Chapter 3

Children's growth and development

Learning objectives

You will be able to gain proper understanding and explain:

- The principles of growth and development.
- The characteristics of physical and physiological growth and development from infancy to early adolescence.
- What is necessary for the healthy growth and development of children in light of circumstances in Cambodia.

This chapter defines the concepts of growth and development, then provides an exposition of the common principles of children's growth and development and explains the characteristics of physical and mental growth and development from infancy to early adolescence. Lastly, we describe factors that affect growth and development.

1. Human development

The process of humans maturing from birth to adulthood is expressed in various words including "**growth**," "**development**," and "**maturity**." Growth refers to the maturation process of a living organism increasing in quantity through cell division, in other words **quantitative change in morphology** or body growth. Body height and weight are representative indicators of growth. Development, on the other hand, is a process through which biological structures and functions undergo division and diversification to become more complex. Through this process, latent functions emerge over time. It is a phenomenon of **qualitative change** also influenced by the additional effects of experience, practice, training, education, and environment. In other words, development refers to structural and functional growth centered on mental aspects.[1]

Children are still in the process of growth and development. Their minds, bodies, and social relations change daily toward maturity. It is critical for children to have healthy childhoods in order to develop their intellectual, physical, and emotional capacities to their full potential. Children's healthy growth and development not only enrich the child's own personal life but also lead to enrichment of society as a whole. Since children spend much of their time at school, teachers who engage with children have a duty to support children's healthy growth and development. To this end, it is important for teachers to bear the following four points in mind and take **an integrated view of the holistic health of each child**, rather than a fragmented view of children's growth and development.[2]

(i) View the child as a whole person. Understand the unique characteristics of each child and take a holistic approach to assessing his or her health.

(ii) Believe in the innate power to grow that every child is born with. Treat each child as having strong vitality.

(iii) Understand, believe, and help develop the child's innate abilities. Newborn babies already have various abilities at birth. We need to believe in such abilities and support the fulfillment of their potential.

(iv) View the child from a life-course perspective to support his or her future. A life-course perspective involves understanding the child's health based on his or her past, present, and future. We also need to bear in mind that the health impacts of childhood conditions may not become apparent until adulthood.

Teachers can instruct children according to their growth and developmental stages by learning about children's growth and development. Teachers can also help to build environments that promote healthy growth and development by removing factors that have adverse effects on growth and development and by instructing children and their families to avoid such factors. Furthermore, by learning the normal patterns of growth and development, teachers can assess whether a child is developing appropriately within normal ranges and help to start addressing problems at an early stage if any abnormalities or problems are suspected.

2. Principles of growth and development

Human growth and development are considered to result from synergy between a biological maturation process regulated by genes and a developmental process influenced by the environment and learning experiences of the individual. **Individual variability** in human growth and development results from differences in the biological maturation process and developmental process influenced by the environment. However, there are common principles of growth and development that apply to most individuals.

1) Most children follow a certain developmental order

Body growth and development of motor functions progress in a certain order.

For example, most children become able to hold their heads up steadily when they are 3-4 months old, roll over from tummy to back when 5-6 months old, sit unsupported when 7-8 months old, start crawling and stand holding furniture when 9-10 months old, and by the time they reach 12 months, some start to walk alone. Although there is a wide variation as to when a child reaches a certain stage of motor function development, they mostly follow a certain order of development (**Figure 3.1**).

