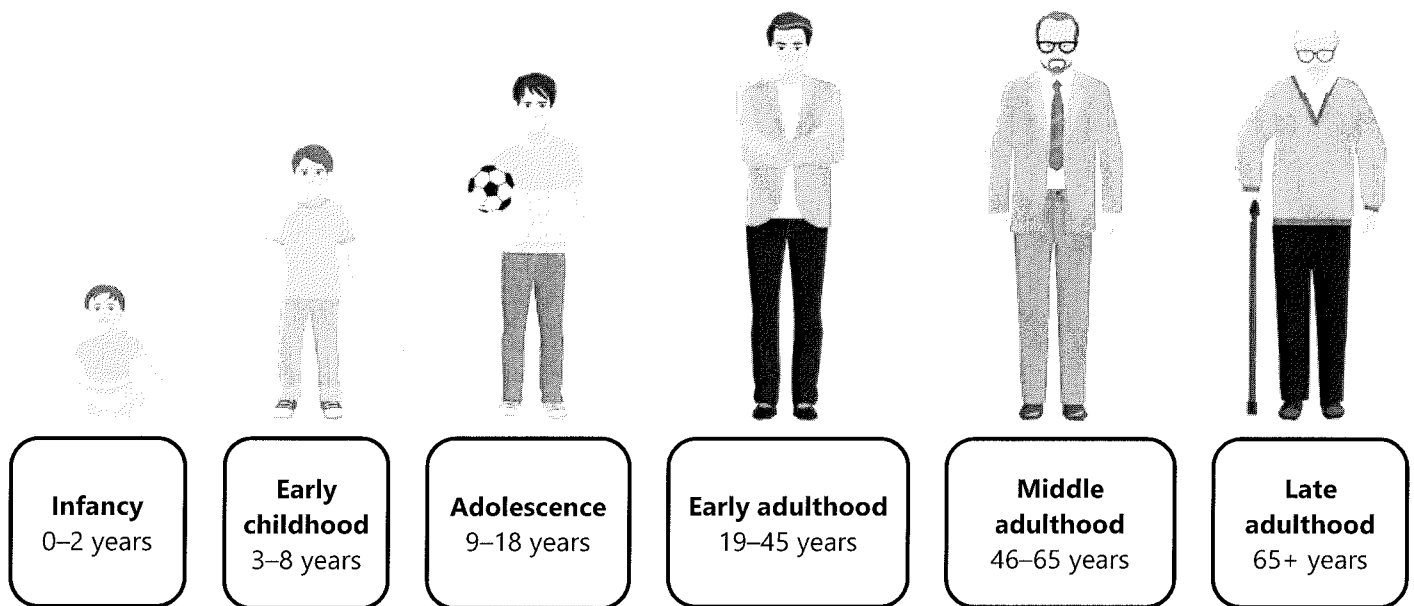


# Chapter 1: Human Growth and Development through the Life Stages

## A1: Physical development

Growth and development are lifelong holistic processes, which are neither precise nor predictable. They depend on innate biological mechanisms and genetic heredity, as well as on the age and life stage a person has reached. They are also influenced by external factors such as the environment (e.g. access to food and clean water) or sociocultural factors (e.g. how gender affects life opportunities and expectations).


A life stage is defined by age in years, and for the purposes of this BTEC the age bands are as follows:



### What is the difference between growth and development?

Growth is different from development, although both are codependent and reliant upon each other.

As we grow, the body undergoes physical and physiological changes. Physical changes refer to size and proportion; for example, increases in height and weight, changes in the size of body organs, muscle development, even the length of your hair and fingernails. Physiological changes refer to the functions of the body. An example of a biological physiological change is menopause. An example of an adaptive physiological change is how a gymnast or ballet dancer enhances flexibility and stamina through training.



