CHAPTER 3

Infancy

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CHAPTER OUTLINE

1. PHYSICAL DEVELOPMENT DURING INFANCY

- Physical growth
- Motor development
- Perceptual development
- Health issues

2. COGNITIVE DEVELOPMENT DURING INFANCY

- Piaget's cognitive development theory and the sensorimotor stage
- Information-processing in infancy
- Language development in infancy

3. GENETICS

- Emotional development
- Self and others
- Psychosocial development

They come out scrunched up and pink and spend most of their hours sleeping, and within no time at all they are running around full of energy. Infancy (birth through the second year) is a time of remarkable growth and change. In this chapter, we will see some of the amazing physical, cognitive, and socioemotional feats infants achieve during this short period of time.

1. PHYSICAL DEVELOPMENT DURING INFANCY

LEARNING OBJECTIVES:

1. *To have a general knowledge of genetic terminology and processes*
2. *Awareness of some of the different types of genetic disorders*
3. *Appreciation for the field of behavior genetics within the context of studying life span development*

PHYSICAL GROWTH

Physical changes in infancy are dramatic and rapid. We gain a stark impression of the drama of these changes when we compare the abilities and functioning of a newborn with those of the same child at the end of the infancy stage. Significant physical changes are observed in all aspects of the body. In this section, we will describe these dramatic physical changes during infancy.

Growth Patterns

Many significant physical milestones are reached before a child's third birthday. These include mastery of the basic motor competencies shared by all human beings: locomotor

The physical changes and abilities of a newborn through the end of the infancy stage is dramatic. (iStock)

(movement) and manual (hand) skills, perceptual skills, and coordination of sensory and motor activities. These basic competencies allow the individual to interact actively with the environment. They stimulate development in other areas as well.

Growth in infancy follows two basic patterns that began with the physical changes observed during the prenatal stage. The progression of these basic patterns can be observed in many physical changes that happen during infancy, especially in those associated with motor skill development and physical development. These patterns will continue throughout the growing years until the individual achieves full maturity.

Cephalocaudal growth pattern

Changes occur in the head region of the body, both internally and externally in advance of those occurring toward the abdominal region.

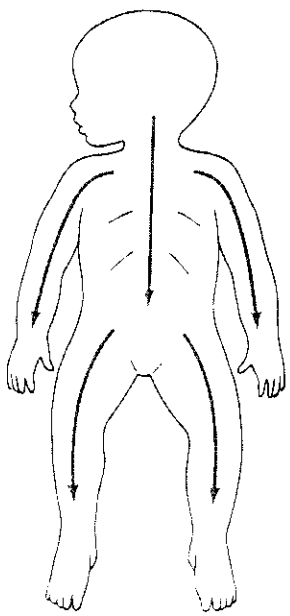
The first basic pattern is that changes are **cephalocaudal** in direction. This means that changes in the head region of the body, both internally and externally, are in advance of those occurring toward the abdominal region. Maturation takes place in a head-to-foot direction. For example, developmental changes in motor performance and functioning occur first in the head region and last in the foot region of the body. The spinal cord, nerves, and muscles experience maturational changes in the head region earlier than in the pelvic region. For this reason, infants are able to rotate their heads from side to side long before they can sit up without support or walk.

Proximodistal growth pattern

Changes happen first in the center, innermost area of the body and then move outward to the ends of extremities.

The second basic pattern is that maturational and developmental changes occur in a **proximodistal** manner. This means that changes happen first in the center, innermost area of the body and then move outward to the ends of the extremities. This proximodistal pattern is also observed in prenatal development. For example, during the embryonic period, arms and legs appear containing finger and toe buds at their ends. Eventually, these buds give rise to the digits of the hands and feet.

FIGURE 3-1 CHANGES ARE CEPHALOCAUDAL IN DIRECTION



Generally, function follows form in growth trends throughout infancy (Timiras, 1972). The pattern of proximodistal changes predicts, for example, that infants will use their arms before they are able to use their hands or fingers to grasp an object accurately.