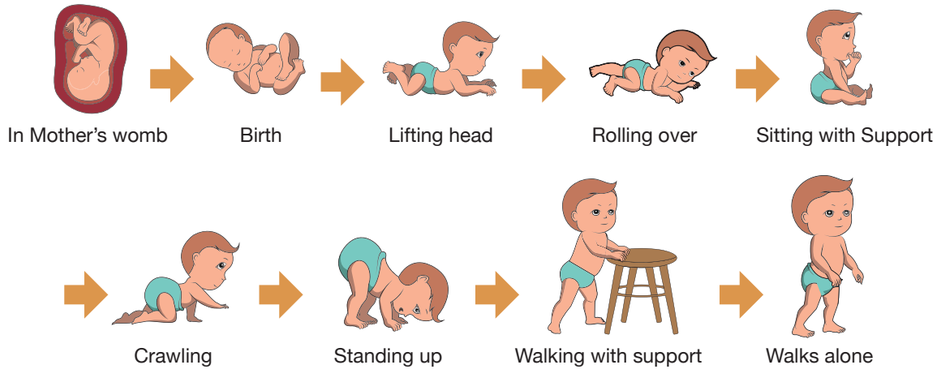
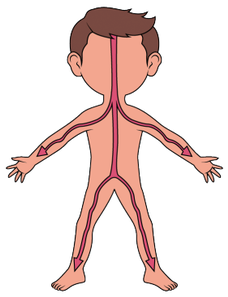


Figure 3.1 Stages of growth and development in babies

2) A certain direction is observed in growth and development[3,4]

Body growth and development of motor functions progress in a certain direction. For example, motor skills develop from holding the head erect, rolling over, sitting up without support, then standing up alone. As seen in this order, body functions develop in the direction from head to tail (**cephalocaudal direction**), and from the center or middle to peripheral portions of the body (**proximodistal direction**). When we look at the process of how children become able to grasp an object, they first touch things, then start grasping things using their fingers and palms (palmar grasp), and finally become able to grasp or pick things up with their fingers (pincer grasp) (**simple to complex, general to specific**). As seen here, body functions develop in the direction from gross to fine motor functions (**Figure 3.2**).



(i) From head to tail

(ii) From center to peripheral portions

(iii) From gross motor to fine motor functions

Figure 3.2 Directions of body growth and development

3) Continuity of growth and development and difference in growth velocity by organ and tissue

As seen in **Scammon's growth curves** (Scammon,1930), which show the growth of various tissue types over time, while there are ups and downs in the curves, growth and development of organs and tissues continue uninterruptedly until they reach the size of the adult level represented by 100% (**continuous process**). The growth velocity, however, differs by age, sex, and function of the tissue (**genetic factors**). For example, body height increases from infancy to adolescence. Furthermore, the period when body height increases rapidly differs between boy and girls. Neural tissue develops rapidly during infancy and early childhood, while lymphoid tissue develops throughout middle and late childhood. Note, however, that Scammon's growth curve only gives an image of growth and development after birth and that the size and functions of each organ and tissue are not zero at the time of birth. Let's work on "Exercise [3-3]" here.

4) There are critical periods and sensitive periods in a child's growth and development[5]

In the biological process of growth and development, there are critically important periods for the development of certain physical and mental skills and acquisition of new patterns of behavior. If a child does not receive the appropriate environmental stimulus or experience to acquire a given skill during that period, it becomes difficult for the child to develop the associated functions or behavior later in life. This period is called **the critical period**. In the case of sensory and motor development, for example, the environment and experiences during infancy have a large impact on the development of binocular vision (the ability to see things using both eyes) and hearing acuity. The critical period for the ability to acquire language is said to be up to 12 or 13 years of age, meaning that if a child grows up in an environment where he or she cannot receive proper language input during early childhood, it becomes very difficult for the child to acquire language proficiency after reaching adolescence.

A sensitive period is when the child is most sensitive to certain environmental stimuli effective for acquiring a new pattern of behavior, which means that the period is most suitable for acquiring that behavior or skill. For example, Dr. Maria Montessori (described by the American Montessori Association as "an Italian physician, educator, and innovator, acclaimed for her educational method that builds on the way children learn naturally") advocated that the sensitive period for acquiring cognitive skills and social aspects of life is from infancy to early childhood.[6,7]

Although the path of individual growth and development is not completely determined biologically, we are not endowed with unlimited plasticity while we grow up. In fact, human growth and development is an intermediate of both, determined through the influence of both biological characteristics and growth environment.

5) Individual variability of growth becomes significant with age

The biological variability of newborn babies is rather small, but as babies grow older, individual variability becomes larger through the influence of genetic factors and the growth environment (**individual difference**).

