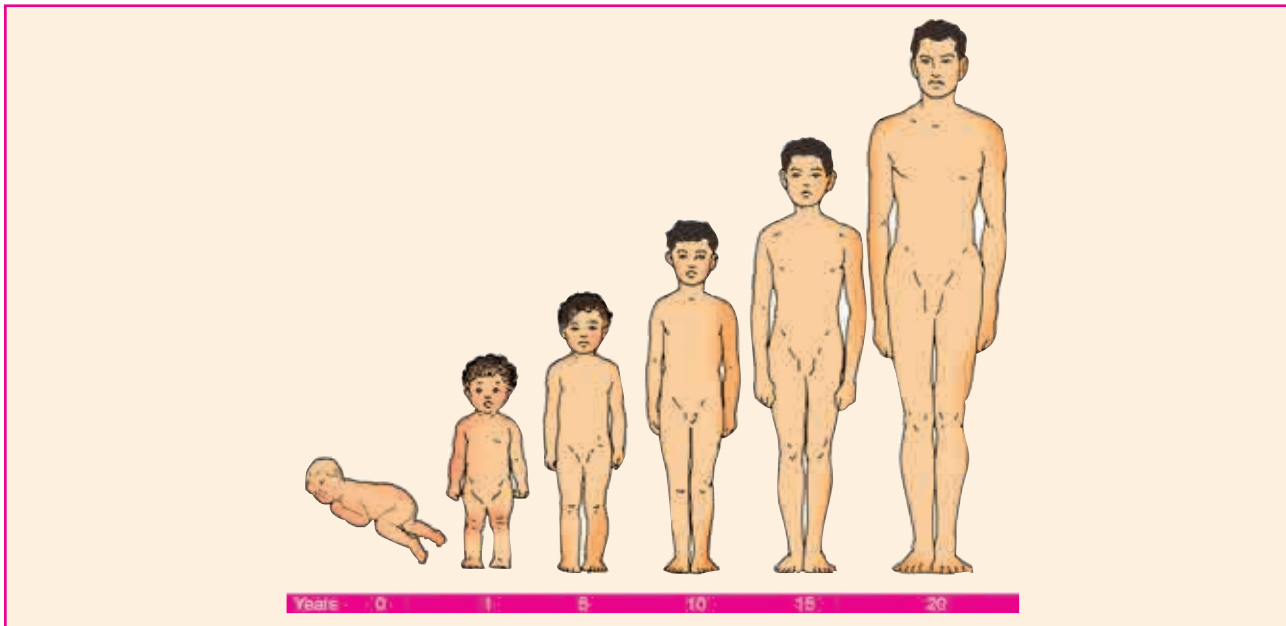


Fig6.B Body Proportions form Infancy to Adulthood

Reflection / Darpan

- (1) Take your own measurements.
 - (a) Height
 - (b) Weight
 - (c) Head Circumference
- (2) Compare it with a six month old or one year old infant.

d) Muscle Development :

- An infant's muscle fibres are very undeveloped at birth. They have more of adipose tissue (fat fibre).
- Muscle development also follows the principles of development. Therefore, larger muscles develop before the finer muscles.
- At every age boys have slightly larger and stronger muscles than girls.

e) Skeletal Development :

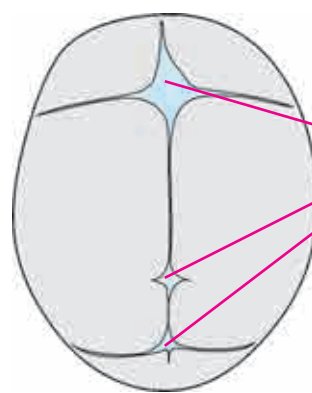
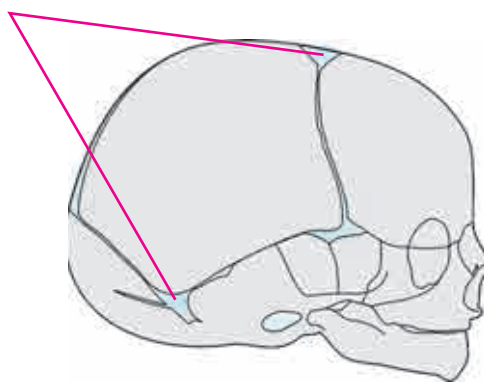
- The best way of estimating a child's physical maturity is to use skeletal age.
- Skeletal development consists of growth in bone size, changes in the number of bones and changes in their composition.
- The human body gets definite shape and support due to the skeleton.
- The skeleton helps in protecting internal organs such as heart, lungs and brain. It also acts as a point of attachment for muscles.
- Skeletal development is the most rapid during the first year of life.