**Growth** refers to changes in body mass, size and shape.

**Development** refers to the acquisition of skills.

Physical growth measured as height stops once we reach maturity, which is around 18 years for girls and 20 years for boys. However, changes in muscle mass, weight and body shape continue throughout our lives. Physiological growth may also continue depending on lifestyle choices or training; however, as our body ages it becomes less easy to maintain fitness levels. Other biological factors that affect both physical and physiological growth are changes in hormone levels (puberty and menopause), and a decrease in the ability of the body to process and absorb certain nutrients, such as calcium, which can lead to osteoporosis (brittle bones), or collagen, which is important for skin tone.

The environment we grow up in may also affect physical and physiological growth; for example, through access to healthcare, education, safe housing and work environments and secure areas to play in for children. Malnourished children are more likely to suffer from stunted growth and cognitive impairment due to deficiencies in, among other things, iron, iodine and vitamins in their diet. Children who suffer from chronic intestinal disorders, such as Crohn's disease, will also have stunted growth as the gut struggles to absorb essential nutrients. Unclean drinking water is linked to many different diseases such as anaemia, diarrhoea and typhoid, the health effects of which may affect growth if untreated. Workplace accidents, including poisoning due to the use of chemicals in dyes or to reclaim metals from discarded electrical equipment, can severely affect different organs in the body, such as the lungs, liver and skin.

Growth does not follow a smooth and continuous curve, but it does follow a fixed pattern. Rates of growth will vary from child to child, even if they are identical twins, and different parts of the body will grow at different rates at different times of our lives. However, growth is quantitative in nature and easy to measure.

Development refers to how the body organises itself within the physical structure over time. Development is all about how we acquire new skills and learn to apply them. Development refers to how our bodies function within physical and cognitive parameters. For example, a two-year-old has the coordination skills to point at a dog, but is unable to ride a two-wheeled bicycle. Development also depends on the type of social and cultural environment into which we are born, as this will affect the types of experiences we have and what skills we do or do not acquire from it.

Development does not follow a smooth and continuous curve, nor does it follow a fixed pattern. It is qualitative in nature, affected by outside experiences as well as inherited traits, and is less easy to measure as it is subject to interpretation.

## How do we measure growth?

The Royal College of Paediatrics and Child Health has created growth charts using data published by the World Health Organisation on Child Growth Standards, which allow health professionals and parents to chart children's growth progress in relation to children of the same sex and age (from 0–19) using centile measurements.

Health services also use BMI or Body Mass Index to measure growth. This is a method of calculating whether you are within a healthy weight range using your weight in kilos and your height in metres. To check your BMI, divide your weight by your height twice. For example, a person weighing 60 kg with a height of 1.7 m would have a BMI of 20.76. It is, however, only an indicator of healthy weight. Some people who work out, train or play a lot of sport may have a heavier musculature than others, and their BMI would place them on the scale as obese rather than healthy.

### What does 'centile' mean?

Centile means 100. If a child is at the 50<sup>th</sup> centile, then they are number 50 in a row of 100 children, where one is the lightest and 100 the heaviest.



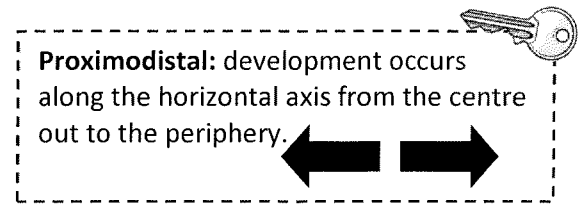
Between birth and the age of two, the human body experiences a huge growth spurt, in relation to other life stages. Just compare a picture of a day-old baby and a two-year-old and you will see an immense difference in body shape, size and ability. This growth occurs through a mixture of innate biological systems, inherited traits and sensory development. Research has identified two patterns of growth, cephalocaudal and proximodistal.

