9

NATURE AND DETERMINANTS OF DEVELOPMENT

One of the most important features of all living beings is change. The changes are most striking when we see the transition in human life spanning from conception to death. The journey from an unborn baby to an adult and then on to an old person is very fascinating. Even a casual observation of the human lives around you will make it clear that several changes happen each day in our bodies and psychological functioning. Some changes are noticeable while some can not be immediately or clearly observed. Some of these changes are determined more by hereditary or genetic factors, while some depend more on environmental and cultural factors. Different cultures hold different goals for development and use different strategies to bring up children. In order to help individuals develop in the best way possible, it is important to understand the nature and process of development throughout the life-span.

OBJECTIVES

After studying this lesson, you will be able to:

- describe the nature of development and distinguish it from other related concepts;

- describe the important domains and stages of human development;

- identify major genetic and environmental influences on human development; and

- learn about the effects of environmental factors on pre-natal as well as post-natal development.

9.1 NATURE OF DEVELOPMENT

In this section, we will try to understand what is meant by the term "development", distinguish it from other related concepts, and identify its main characteristics.

Nature and Determinants of Development

A. The Concept of "Development"

The term "development" is generally used to refer to the dynamic process by which an individual grows and changes throughout its life-span. It is often thought of as the process of qualitative change taking place from conception to death. In this way development is a broad term and deals with all areas including physical, motor, cognitive, physiological, social, emotional and personality. It should be noted that developments in all these areas are inter-related. For example, a 13 year-old girl undergoes physical and biological changes in her body and such changes are in turn related to her mental, social and emotional development.

Life begins at conception when mother's ovum fertilized by the father's sperm and a new organism is created. From that point till death an individual keeps on changing. Such changes are not random but orderly and generally follow a pattern. It may be noted that the developmental changes are not always incremental or evolutionary. They may also involve a decline in the functioning called "involution". A child loses milk teeth in the process of development while an old person may show decay in memory and physical functioning. Development, therefore, is best viewed as a gain-loss relationship in which newer and different kinds of changes take place. Older behavior patterns may lose their salience while new ones may emerge.

Development is shaped by the joint influences of both nature and nurture in a cultural context. Nature refers to the hereditary contribution a child receives from parents at the time of conception. Genetics determines several aspects of a person's physical structure and functioning as well as some psychological characteristics to a certain extent. Nurture refers to the influences of the complex physical and social ecology in which we develop and grow. Various aspects of the child's ecology (e.g. physical facilities, social institutions and rituals, and school) influence the developmental outcomes in important ways.

B. Key Developmental Concepts

The term "**development**" is often used interchangeably with "**growth**" and "**maturation**", but these terms need to be carefully distinguished.

"**Growth**" generally refers to the quantitative additions or changes in the organic structure. For instance as we become older, the body size, height, weight, proportion of parts of our body change in measurable ways. Also, the vocabulary increases. "**Development**" on the other hand, is a broader term which often includes growth, but is used more to refer to functional and qualitative changes in cognitive ability, perceptual ability, personality and emotional development and so on.

"**Maturation**" is a term that refers to the natural unfolding of changes with increasing age, e.g. hormonal changes as the individual reaches puberty. An example of this

can be seen in breast development which is influenced by release of estrogen when a girl reaches adolescence. Maturation refers to the changes which are primarily biological in nature and occur due to our genetic programme. Our biological structure follows a predetermined course of changes with time. This can be seen in the development of teeth during childhood. Changes in body proportions with age provide an example of such predetermined universal trends. The size of the head is roughly half of the whole body at birth, but the proportion keeps decreasing until adulthood, when it is less than one-fourth of the whole body. Therefore, maturational changes in our body are primarily due to the ageing process rather than learning or other factors such as illness or injury.

It must be noted that changes in behavior also occur due to **"learning"**. Learning takes place as a result of a person's interaction with the environment. Maturation provides the raw material and sets the stage for learning to occur. Taking the case of learning to read, the child needs to be biologically ready. The eyes need to develop proper focusing ability before a child can learn to read. Therefore, maturation and learning jointly bring about changes in a person's behaviour.