- At birth, an infant has about 300 bones that eventually fuse together to form the 206 bones found in the adult body.
- The infant's skeleton is mainly made up of **cartilages**. This gives softness to the bones, which also increases the chances of the bones becoming misshapen.
- The process of hardening of the bones due to the deposition of calcium, minerals and phosphorus is called **Ossification** of bones.
- Ossification makes the bones stronger. This is a long and gradual process.
- Babies are born with spaces between cranial bones in the skull, which allows their head to mould during birth for easier delivery. These soft spots in the skull are called **Fontanelles**. These close by the age of 18 months.
- Bone development occurs rapidly during the first year of life.
- Skeletal growth of girls is considerably ahead of boys.

Do You Know?

- A **human** body has 206 bones of which :
- 260 bones are in the **human** foot.
- **Human** hand, including the wrist, contains 54 bones.
- The femur or thighbone, is the longest and strongest bone of the **human** skeleton.
- The stapes in the middle ear, is the smallest and lightest bone of the human skeleton.

Fontanelles



Fontanelles

Fig6.3 Fontanelles

f) Teeth Development :

- Development of teeth is a gradual process.
- Teeth begin to form in the sixth week of prenatal life.
- Eruption of first tooth usually happens during the sixth or seventh month after birth.
- The average baby has four to six teeth by the age of one year and sixteen teeth by the age of two years.
- All 20 milk teeth appear around two and a half years of age.

Do You Know?

- **Bones** are not as **strong** as **teeth**. Teeth are the hardest part of the human body. Teeth mostly consist of a calcified tissue called dentine. The **tooth's** dentine tissue is covered in enamel, which is the hard, shiny layer that you brush.

Table 6.2 Development of Teeth during Infancy

Age	Teeth
6 to 7 Months	1 st tooth
1 Year	4 to 6 teeth
2 Year	16 teeth
2 and Half Year	20 teeth

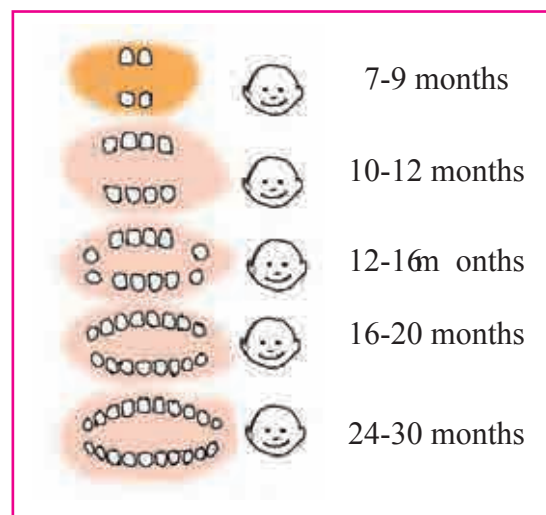


Fig6.4 Teeth Formation

g Brain Development :

- Brain is one of the important part of the central nervous system.
- At the time of birth, the brain is about 25 percent of its adult weight.
- At the age of 3 months it is 40 percent, by 6 months it is 50 percent and by 2 years of age it is 75 percent of the adult size.
- All the motor and cognitive skills of an individual are influenced by the maturing nervous system which includes the brain, spinal cord and the nerves.