3. Growth and developmental periods by age

Human growth and development periods can be roughly divided according to age groups: newborn (up to 4 weeks from birth); infant (until the age of 1); early childhood (until entering primary school) divided into toddler (1-3 years) and preschool (3-6 years); middle childhood (during enrollment in primary school; school age, 6-12 years); and adolescent or late childhood (from secondary school to adulthood, or until height growth ceases; approximately 12-18 years) (**Figure 3.3**). Here, we will investigate the details of physical growth, motor and cognitive development, and emotional and social development during the early and middle childhood periods (**Table 3.1**).

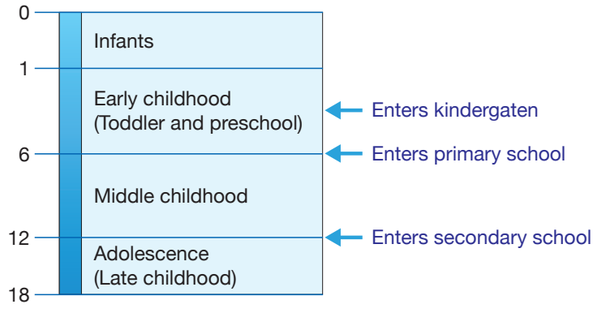


Figure 3.3 Children's growth and development periods by age

1) Growth and development during early childhood

(1) Physical growth

Body height and weight steadily increase during these periods. By the time a child reaches the age of five, body height and weight will increase 2.2-fold and 6-fold respectively from the time of birth. Body shape becomes more slender, approaching the shape of an adult, and the head-to-body ratio reaches around 1:6 at the age of six. A child's permanent teeth start to grow from around this time, with some individual variability.

(2) Motor development

Gross motor skills development: a child typically starts walking around 12 months after birth, becomes able to walk steadily by 18 months, and by the age of three, can jump and kick a ball. At ages five to six, most children become able to make complex and coordinated movements using hands and feet like standing on one foot, skipping on both feet, and jumping rope.

Fine motor skills development: a child from 12 to 18 months old has typically mastered basic skills like reaching out for an object, grabbing, and letting go. As children grow older, they become capable of coordinated motions using tools with both hands. At ages three to four, they become able to use scissors or button and unbutton clothes, which require different movements between the two hands, but still in an awkward manner. From around age four, children start showing a tendency to consistently use their dominant hands. By the ages of five to six, they become capable of skillfully moving finger joints, meaning that they can learn to write letters by moving a pen with the tip of their thumb, index finger, and middle finger. They will also become able to hold a paper cup without crushing it by applying the right amount of force as appropriate to the object.

(3) Cognitive development

Children at the ages of two to three start developing abstract thinking skills, the ability to form an image of something through perceptual experiences, and imagine things that are not being directly experienced. When they reach the ages of four to six, they become capable of sorting and associating objects. They also understand left and right with reference to their own body. When drawing a picture of a person, they start drawing hands and feet, though not in sufficient detail.

Dramatic language development can be seen during the toddler period. After 18 months to two years from birth, children start joining two words in a sentence and their vocabulary rapidly expands. It is said that by the age of two children typically have a vocabulary of more than 300 words. At the ages of four to six (i.e., preschool age), they understand that a "cat" is an "animal" and "banana" is "food." This means that they understand the definition of those words and can categorize words that represent a concrete object into a category of abstract meaning.

(4) Emotional and social development

Emotional and social development during the early childhood period is closely associated with human relations, basic lifestyle habits, and play that the child experiences. Children start developing self-consciousness and show their desires. For example, children two to three years old play individually, doing their own things, even when there are other people around, but as they grow older, they gradually learn to engage in the same play and interact with others. By the time they reach five to six years of age, they can share common goals and rules while playing. They develop the ability to understand other people's feelings from around age four and become capable of thinking from another person's point of view.

2) Growth and development during the middle childhood period

(1) Physical growth and development

Physical growth and development are steady and gradual during the earlier half of the middle childhood period. Once children enter the latter half, however, genital functions develop rapidly with some individual variability. Development of genitalia begins earlier in girls than in boys. Girls start to develop breasts and pubic hair.