"Evolution" is a term that refers to species-specific changes. Evolutionary changes happen very gradually and are passed on from one generation to the other so that the species is better equipped for survival. The evolution from apes to human beings took place over a period of about 14 million years. Changes that occur at the level of species are called **phylogenetic** and those that occur at the level of individual are called **ontogenetic**. The term evolution is also used to describe the incremental changes that take place in the course of development.

C. Characteristics of Development

We can now summarize the characteristic features of development to help us distinguish it from other kinds of changes.

- Development is a **life-long process**, spanning from conception till death.

- Developmental changes are often **systematic, progressive and orderly**. They usually follow a pattern, proceeding from general to specific, and from simple to complex and integrated levels of functioning.

- Development is **multi-directional**, i.e. some areas may show a sharp increase while other areas may show a decline. Developmental changes usually involve an increase in maturity towards higher levels of functioning, e.g. increase in vocabulary's size and complexity. But it may also involve a decrease or loss, such as in bone density or memory in old age.

- Moreover the rate of growth and development is **not always constant**. 'Plateaus' are often seen in the pattern of development, indicating periods of no apparent improvement.

- Developmental changes can be **quantitative**, e.g. increase in height with age, or **qualitative,** e.g. formation of moral values.

- Development is both **continuous** as well as **discontinuous** process. Some changes may occur very rapidly and be overtly visible, such as appearance of the first tooth, while some changes may not be sharp enough to be observed easily in day-to-day functioning, such as understanding of grammar.

- Developmental changes are **relatively stable**. The temporary changes due to weather, fatigue or other chance factors will not qualify as development.

- Developmental changes are **multi-dimensional** and inter-related. They may happen together in many areas at a time, or can occur one at a time. During adolescence there are rapid changes in the body as well as in emotional, social and cognitive functioning.

- Development is highly **plastic or flexible**. This means that the same person may suddenly show greater improvement in a particular area than expected from the past rate of development. An enriched environment can produce unexpected changes in the physical strength, or in memory and intelligence levels.

- Development is **contextual**. It is influenced by historical, environmental and socio-cultural factors. The loss of a parent, an accident, a war, an earthquake and child-rearing customs are examples of factors which may influence development.

- There are considerable **individual differences** in the rate or tempo of developmental changes. These differences could be due to hereditary factors or environmental influences. Some children can be very precocious for their age, while some children show developmental delays. For example, though an average child begins to speak 3 word sentences around 3 years of age, there will be some children who have mastered this much before 2 years, while there will be some who are not able to speak full sentences even by 4 years. Moreover, there will be some children who are not able to speak even beyond the upper limit of the range.
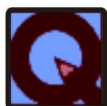
INTEXT QUESTIONS 9.1

1. Write True/False against each statement:

   a. Development refers to both quantitative and qualitative changes.   T/F

   b. Development follows a constant rate.   T/F

   c. The study of development does not cover old age.   T/F

   d. A person may show increase in some aspects and show decline in other aspects at the same time   T/F

   e. Enrichment of the environment can produce dramatic changes.   T/F

2. Write short answers to the following questions:

a. Explain the concept of development.

_____

b. State any 3 major characteristics of human development.

_____

9.2 DOMAINS OF DEVELOPMENT

As we have noted development is an inclusive term that incorporates changes in several areas. These areas or domains deal with 3 broad categories:

1. **Physical and motor development**: It refers to changes in body-size and structure, functioning of various body systems, brain development, perceptual and motor development.

2. **Cognitive development**: It refers to the development of cognitive and intellectual processes, including memory, attention, intelligence , academic knowledge, problem solving, imagination and creativity. It also includes development of language.