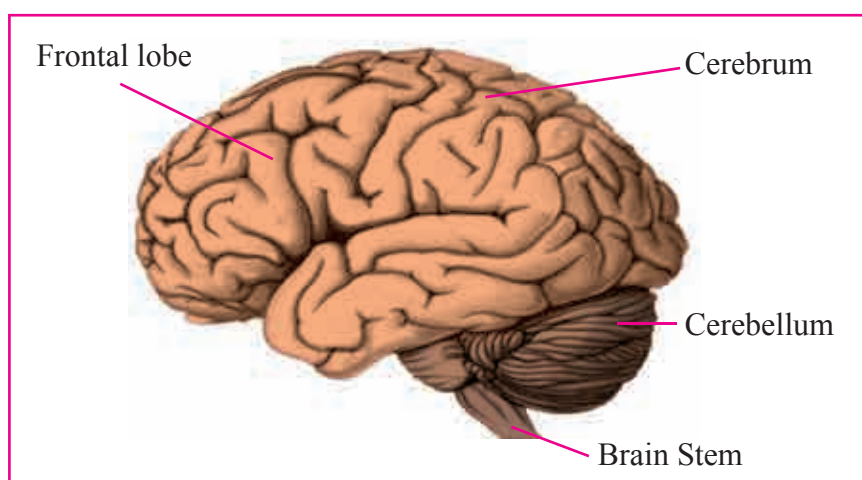


Fig6.3 Brain

- The nervous system is made up of two basic types of cells called the neurons and the glial cells.
- The human brain has 100 to 200 billion neurons or the nerve cells. These transmit and store information.
- Glial cells are the “glue” that hold the whole nervous system together providing structure and firmness to the brain. They also segregate the neurons.

- As the neurons are segregated, when an impulse passes from one neuron to another, it jumps across a tiny space. This is called a **synapse**.
- Formation of synapses is rapid during the first 2 years of life, especially in the auditory, visual and language areas.
- **Myelination** is the process in which neurons become insulated by a fatty sheet of myelin which speeds up and improves the efficiency of message transfer.
- By the end of infancy, the anatomical features of the brain are reasonably well established.