Cephalocaudal development describes how growth and development start at the head and end at the feet. When you look at a baby's head, it is much larger proportionately compared to the rest of the body, with 25% consisting of the head and 75% the rest of the body. By the time we reach adulthood, our head is proportionately about 10% of our body length. This is because development in the brain takes precedence over the rest of the body. Control of the body starts with control of the head. When a baby is born, its neck is unable to support its head, but during the first few weeks, the baby learns to control its neck muscles to support the head and allow it to look around. Once this can happen, the shoulder muscles will become engaged as the baby turns, giving it greater strength in its torso so it learns to roll over. Once it has learnt to roll over, it will start to push up with its arms from the floor and work out how to come up into a sitting position. From this position, it will learn to shuffle, crawl, pull itself up and finally, by around 14 months, walk unaided.

**Cephalocaudal:**  
development occurs  
along the longitudinal  
axis from head to toe.



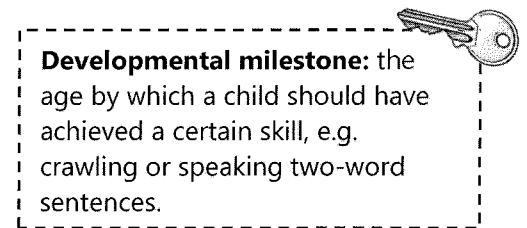
Proximodistal development describes how growth and development start from the centre of the body and gradually move out to the periphery of the body. Development of the head, neck and torso at the centre takes precedence over the development of arms and legs. An example would be that infants develop gross motor skills, such as arm waving, before they develop fine motor skills, such as picking things up.



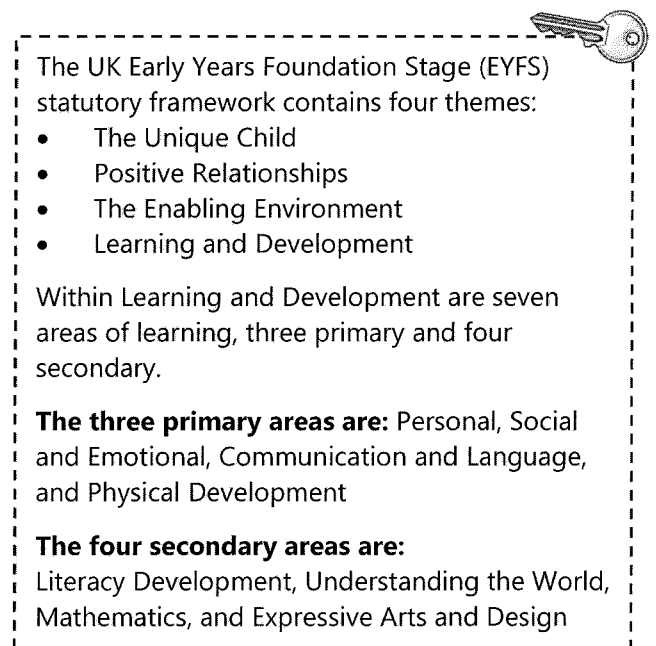
Both cephalocaudal and proximodistal development occur in a fixed pattern and in stages. If a child misses a stage, for example, does not crawl before pulling up to walking position, it may indicate a future developmental problem such as dyspraxia.

## How do we measure development?

Development and acquisition of skills occur in four main areas: physical, cognitive, communication and social and emotional development. Although previously child development psychologists believed the acquisition of skills is linked to brain development and maturation, recent studies suggest the process is more complex. Smith and Thelen (2003) suggest that sensorial input, and thus the environment, play a much greater role than previously thought.



Development is measured by 'milestones', which are achieved within a time and age window, rather than by a specific age. These milestones may differ depending on social and cultural expectations, for example, learning how to write letters and numbers is expected to happen by the age of five in the UK, but not until around seven in Scandinavia. Measuring development is therefore subjective, and personal. A child born in a village in Africa will face a different set of social and cultural expectations that affect the skills families believe their children need to acquire as they grow, compared to a child born in a metropolitan environment.



Development and acquisition of skills are the focus of education curricula and frameworks throughout the world, from infancy through to early adulthood. Adults working and supporting children within these frameworks are expected to provide opportunities for children which will allow them to develop their full potential across a wide range of areas. The skills we acquire can develop from simple to complex at any stage, and not all children or adults will achieve the same skill sets within the same time span, or indeed at all. Skills development is dependent upon a complex mix of innate biological and environmental stimuli.