3. **Socio-emotional development**: It refers to how we develop relationships with other people, and how our emotions emerge and change as we grow older. It includes emotional communication and self-control, understanding of self and others, interpersonal skills, personality, and emergence of friendship and moral reasoning.
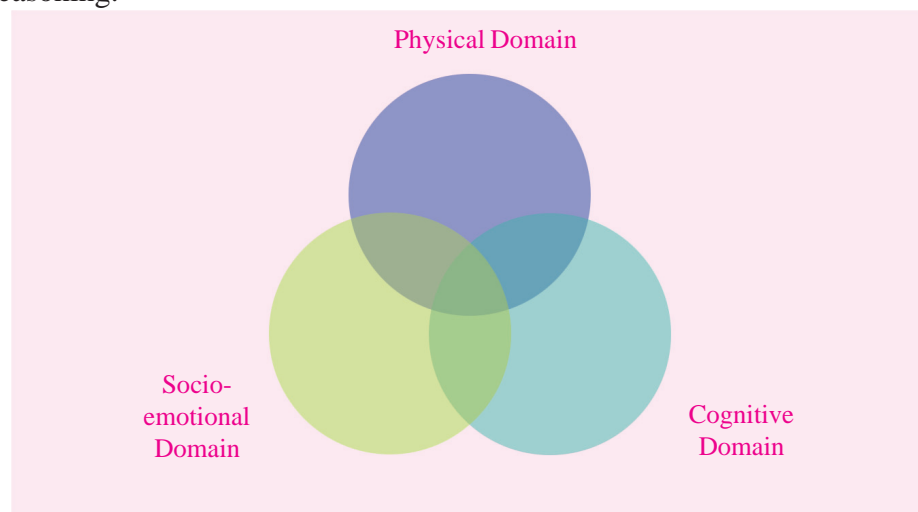
Fig. 9.1: *Inter-relatedness of the domains of development*

These domains or areas are inter-related and combine in a holistic manner to make a person's developmental pattern unique. Each domain influences and is influenced by others. As a baby develops physically, several motor skills are acquired. As the

baby becomes capable of grasping, reaching, sitting, crawling, standing and walking, he/she is able to better explore the environment, resulting in further cognitive development. Improved thinking and understanding helps formation of better social relations as well as emotional expression and comprehension. On the whole, each domain helps the child move towards enriched experiences, learning and overall development.
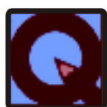
INTEXT QUESTIONS 9.2

1. Fill in the blanks in the following statements:

   a. Improvement in memory and language indicates development in the ————domain.

   b. Interpersonal relationships fall in the _____ domain.

   c. Changes in size and structure of the body fall in the _____domain of development.

   d. _____ broad domains of development can be categorized for the sake of convenience.

9.3 STAGES OF DEVELOPMENT

Even though development is a continuous process, some theorists believe that various stages can be identified for the sake of locating major shifts and determining the developmental tasks. This helps in monitoring the pace of developmental changes. It must be pointed out that there is no sharp dividing line between them. Each stage has certain characteristic features and prepares the ground for the next stage. Some theorists have suggested stages in specific areas of development. For instance Piaget who identified stages of cognitive development and Freud who suggested stages of psycho-sexual development. These theories are explained in other lessons.

A. Developmental Stages: A Life Span Perspective

Most psychologists identify the following stages of development:

- **Prenatal period** (from conception to birth) : In this period, the single-celled organism changes into a human baby within the womb.

- **Infancy and toddlerhood** (birth-2 years): Rapid changes in the body and brain help several sensory, motor, social and cognitive capacities to emerge.

- **Early childhood**: (2-6 years): Motor skills are refined, language develops, ties are formed with peers, and the child learns through play.

- **Middle childhood** (6-11 years): These are the school years when the child acquires literacy skills, thought processes are refined, friendships emerge and self-concept is formed.

- **Adolescence** (11-20 years): This period is marked by puberty which signals the onset of rapid physical and hormonal changes, emergence of abstract thinking, sexual maturity, stronger peer ties, sense of self and autonomy from parental control.

- **Early adulthood** (20-40 years): This is the stage of life when the youngster leaves home for the sake of education, or to find a career, and to form intimate relationships leading to marriage and having children.

- **Middle adulthood** (40-60 years): At this stage the person is at the peak of his/her career. There is a need to help children begin independent lives, and to look after own parents who are aging.

- **Late adulthood (**60 years till death): This period is marked by retirement from work, decrease in stamina and physical health, bonding with grand-children, and dealing with impending old age and death of self and spouse.

Fig. 9.2: *Stages of human development*

Though the stages of development are universally recognized, the exact age range is arbitrary and depends on cultural factors. In some cultures, for example, there is no distinct phase of adolescence with the stress associated with it. One simply moves from childhood to adulthood. The concept of old age is undergoing a change with enhanced medical, health and cosmetic facilities. Life-span expectancy has also increased and reached to 65 years in India.