(2) Motor development

Children develop muscles and acquire basic motor skills over the middle childhood period. They become able to jump, throw, and perform other motions much more skillfully than during the early childhood period. They learn how to combine basic motions using hands and feet, and attain temporal and spatial movement skills.

(3) Cognitive development

In the cognitive aspect, children start thinking logically about specific things. By ages nine to ten, they become able to recognize equal amounts of a substance even if it is placed in different containers. This indicates that they have acquired the concept of "preservation" and are ready to understand such concepts as numbers, weight, volume, and time. From ages eleven to twelve, children start to think systematically and infer a conclusion based on a hypothesis.

The main form of communication for children is speech during the early childhood period, but as they grow up and attend school, they acquire other forms of communication: writing and reading. During the earlier half of the middle childhood period, children tend to write only short sentences, but will eventually learn to write longer sentences using conjunctions in the latter half of this period.

(4) Emotional and social development

The middle childhood period is a time when children develop social emotions such as sense of self and empathy within the social framework of school. Self-consciousness can be observed from the early childhood period, but children start to recognize and sense themselves as beings (i.e., experience their own existence) through social interrelations with their peers when they enter the middle childhood period. They develop feelings of capability as well as inferiority through comparison with others, and gradually establish their feelings of self-esteem. Peer-to-peer relationships also undergo change in the later part of the middle childhood period. The peer group with which a child engages grows larger. Children form groups based on a sense of unity fostered by playing together and sharing the same experience. This period is called the "gang age" and peer groups take on a social significance. These gangs or peer groups are prominently characteristic of boys.

4. Factors that influence children's growth and development

Historically, children's health was defined in the same way as adult health and was hardly given special consideration. However, it has recently been recognized that a developmental perspective needs to be incorporated into the concept of children's health. It is becoming increasingly clear that children's health is determined through the interaction of many factors different from those of adults. Against this background, the Committee on Evaluation of Children's Health (National Research Council and Institute of Medicine, US) issued a report that proposes to define the concept of children's health as follows to include growth and development and sheds light on the factors that influence developmental health.[8]

"Children's health is the extent to which individual children or groups of children are able or enabled to (a) develop and realize their potential, (b) satisfy their needs, and (c) develop the capacities that allow them to interact successfully with their biological, physical, and social environments."[8]

Table 3.1 Summary of development indicators during the early and middle childhood periods

Dimension of Development	Infancy and early childhood period					Middle childhood period	
Age	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7
Body height	1.5 times birth height			Twice birth height			
Body weight	3 times birth weight	4 times birth weight		5 times birth weight			
Gross motor skills	Stands holding furniture	Walks	Runs				
	Drops a ball and follows it with eyes	Throws a ball toward a target	Kicks a ball	Skips on one foot	Skips on both feet	Catches a ball with hands	
Fine motor skills		Draws and copies lines	Draws a circle	Draws a square	Draws a triangle		
		Builds a tower with blocks		Uses scissors			
Language skills	Produces first intelligible words	Expands vocabulary	Asks questions using interrogatives			Capable of holding a conversation	Reads, writes, and acquires basic academic skills
Emotional and social skills	Understands and obeys prohibition	Plays alone apart from parents	Plays with friends	Plays in groups of three or more		Rational and theoretical thinking	Can make inferences in the mind
	Repeats the same behavior when praised	Imitates phone conversation	Likes to care for younger children	Asks for permission		Can move from concrete to abstract thinking	

Table 3.2 Organization of Influences on Children's Health

Children's biology	
Children's behavior	
Physical environment	
	Prenatal exposures
	Childhood exposures
	Home, school, and work settings
	Child injury and the provision of safe environments
	The built environment
Social environment	
	Family
	Community
	Culture
	Discrimination
Services	
Policy	

Cited from "Committee on Evaluation of Children's Health. Children's health, the nation's wealth: Assessing and improving child health."[9]