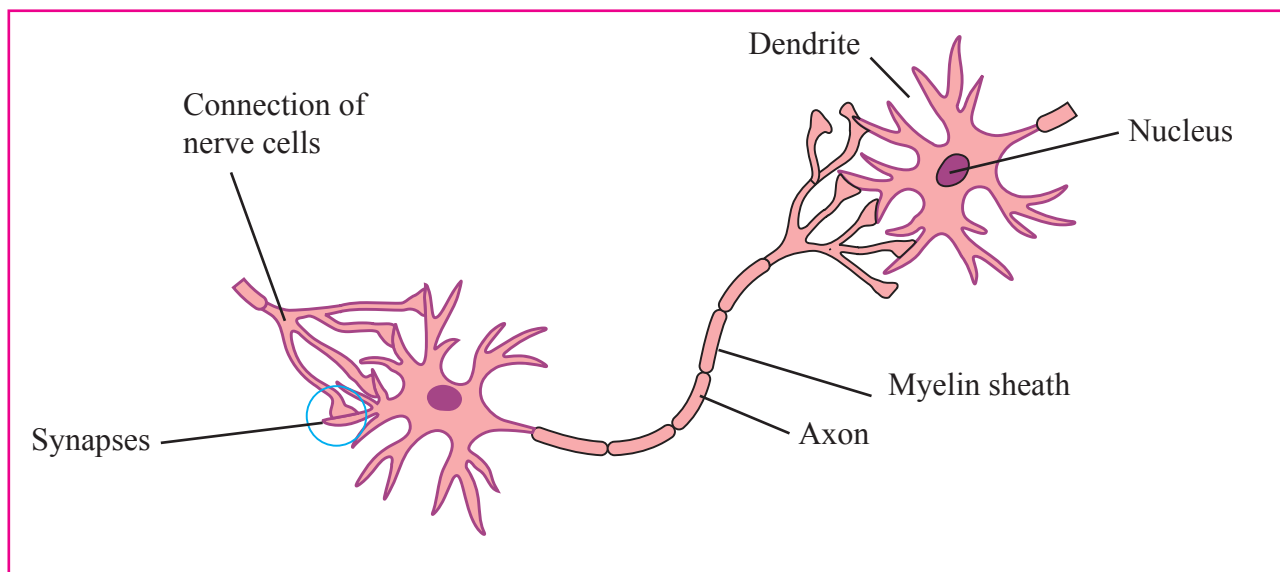


Fig6.6 Typical myelinated neuron

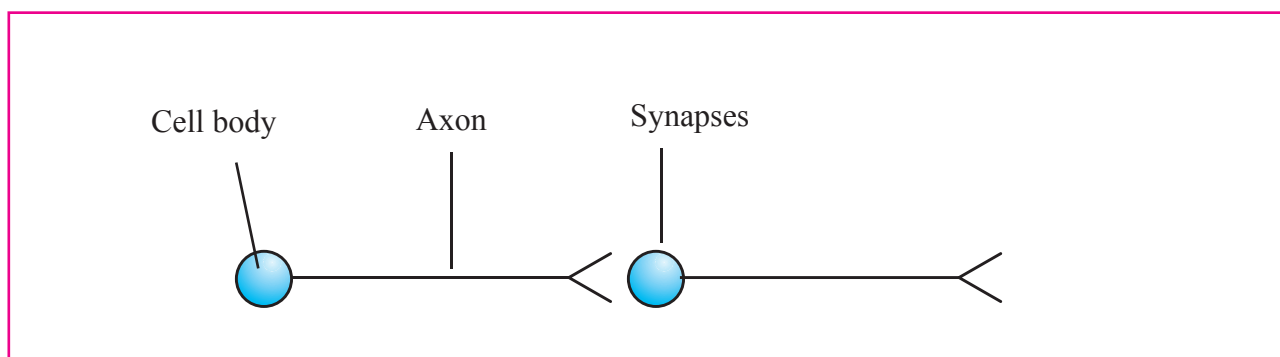


Fig6.7R epresentation of synapse

6.2 Motor Development :

Meaning

- Motor development means the development of control over bodily movements through the coordinated activity of the nerve centres, the nerves and the muscles. This control comes from the development of the reflexes and mass activity present at birth.
- For example, in the beginning a baby's body is in constant motion. Gradually this random and meaningless movement becomes more coordinated and organized and makes the control on muscles possible.

Importance :

- Motor development depends on neural and muscular maturation.
- Motor development allows the child to explore and understand the environment.
- It helps children to become self sufficient and independent.
- As speech is a motor mental activity, motor development is also essential for speech.

Definition :

- Motor development is the study of change in motor behaviour as influenced by biological and environmental factors (Gabbard,2008)
- According to Hurlock, controlling body movements by coordination between muscles and nerves means motor development.

Motor Development During Infancy :

- Infants and children show remarkable and rapid progress in their motor development.
- By the end of the first year most infants are able to crawl, sit up, stand up and many are taking their first steps.
- They also develop eye-hand coordination that allows them to explore and manipulate objects.
- By 15 months of age, children become proficient at walking and running.
- New research suggests that infants use a variety of different grips according to the size and shape of the object, indicating that the infant's motor abilities are highly flexible and able to adapt to the demands of the situation.
- Motor development follows the cephalocaudal and proximodistal laws of development.

Sequence of Motor Development

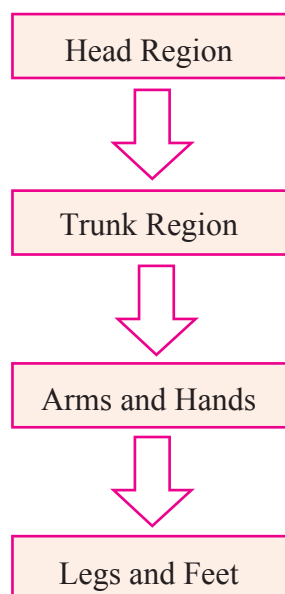


Table 6.4 Sequence of Motor Development during Infancy:

Average Age	Motor Development
6 weeks	When held upright, holds head erect and steady
2 months	When baby is lying on the stomach he / she lifts self by arms, rolls from side to back
3 months and 3 weeks	Grasps cube
4.5 months	Rolls from back to side
7 months	Sits alone, crawls
8 months	Pulls to stand
9 months 3 weeks	Claps
11 months	Stands alone
11 months 3 weeks	Walks alone, builds tower of 2 cubes
14 months	Scribbles vigorously
16 months	Walks upstairs with help
23 months and 2 weeks	Jumps in place
24 months	Walks on tiptoe

Activity :

Refer to the table 6.4 given above and look at each age and the corresponding motor development. Identify the developmental sequence and write it down.