B. Life Stages : An Indigenous View

Ancient texts also view the human life-span in terms of stages. Life is seen as a process of evolution in four stages known as **Ashramas**, which literally means a dwelling place. There are four main Ashramas:

- **Brahmacharya:** During this period the major task is learning while living as a student under the guidance of a Guru, with emphasis on discipline and simple living.

- **Grihastha**: In this phase of life an individual has to work and take on the responsibility of raising and maintaining a family within the social context.

- **Vanaprastha:** It is a period of seclusion after one has raised the family and completed the duties towards it. It requires severe discipline and austerity and sharing responsibilities with the younger people.

- **Sanyasa:** It is the final stage of life when one needs to achieve complete detachment from worldly objects, freedom from desire, and move towards ultimate self-knowledge and renunciation from the world.

These stages or ashramas are based on the principle that a human being should grow, participate and discharge worldly duties and contribute to the progress and welfare of society and move towards liberation and spiritual growth. It is desired that the older persons should give way to the younger generation. In this scheme one lives in a web of obligations to society as well as environment including all living beings such as animals and trees. It emphasizes co-existence with this whole living world rather than being a consumer and exploiting the environment for personal gains.

C. Developmental Tasks

Each developmental stage is characterized by a dominant feature or a leading characteristic which determines its uniqueness. For example, a child is expected to go to school and study while an adult is expected to work and raise a family. Certain characteristics stand out more prominently than others and each period is called a stage. People learn certain behavior patterns and skills more easily and successfully at certain stages and this becomes a social expectation. For example, a child is supposed to be able to go independently to school in middle childhood. Such social expectations of a particular age common to all persons constitute "developmental tasks". If a person is able to master the developmental task of a particular stage, he or she is considered to have successfully moved on to the next stage of development.
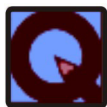
INTEXT QUESTIONS 9.3

1. Write True or False after each statement:

    a. Developmental stages have a fixed age range.

    b. Prenatal period extends from birth to conception.

    c. Adolescence is marked by rapid physical and psychological changes.

d. There are four stages in the Hindu view of development.

e. The Hindu concept of development encourages staying away from the family.

f. Developmental tasks are social expectations of a particular age group.

2. Write short answers to the following questions:

a. State the major stages of development as described in ancient Hindu texts.

_____

b. What do you understand by the term "developmental tasks"?

_____

9.4 INFLUENCES ON DEVELOPMENT

It is important to understand the factors that determine the course of development. Each one of us is a product of genetic factors and environmental influences. The role of maturation and learning has already been described briefly in an earlier section. Let us now look at the contributions of heredity and environment in some detail.

A. Genetic Influences

At the time of conception, the ovum of the mother and the sperm cell of the father unite to form a new cell. The small particles in the nucleus of the cell are called **chromosomes**. The chromosomes exist in pairs. The human cell has 46 chromosomes arranged in 23 pairs. One member from each pair comes from the mother and the other one from the father. Chromosomes store and transmit genetic information. The genes, which are the actual trait carriers, are found in very large numbers in each chromosome.

The fertilized zygote brings together various combinations of chromosomes. In this way, different genes are transferred from each child of the same set of parents. Due to this reason each child bears greater similarity to his on her blood relatives than to anyone else. At the same time there are also many differences amongst blood relatives.

B. Genotypes and Phenotypes

Genetic transmission is a complex process. Most characteristics that we observe in human beings are combinations of a large number of genes. Innumerable permutations and combinations of genes are responsible for the large differences in physical and psychological characteristics.