According to the report, there are biological, behavioral and (physical and social) environmental factors that affect a child's developmental health (**Table 3.2**). From this report, we can understand a comprehensive list of factors that affect children's health. **Biological influences** include genetic expressions, prenatal influences, and perinatal and postnatal events. **Behavioral influences** include the child's emotions, beliefs, attitudes, behaviors, and cognitive abilities. **Environmental influences** are wide-ranging and include influences from the biological environment (e.g., infectious agents such as malaria and intestinal helminths in Cambodia) and physical environment (e.g., water pollution and exposure to metals and pesticides in Cambodia) and social factors such as loving interactions with caregivers (e.g., domestic violence, abuse, and maternal mental health in Cambodia), socioeconomic resources in the family and community (e.g., income and job opportunities in Cambodia), and peer relationships and the availability and quality of services (e.g., health services in Cambodia).[9]

In a survey of factors affecting early childhood growth and development based on the current situation in Bhutan, the following five main factors have been identified as contributing to growth and development in early childhood: nutrition, environment, parent's behaviors, parenting, and social and cultural practices.[10] **Table 3.3** shows risk factors for growth and developmental delay in developing countries, listing influence of both community or ecological factors and individual factors on preschool children.[11]

The issue of healthy growth and development in children is a focus of interest in Cambodia, too. The health status of children in Cambodia largely improved in the period from 2000 to 2010: infant mortality (deaths per 1,000 live births) dropped from 95 to 45 and under-five mortality (deaths per 1,000 live births) from 124 to 54.[12] On the other hand, consistent with the risk factors noted in **Table 3.3** and the Bhutan study, there are still challenges to be resolved, such as improvement of nutritional status, hygiene conditions such as water sources and toilet facilities, violence against children and child labor, and socio-economic disparity between urban and rural households. Therefore, in order to promote the healthy development and growth of Cambodian children, it is necessary to clarify the risk factors and factors promoting development and growth by targeting a wider age range of children and to address such challenges as school health initiatives under the national policy.

Table 3.3 Examples of community or ecological risk factors and individual risk factors among preschool children in developing countries

Community or ecological risk	Individual
Poor sanitation	Repeated infections
Famine	Under-nutrition
Endemic violence	Abuse and neglect
Lack of accessible services: preschools, schools, libraries, health services	Very low family income
Lack of commitment to child development	Low birthweight
	Low maternal education
	Large family size
	Short intervals between births
	Low levels of developmentally enhancing parenting practices

Cited from "A brief review of risk-factors for growth and developmental delay among preschool children in developing countries"[11]

In light of this situation, the Cambodian Government developed the five-year National Action Plan on Early Childhood Care and Development, 2014-2018, which aims, as a priority, to increase school enrollment rates and enhance protection of all young children under six years of age, especially children from poor families and indigenous minority groups and children with disabilities, who were most marginalized from early learning opportunities. Through this action plan, the Cambodian Government commits to extending support and improving the quality of early childhood care and development throughout the nation.[13]

Exercises for further thought and research

[3-1] Think of a child you are familiar with (a younger brother or sister, a child in the neighborhood, etc.) and check the child's growth and development status according to the dimensions of development in **Table 3.1**.

[3-2] Consider the potential benefits and significance for a school teacher of learning about children's growth and development processes.

[3-3] Check the patterns of Scammon's growth curves on the Internet and their characteristics. Next, think about why these pattern differences occur.

[3-4] Consider events and phenomena that are, or are likely to be, a threat to the growth and development of children in Cambodia.

References

1 Edited by Emiko Fukuda, (Ed.) "*Ningen hattatsugaku* (Human development)" 5th edition, Tokyo: Chugai-Igakusha, 2019.

2 Edited by Goro Kono and Etsujiro Takahashi, (Eds.) "*Hoikuno nakano hoken – Yochien/hoikusho denohokenshido no riron to jissen* (Health as part of nursing – Theory and practice of health guidance in nursery schools)," revised edition, Tokyo: Houbunshorin, 2010.