Innate biological patterns or genetic traits are personal to you and inherited from your parents. Genetic traits can affect our speed of growth (stature, height) and what we look like (colour of hair, eyes and skin). They can also affect our personality (see the section on emotional development).

# Growth and development milestones throughout the life stages

## Growth milestones

### *Infancy 0–2 years*

Growth is fast during infancy, with a general tripling in weight by the end of the first year, and doubling in height by the end of the second year. At the beginning, the body is completely out of proportion compared to that of an adult, as a baby's head is relatively large, and their legs relatively short, in relation to the rest of their body. As bones and muscles strengthen and grow, supporting the body, the baby is able to do more things and achieve developmental milestones. Babies are born with four soft spots or fontanelles on the skull, the posterior, the sphenoidal, the mastoid and the anterior fontanelle. The softness of the fontanelles allows the brain to grow and expand, as it does so more rapidly than bone can grow. By the age of 18 months to two years, the fontanelles will have fused together and the brain will have tripled in weight and reached 80% of the size of an adult brain. Head circumference will have increased from around 14 inches (35 cm) to 19 inches (48 cm).

### *Early childhood 3–8 years*

The body continues to grow and bones will lengthen and muscles grow stronger, enabling children to master their body movements (gross and fine motor skills) and explore their environment. Between these ages, children will refine their gross motor skills – for example, learn to walk upstairs with alternating feet, run and jump (3–4 years), skip, hop and kick a ball (4–5 years) – as well as refine their fine motor skills, such as using scissors (4–5 years) and writing (4–6 years). A child's height and weight will increase and the body will appear less out of proportion, although legs will still appear short compared to adults, comprising a third of the body, as opposed to half of the body in adults.

### *Adolescence 9–18 years*

At this stage, also referred to as puberty, changes caused by the hormones secreted by the pituitary gland alter the body shape and cause rapid spurts of growth to occur. Hormones are chemical messengers, secreted directly into the blood from the glands in the endocrine system. At puberty, the pituitary gland secretes hormones that start physical and sexual changes in the body. In boys, the hormone triggers the production of testosterone in the testicles, which causes the penis and testicles to enlarge, and starts the production of sperm. Boys will also start to grow facial, underarm and pubic hair, and their voices will drop. In girls, the hormone will trigger the production of oestrogen in the ovaries, starting ovulation and menstruation. Girls will also start to grow underarm and pubic hair, develop breasts and their hips will broaden. Physically, girls will have attained their adult height at or around the age of 18.

### *Early adulthood 19–45 years*

In the early adulthood stage, the body reaches full physical maturity. Boys will reach their full adult height around the age of 20, but both genders will continue to develop musculature and gain body fat. At this stage, we are at our peak when it comes to strength, sensory abilities, reaction times and cardiovascular fitness. During this stage, some women will become pregnant and have children. Pregnancy alters the physical shape of the body, both internally and externally, as it accommodates the growing foetus, and towards the end of the pregnancy breasts will enlarge as the body prepares to provide milk for the baby. At the end of this stage, women may go through a perimenopause, experiencing symptoms similar to the menopause, such as hot flushes and a reduced libido, and their menstruation may become irregular. This is due to a drop in oestrogen levels. Many women experience mood swings and emotional ups and downs that may be helped by hormone therapy. From around the age of 35, our bone density starts to lessen. In the brain, neurons start to die off and are not replaced.