For the first six months following birth, growth is a continuation of the rapid changes begun during the prenatal stage. Thereafter, the rate of changes declines slowly for the remainder of infancy.

Weight and Height Changes

Weight changes are much more dramatic than height changes during the first year. A normally developing baby doubles his or her birth weight by the fourth month and triples it by his or her first birthday. Newborns grow to about one and a half times taller by their first birthday. By the second year, an individual has reached about 50 percent of his or her potential adult height and 20 percent their adult weight (Tanner, 1990).

4. What does myelination of the axon accomplish?

Brain Development

Before specifically discussing brain development during infancy, it is important to lay the foundation by describing some basic features of the brain. The neuron is the information-processing cell of the nervous system (Bransford, Brown & Cocking, 2000). Nearly all of your neurons were generated during your prenatal life and will continue to function into old age. In fact, neurons started being created within ten weeks after conception and production was pretty much complete by twenty-eight weeks after conception. These neurons were created at the astonishing rate of about 1,000 neurons per second, resulting in somewhere around 100 billion neurons.

Neuron
The information processing cell of the nervous system.

Cell body
Contains the parts of the cell to keep it alive and functioning (such as the nucleus).

Dendrites
Receives information from other neurons.

Axon
Takes information from the neuron away to be sent to other neurons.

Myelinated
A layer of fat that can surround the axon.

Neurotransmitters
Chemical messengers that carry information to other neurons.

Synapses
The tiny gaps between neurons.

The **neuron** has several important parts (Bransford, Brown & Cocking, 2000). The **cell body** contains the parts of the cell to keep it alive and functioning (such as the nucleus). The **dendrites** receive information from other neurons, whereas the axon takes the information from the neuron away to be sent to other neurons. The **axon** can be **myelinated** (or surrounded by a layer of fat). Myelination insulates the axon and speeds up message transmission (and it may possibly provide energy). At the end of the axon are the terminal buttons which can release neurotransmitters. **Neurotransmitters** are chemical messengers that carry information to other neurons. The tiny gaps between neurons are called **synapses**. We know this is brief and to the point, but most of you have probably already learned about the brain in general psychology, biology, anatomy, or health.

The outer surface of the brain (the wrinkled part) is called the cerebral cortex (called cortex for short). The cortex is where the magic called "human qualities or traits" occurs. Personality, problem-solving, language, purposeful movement, and emotional control are just some examples of important human behavior that are at least partially controlled by the cortex (Siegler, 1998). Areas of the cortex can be specialized for special processes—we will learn more about this with language development.

There are two hemispheres to the brain, the left and the right. Language ability is specialized in certain areas of the left cerebral cortex for most individuals (Siegler, 1998; Tanner,

1990). This specialization is evident in newborns as measured by brain activity in response to speech. It is theorized that such specialization may help prime the brain to learn language quickly in infancy. Spatial processing seems to be specialized in certain areas of the right cerebral cortex for most individuals. This specialization is evident during infancy.

Sometimes, babies are born with (or develop after birth) severe forms of epilepsy which necessitate removal of the left hemisphere of the brain. If this is done during infancy, language function is moved to the remaining right hemisphere with relatively little problem. Interestingly, when language processing moves in, spatial processing moves out (at least somewhat). It appears that it is within our genetic code to give language processing preference for any available healthy brain tissue over spatial processing. It is important to note that the earlier in life that such brain surgery is done, the better. The brain appears to lose some of it's plasticity with development, resulting in less optimal recovery at later ages (Siegler, 1998).

An adult brain is about three pounds. The brain achieves 25 percent of its weight by birth and 75 percent by the first birthday. Although the newborn is born with most of the neurons he or she will ever have, the number of dendrites (with corresponding synapses) increases significantly during infancy. No experience is lost on a newborn, as experiences build connections in the brain. Research shows that animals and humans reared in stimulating environments have bigger brains and more connections than animals and humans reared in barren or neglectful environments (National Research Council and Institute of Medicine, 2000).