Only identical or monozygotic twins have exactly the same set of chromosomes and genes as they are formed by duplication of a single zygote. Most twins are fraternal or di-zygotic, who develop from two separate zygotes. These fraternal twins may resemble each other like brother and sister, but they will also be different from one another in many ways.
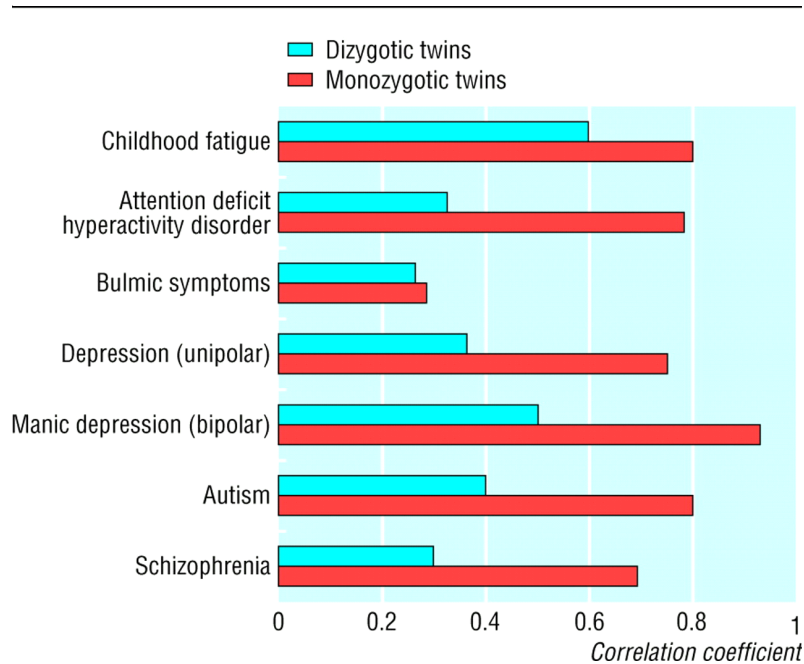
Fig. 3: *Differences between Mono-zygotic and Di-zygotic twins*

Genes can be **dominant** or **recessive**. It is a known fact that there is more color blindness or lack of sensitivity to certain colors among males than females. A grandmother and mother can transmit this condition to the male child without being color blind themselves. This is because in the male this disorder is dominant, whereas in female it is recessive. The genes form pairs. If both genes in a pair are dominant, the individual will display the specific trait (e.g. color blindness). If one gene is dominant and the other recessive, the dominant will prevail. The recessive gene will be passed on and may show up in a later generation.

The dominant gene, therefore, is the one responsible for a particular trait to show up in a person. The characteristics which show up and are displayed e.g. eye color, are called **phenotypes.** The recessive gene does not show up as a trait, unless paired with another gene just like it. The characteristics that are carried genetically as recessive genes but are not displayed are called **genotypes.**

Genotype, therefore, refers to the actual genetic material or a person's genetic heritage while **phenotype** refers to the individual's physical and behavioral characteristics which are determined by both genetic and environmental factors.

C. Environmental Influences

Nature refers to what a child has inherited genetically from her parents, while the influence of environment on the development of the child is referred to as nurture.

Notes

To understand the development of a person, we have to study the complex interaction between nature and nurture or heredity and environment.

Environmental influences are important both at the prenatal and postnatal stages of human development. At the prenatal stage, when a fetus is in the mother's womb, internal or external harmful agents, such as certain legal or illegal drugs, alcohol, lead and pollutants can harm the unborn baby's development. The mother's nutrition, diseases and emotional stress can also affect the development of the fetus.

After birth, several types of environmental factors operate to influence the development of the child. The **ecological systems theory** of development views environmental factors organized as concentric circles of systems.
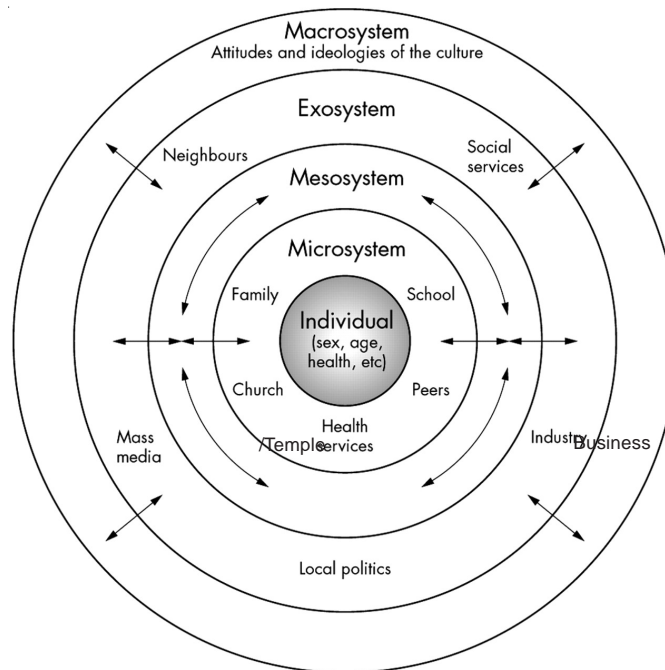