### *Middle adulthood 46–65 years*

This is when both men and women start to show signs of ageing, such as greying hair, losing hair or getting wrinkles. People not only start to look older, but may also struggle with vision or hearing loss. As we age, we may start to suffer from presbyopia, which is when our eyes lose the ability to change focus quickly from faraway objects to closer objects. Following conversations in crowded, noisy spaces also becomes more difficult as general deterioration of the sensory hair cells in the inner ear means we become less able to differentiate between different sounds. Medication taken for chronic illnesses such as diabetes or cardiovascular disease can also affect physical, sensory and physiological aspects. During this stage, women experience the menopause. Oestrogen levels drop considerably and menstruation ceases completely. Once the menopause has occurred, a woman is unable to have children naturally. Both men and women will notice a decrease in muscle tone and put on weight more easily, particularly around the middle as the muscle to fat ratio changes. People will start to lose height, as the discs that cushion between each vertebra of the spine dehydrate and flatten. Bone density continues to lessen and some adults may suffer from osteoporosis, where the bones become brittle and fragile.

### **Late adulthood over 66 years**

The density of bones continues to deteriorate (osteoporosis), as does muscle strength. Changes in the brain (loss of brain cells or atrophy) may affect hearing, vision, memory and problem-solving skills. Often the immune system functions less well and as a result people at this stage of life can succumb to relatively common illnesses such as influenza.

## **Development milestones**

### **Infancy: 0–2 years**

#### **Physical**

- Fine motor skills: grasp ⇒ hold ⇒ point ⇒ shake ⇒ pick up ⇒ throw ⇒ place ⇒ wave ⇒ palm grip for mark-making ⇒ feed themselves ⇒ build 2–3 block tower
- Gross motor skills: flex legs when on back ⇒ kick out ⇒ roll over ⇒ crawl ⇒ sit up ⇒ cruise furniture ⇒ walk ⇒ climb stairs one step at a time

#### **Cognitive**

- Focus on moving objects ⇒ recognise caregivers' faces ⇒ react to familiar sounds ⇒ understand the difference between animate and inanimate objects ⇒ understand size relative to near and far ⇒ understand object permanence (see Piaget) ⇒ understand the difference between 'me' and 'you'

#### **Communication**

- Cry ⇒ gurgle ⇒ stick tongue out ⇒ smile ⇒ babble ⇒ start to make recognisable sounds ⇒ single words (one or two syllables) ⇒ one-, two- and three-word 'sentences'

#### **Social and emotional**

- Recognise mother's voice ⇒ imitate facial expressions ⇒ play peek-a-boo ⇒ fear of strangers and separation anxiety ⇒ become angry or frustrated when unable to do something ⇒ play alongside other children ⇒ will let themselves be comforted

### **Early childhood: 3–8 years**

#### **Physical**

- Fine motor skills: drink from a cup ⇒ build 4–6 block tower ⇒ push buttons ⇒ string large beads ⇒ twist off tops ⇒ pencil grip for mark-making ⇒ blow bubbles ⇒ unzip and zip up ⇒ master button fastenings ⇒ turn pages
- Gross motor skills: jump (two feet) ⇒ walk upstairs using alternate feet ⇒ peddle a tricycle ⇒ kick a ball ⇒ skip (alternating feet) ⇒ hop (one foot) ⇒ throw a ball underarm and then overarm ⇒ catch a small ball

#### **Cognitive**

- Start to categorise objects ⇒ develop an understanding of past and present ⇒ develop an understanding of right and wrong ⇒ understand simple mathematical concepts ⇒ learn to read and write ⇒ develop concentration skills

#### **Communication**

- Increasing vocabulary ⇒ talk in longer sentences ⇒ argue ⇒ negotiate ⇒ develop language skills, including syntax and rhyme ⇒ ask questions ⇒ can be understood at least 90% of the time ⇒ learn to read ⇒ use all the pronouns (I, me, you, etc.) correctly ⇒ follow three-step directions

#### **Social and emotional**

- Have different expressions for different emotions ⇒ start to have a simple sense of humour and can tell simple jokes ⇒ cooperate with others ⇒ follow instructions ⇒ seek help when unable to do something ⇒ play together with children and have friends ⇒ cooperate with others ⇒ may be jealous of siblings or peers ⇒ start to project outside ideas on self-image (I am good, etc.) ⇒ able to self-regulate some of the time

## **Adolescence: 9–18 years**

### **Physical**

- Fine motor and gross motor skills continue to develop in relation to physical build, and sociocultural expectations. The body is going through spurts of change in relation to hormonal changes within the body that may affect self-esteem and cause anxiety.