Different areas of the brain develop at different times. Many are not complete until well into adolescence. In terms of infants, areas important for language, visual, motor, emotions, and planning all show development during infancy (National Research Council and Institute of Medicine, 2000).

Other Physical Changes

Three major areas of physical development would include muscle development, fat development, and bone development. Although nearly all of a person's muscle fiber is present at birth; it continues to grow, strengthen, thicken, and band together during infancy and throughout childhood. During the end of prenatal development, a layer of fat begins to be deposited below the skin. This layer of fat continues to develop during infancy and is important for body

The layer of fat that is developed during infancy is important for body temperature control. (iStock)

temperature control. Finally, bones begin as cartilage during prenatal development. It slowly hardens to bone in the center core during prenatal development and the outer ends (epiphyses) harden to bone near birth. The rest of the cartilage turns to bone slowly and, when complete, finishes growth of the skeleton (Tanner, 1990).

Test Yourself

1. Describe the physical growth patterns discussed in this section.
2. In which hemisphere of the brain is language localized for most people? Why may the brain have such a specialized area?

MOTOR DEVELOPMENT

Basic motor, or movement, skills are developed in infancy. Changes or refinements in these skills are based on (1) maturation of structures such as nerves and muscles, (2) exercise of existing reflexes present at birth, and (3) experiences in practicing and refining the skills as they appear and change. In many respects, motor skill development reflects the interaction between genetic programming and environmental experiences more dramatically than any other developmental pattern.

The pattern of motor skill development in infancy illustrates many of Gesell's ideas regarding maturation (that development unfolds according to a preprogrammed, biological sequence). Gesell stressed that motor skills emerge in accordance with a predictable inborn sequence that is highly organized and common to all humans. Babies do not acquire them before they are developmentally ready. Individual differences in the rate at which these skills emerge and become refined are apparent among infants.

Motor Skills

The achievement of upright locomotion is a milestone in human development. An infant's first steps reflect much developmental progress in motor skills from the time of birth. They set the stage for many related developmental events later in the life span.

Walking is a highly complex behavior. It involves the coordination of a large number of muscle groups working in association with sensory perception to maintain balance. Reflex activity in the neonatal period and movement behaviors in the early months of infancy prepare the individual to walk. Upright locomotion develops as a sequence of events that follows the cephalocaudal pattern. It is accompanied by maturation of muscle groups and nerve fibers involving the spinal cord and lower brain structures. Please note that although we are heavily emphasizing the importance of biological maturation in this section, keep in mind the importance of caregiving behaviors and infant experiences in promoting infant motor development. As always, nature and nurture both play a role in this developmental feat.

The sequence of events that culminates in walking illustrates the principle that changes in motor skills proceed from the general to the specific. The diffuse, largely uncoordinated behaviors of early infancy are brought under the control of the specific body parts involved in walking. The process involves orderly changes as an infant experiences the maturational preprogrammed responses that partially compose motor skill development.

The sequencing begins in association with the behavior of early infancy. The child first acquires the ability to lift its head and then its chest from a prone position. The ability to sit up with, and then without, support is attained next. This illustrates an infant's increasing control over the muscles and nerves of the trunk region of its body. By about seven months of age, most infants show the rapid increase in motor skill activity and changes that permit **crawling** (locomotion with the abdomen on a surface). This is followed by **creeping** (locomotion by moving the hands and knees with the abdomen off the surface). A variation in locomotion is **hitching**, or crawling or creeping backward using the buttocks rather than the hands and knees. Using various body parts in numerous combinations produces movement in all directions.

Crawling
Locomotion with the abdomen on a surface.