Fig. 4: *Ecological systems influencing human development*

The **micro-system** is the immediate environment at home and interactions between them and the child's own characteristics. The **meso-system** consists of the relationships between family members and school and neighborhood. The **exo-system** refers to the influences of indirect agencies such as work-place of the parents or community services. The macro-system is the outermost layer which includes cultural values, laws and customs. The systems are ever-changing and dynamic. There is also a **chronosystem** which refers to the time dimension. As the child grows, there are changes within each system, and also changes due to the child's interaction with the environment. On the whole, in ecological systems theory, children are both products and producers of their environments, in a network of interdependent effects.

The present view of development gives importance to both nature and nurture. Heredity and environment are inseparably interwoven, each affecting the impact of the other on the child. Development therefore has certain universal features, as well as features unique to the individual. It is important to understand the role of heredity, but more fruitful to understand how the environment can be improved, so as to help the child develop in the best possible way within the limits set by heredity.

An understanding of the principles and determinants of development helps us in several ways:

1. It helps us to know what to expect of the individual's capability at a particular age.

2. It gives information on when to provide opportunities and stimulation for optimal development.

3. It helps to parents, teachers and others who work with children, to prepare them for the physical and psychological changes that are to take place.

4. It helps us to be prepared for changes in our bodies and personalities as we grow older.

5. It helps us to understand that it is possible to facilitate the process of development by providing an enriched environment.
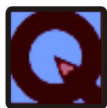
INTEXT QUESTIONS 9.4

1. Fill in the blanks in the following statements:

   a. Heredity is determined at the time of _____.

   b. There are ____ pairs of chromosomes in a human cell.

   c. Genes can be _____ or _____.

   d. Characteristics that are carried in the genetic code but not displayed are called _____.

   e. In the ecological systems theory, the layer which consists of cultural values, laws and customs is called the _____.

   f. External agents that can harm the unborn baby in the womb are called _____.

2. Write short answers to the following questions:

   a. Explain the terms 'genotype" and "phenotype".

b. Briefly explain the main features of the ecological systems theory of development.

WHAT YOU HAVE LEARNT

- Development refers to the process by which the individual grows and changes during its life-span, from conception to death.

- Development is systematic, orderly, progressive, multi-dimensional, multi-directional, plastic and contextual.

- The major domains of development are physical, cognitive and socio-emotional.

- Stages of development can be categorised for the sake of convenience, ranging from prenatal stage to late adulthood or old age.

- Each stage is characterized by certain developmental tasks which are social expectations for a given age group.

- Hereditary factors are determined at the time of conception and genetic information is carried by genes and chromosomes.

- Genotypes refer to the characteristics which are carried genetically but not displayed.

- Phenotypes refer to those characteristics which are displayed.

- Environmental factors influence both prenatal and post-natal development.

- External harmful agents can cause damage to the fetus in the mother's womb.

- Maternal disease, nutrition and stress can influence fetal development.

- The ecological systems theory proposes several sub-systems in the growing child's environment which can influence development.

- Both nature and nurture jointly influence development.

TERMINAL QUESTIONS

1. Differentiate between the terms "development", "growth", "maturation" and "evolution".

2. Describe the major domains of development.

3. Identify the major stages of human development.

4. Discuss the relative importance of nature and nurture in development.

ANSWERS TO INTEXT QUESTIONS

9.1

1. a. true

    b. False

    c. False

    d. True

    e. True

2. a. Refer to section 9.1.1

    b. Refer to 9.1.3

9.2

a. cognitive

b. socio-emotional

c. physical

d. three

9.3

1. a. False

    b. False

    c. True

    d. True

    e. False

    f. True

2. a. Refer to Section 9.3.2

    b. Refer to Section 9.3.3

9.4

1. a. conception

    b. 23

    c. dominant, recessive

    d. genotypes

e. macrosystem

f. teratogens

2. a. Refer to section 9.4.2

b. Refer to section 9.4.3

Hints for Terminal Questions

1. Refer to section 9.1.2

2. Refer to section 9.2

3. Refer to section 9.3.1

4. Refer to section 9.4