3 Ruffin N.J. Human growth and development – A matter of principles. Virginia Cooperative Extension. Virginia Tech. 2019. https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/350/350-053/350-053 (FCE-134 P).pdf

4 Dhaker R. Growth and development. https://www.slideshare.net/rdhaker2011/growth-and-developmentppt

5 Schaffer H.R. Key Concepts in developmental psychology, 58-61, Los Angeles, Sage, 2006.

6 Montessori M. Six "Sensitive Periods." https://www.montessoritrainingusa.com/sites/montessoritrainingusa.com/files/Six%20Sensitive%20Periods.pdf

7 American Montessori Association. Who Was Maria Montessori? https://amshq.org/About-Montessori/History-of-Montessori/Who-Was-Maria-Montessori

8 Committee on Evaluation of Children's Health. Children's Health, the Nation's Wealth: Assessing and Improving Child Health. p.4, Washington DC, The National Academies Press, 2004. https://www.ncbi.nlm.nih.gov/books/NBK92198/#ch2.s3

9 Committee on Evaluation of Children's Health. Children's Health, the Nation's Wealth: Assessing and Improving Child Health. p.45-90, Washington DC, The National Academies Press, 2004. https://www.ncbi.nlm.nih.gov/books/NBK92200/#ch3.s1

10 Pem D. Factors Affecting Early Childhood Growth and Development: Golden 1000 Days. Journal of Advanced Practices in Nursing, 1:1, 2015. DOI:10.4172/2573-0347.1000101.

11 Ali S.S. A brief review of risk-factors for growth and developmental delay among preschool children in developing countries. Advanced Biomedical Research. 2:91.2013 doi: 10.4103/2277-9175.122523.

12 National Institute of Statistics, Directorate General for Health, and ICF Macro, 2011. 2010 Cambodia. Demographic and Health Survey: Key Findings. Phnom Penh, Cambodia and Calverton, Maryland, USA: National Institute of Statistics, Directorate General for Health, and ICF Macro. https://www.nis.gov.kh/nis/CDHS/CDHS_2010_Key_Findings.pdf

13 The National Committee of Early Childhood Care and Development. National Action Plan on Early Childhood Care and Development 2014-2018. https://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/cambodia_early_childhood_national_action_plan_2014-2018.pdf

Chapter 4

Cleanliness, hygiene and health

Learning objectives

You will be able to gain proper understanding and explain:

- The principles of cleanliness and hygiene.
- With examples, diseases and conditions that arise from unsanitary and unhygienic behavior.
- With examples, good hygiene behavior and behavior to keep our bodies clean.
- With concrete examples, unhygienic environments (home, school, town/community).
- With multiple examples, diseases and conditions that arise from unhygienic environments.
- With examples, what can be done to improve unhygienic environments.
- Ideas on how unhygienic and unclean behaviors can be changed.

In this chapter, we learn about cleanliness and hygiene in relation to children, homes, schools, and communities. The specific learning topics are hand washing, bathing, clean water, hygienic food preparation, cleaning, waste separation, and water and sewage systems.

1. Personal and environmental cleanliness and hygiene (home, school, town/community)

1) Personal cleanliness and hygiene

To lead healthy lives, we need to keep our own bodies **clean and hygienic**. "Cleanliness" refers to the state or habit of keeping yourself and your surroundings free from dirt. "Hygiene" means the practice of preventing illness or the spread of disease by keeping yourself and your home, workplace, and community environments clean. Key behaviors in maintaining cleanliness and hygiene are washing your hands, brushing your teeth, and bathing.

First, to prevent infectious diseases, it is important that your hands are clean (not dirty) and hygienic (no cause for disease to take effect). Hands need to be washed with water and well-lathered soap to remove dirt attached to the surface of the hands (**cleanliness**), while also removing the viruses and bacteria that are the cause of disease (**hygiene**), blocking this infection route. As explained in detail in Chapter 7, the three main factors in the transmission of infectious diseases are **pathogens** (for example, bacteria and viruses that cause disease), **transmission routes** (the routes whereby bacteria and viruses are communicated), and **hosts** (people's resistance and immunity to bacteria and viruses). Transmission routes include **direct contact**, **droplets**, and **airborne transmission**. To prevent direct contact transmission in particular, it is important to maintain cleanliness and hygiene by washing your hands, sterilizing your fingers, and sterilizing surfaces that are touched by multiple people.