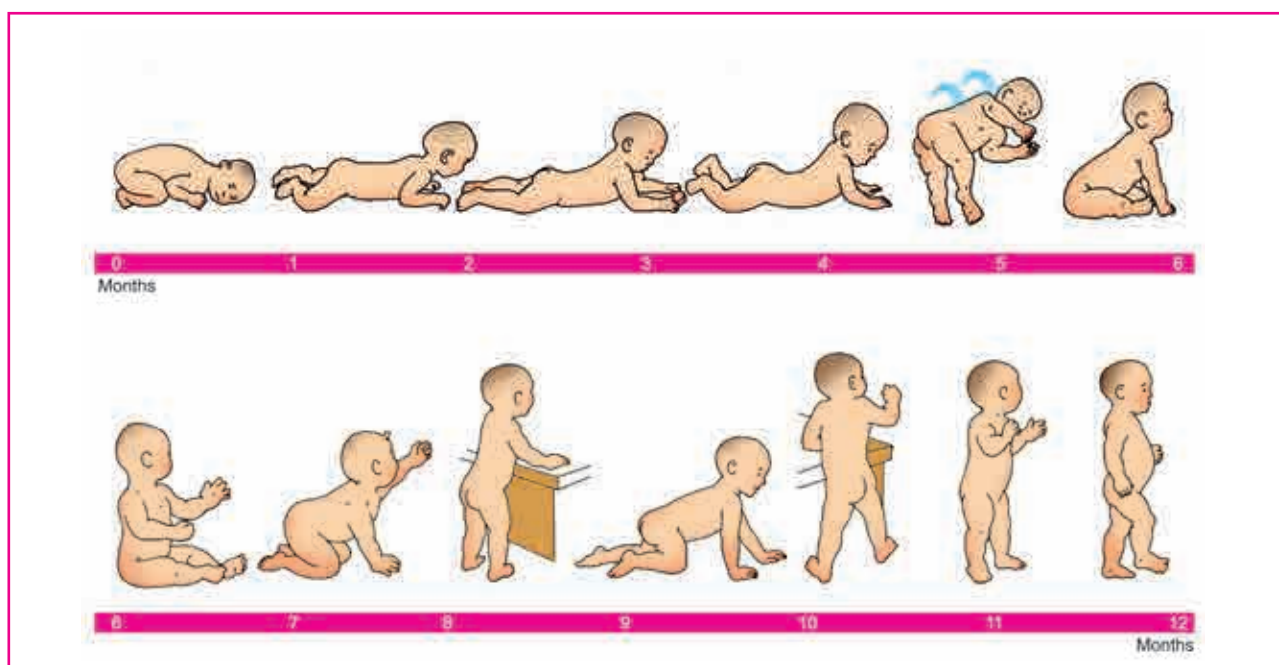


Fig.6.8 Chronological Progression of Gross Motor Development

Motor Skills :

- Motor skills are actions that involve the movement of muscles in the body. They are divided into gross and fine motor skills. These include all the hand and the leg skills.
- Gross motor skill is the ability to control and use large muscles of the body especially the arms, legs and back. Eg. Crawling, walking, running, jumping.
- Fine motor skills can be defined as small muscle movements that occur in fingers as well as eye-hand coordination. Eg. Zipping, unzipping, drawing, painting.
- Certain factors such as body size, readiness to learn particular skills, opportunities, motivation, feedback and practice influence the development of motor skills.

Activity :

Give a few examples of daily activity that can be categorised as fine and gross motor skills

Activity :

Complete the blanks with the words studied in the chapter.

ME- I- N — AI- N (Clue : Fatty sheet of neuron)

— S- IFC- AI- O — (Clue : Hardening of bones)

CR- I- LG- — (Gives softness to the bones)

—Y— A—S — (Passage of impulse)

C— PA- LC- U — AL (law of development)

— OT- AE- L- E (Soft spots in the skull)

NU- —N (Nerve cell)