### **Cognitive**

- Reasoning develops ⇒ problem-solving skills improve ⇒ acquisition of basic concepts (Piaget's concrete operational stage) continues ⇒ abstract thinking improves (Piaget's formal operational stage) ⇒ understanding of more complex mathematical concepts ⇒ reading and writing skills continue to develop through access to more complex texts and ideas

### **Communication**

- Able to discuss and hold an argument ⇒ understand jokes, wordplay and sarcasm ⇒ increase vocabulary and compositional skills ⇒ use persuasion and negotiation to achieve goals

### **Social and emotional**

- Have a close friendship circle ⇒ often feel they are being watched and judged by others ⇒ develop feelings of 'it will never happen to me' ⇒ may engage in risky or irrational behaviours linked to the final stages of brain development ⇒ sensitive to real or perceived criticism ⇒ challenge ideas and seek independence

## **Early adulthood: 19–45 years**

### **Physical**

- Fine motor and gross motor skills continue to develop in relation to physical build, and sociocultural expectations, although growth in height finishes around the age of 18 for women and 20 for men. Work/life experiences will dictate which fine or gross motor skills become more important. Towards the end of this life stage, indications of age may start to affect gross or fine motor functions, e.g. stiffness in the joints or a decrease in stamina.

### **Cognitive**

- The brain reaches maturity around the age of 22 and continues to function at peak levels for the next five years. At this stage, adults show greater flexibility in their thought patterns than in the adolescent stage. Around the late 20s, as neurons start to die off, we may start to experience a decline in processing functions and memory recall. Learning new skills may take longer, and need stronger reinforcement than previously.

### **Communication**

- Communication skills develop in relation to experiences. However, as brain cells die, recall of vocabulary, names and places, etc. may cause communication problems.

### **Social and emotional**

- Previous experience boosts how we cope in social situations, which centre around personal relationships and work. Moral reasoning and self-regulation are key to social and emotional skills at this stage.

### ***Middle adulthood: 46–65 years***

#### **Physical**

- Fine motor and gross motor skills will continue to degenerate. Changes in physiology make it difficult for us to master completely new skills due to decreases in muscle tone, vision, or problem-solving and processing skills.

#### **Cognitive**

- Greater reliance on experience with regard to problem-solving skills, as completely new skills take longer to learn, and may not fully embed themselves in the memory due to loss of brain cells.

#### **Communication**

- Degeneration in memory recall may affect oral communication skills, for example, forgetting a person's name.

#### **Social and emotional**

- Changes in physical and cognitive abilities can lead to low self-esteem and depression. This is particularly true for those who live alone, as they may find it difficult to socialise, continue meeting friends or start new friendships.

### ***Late adulthood: over 66 years***

#### **Physical**

- The acquisition of new physical skills is unlikely at this stage of life, and adults of both genders will experience the loss or impairment of physical skills, either due to general deterioration or to medical problems such as arthritis or osteoporosis.

#### **Cognitive**

- Deterioration in cognitive skills continues and certain medical conditions such as dementia and Alzheimer's (around 50% of 85-year-olds will be diagnosed with these diseases) may exacerbate this.

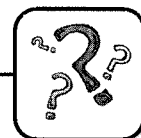
#### **Communication**

- Loss of brain mass continues to impact on memory recall and problem-solving skills.

#### **Social and emotional**

- Loneliness, low self-esteem and depression can have an impact on social relationships and interactions.

## **A1 Revision questions**



1. What are the six different life stages and what ages are assigned to them?
2. Define growth.
3. Define development.
4. At what life stage do we reach our adult height?
5. What does 'centile' mean with regard to height and weight charts?
6. What is the difference between proximodistal and cephalocaudal development?
7. What is a developmental milestone?
8. Provide examples of growth milestones for each life stage.