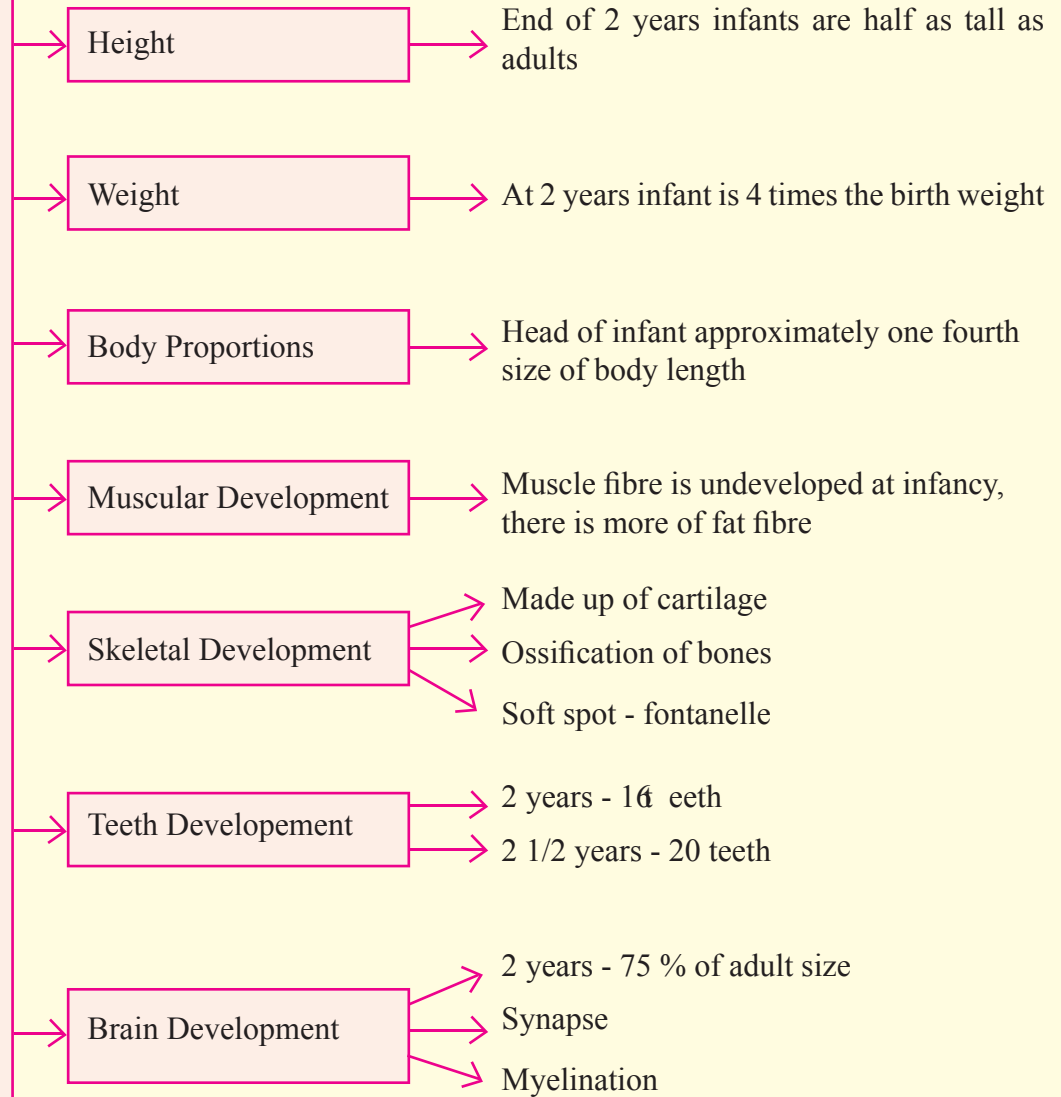
Activity :

Read the chapter and find the word :

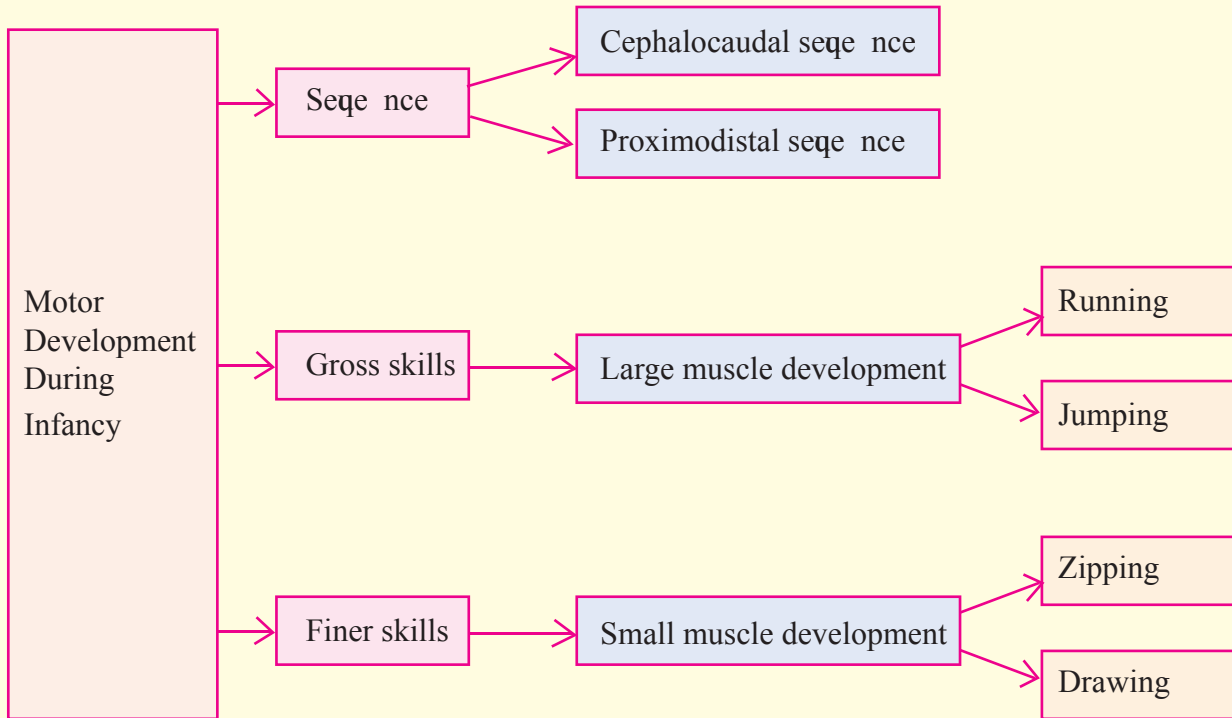
- An important indicator of health and wellness
- Measurement of head circumference, length of arms and legs
- Producing movement and maintaining position of parts of the body
- Change in number of bones, their length and composition
- Softness of the bones
- Hardening of bones
- Soft spots in skull
- Hardest part of the human body
- CEO (Chief executive officer) of the human body
- Transmits and stores information
- Holds the nervous system together
- An impulse passes across a tiny space
- Efficiency of message transfer

Revise the points

Physical Development during infancy



Revise the points





5. The jump of a message across a tiny space from one neuron to another is called

- a) myelination b) synapse
c) ossification
- 6 skills refer to the movements of the finger and eye-hand coordination.
- a) Fine motor b) Gross motor
c) mental

1. The rate of physical development is rapid during infancy.
2. Skeletal development takes place very slowly in infancy.
3. The infant's skeleton is mainly made up of cartilage.
4. By the end of 2 years babies have 16 teeth.

A	B
1. Infancy	a. 20 temporary teeth
2. Two and half years	b. Drawing ,painting
3. 15 months of age	c. Age of radical adjustment
4. Gross motor skills	d. Can walk alone
5. Fine motor skills	e. Crawling, jumping
	f. Age of relaxation

1. Synapse
2. Gross motor skills
3. Motor development
4. Glial cells
5. Physical development

Q. 5. By considering first correlation complete the second correlation

1. Neonatal period : Birth to 15 days : : Toddlerhood : _____
2. 6 to 7 months : 1st tooth : : 2 year : _____

Q. 6. Rearrange the sequence of motor development in serial order.

Arms and hands, Head region, Legs and feet, Trunk region

Q. 7 Fill in the boxes with the help of the given clue.

- 1 Process of hardening of the bones.

		s				c					n
--	--	---	--	--	--	---	--	--	--	--	---

- 2 The infant's skeleton is mainly made up of

c				i				e
---	--	--	--	---	--	--	--	---

- 3 Gap between two neuron

	Y			P		
--	---	--	--	---	--	--

Q. 8. Short Notes

1. Sequence of motor development
2. Teeth development
3. Skeletal development
4. Body proportions during infancy

Q. 9. Answer in detail.

1. What is Infancy? Explain the Physical development in infancy.
2. Explain motor development during infancy.

Project / Self Study

- Observe the Toddlers in your residential area and measure their height, weight and teeth. Enter the data in a chart.