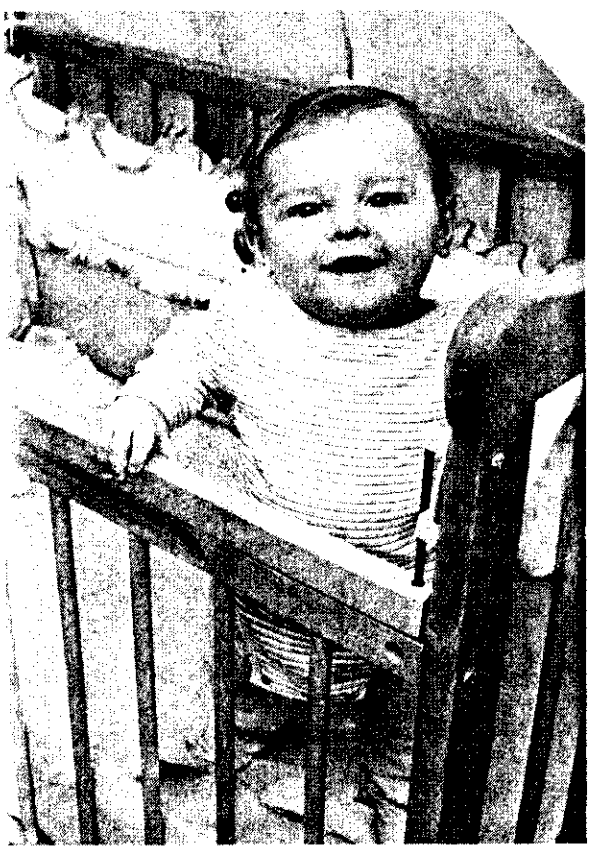
Creeping
Locomotion by moving the hands and knees with the abdomen off the surface.

Hitching
Crawling or creeping backward using the buttocks rather than the hands and knees.

Toward their first birthday, many infants are able to pull to a standing position using crib sides, furniture, or walls for support. **Cruising**, or walking using the assistance of objects or people leads to upright, independent walking. Walking occurs for most American infants around the first birthday. Although we are giving approximate ages for these motor milestones, remember that infants can vary and have their own timetable.

Cruising
Walking using the assistance of objects or people.

One of Gesell's principal conclusions about the role of maturation was that none of these events will occur until an individual is ready developmentally. In other words, neither the appearance of these events nor their rate of development can be altered. His conclusion is questionable, however, because infants who have received special training have been shown to walk earlier than usual (Zelazo, 1983). What is controversial is the *purpose* of accomplishing this achievement earlier than typically expected.



By their first birthday many infants are able to pull themselves into a standing position by using the sides of their cribs. (iStock)

Hand Skills

The human hand is an engineering marvel. Composed of several dozen

Hand skills

The ability to explore and manipulate a wide variety of objects with the hands.

bones, the hands provide the means for exploring and manipulating a wide variety of objects. **Hand skills** let the developing infant take in rich sensory input from the environment and participate in much instrumental or goal-oriented behavior. They are as significant for active exploration as walking or locomotion.

Much of our understanding of the developmental changes in hand or manual skills come from observing the grasping activities and behaviors of infants (Frankenburg et al., 1981; Halverson, 1931; von Hofsten, 1983). The emergence and refinement of the ability to handle objects and use the hands with agility follows the proximodistal pattern and conforms to the trend of general to specific responses. Essentially, there is an orderly sequence of steps and refinements in this type of motor skill.

At birth, grasping is governed by reflexive action. By the second month, this behavior is random and clumsy as the infant attempts to reach and retain objects. Initially, a baby uses the entire hand to grasp or pick up something. Later an infant uses only the palm and the fourth and fifth fingers. This is referred to as the ulnar grasp.

By six months of age, a different problem emerges. The infant is able to grasp an object in a primitive manner, but is unable to let go of it. Willful letting go of objects is not possible until about eight months of age. At this age, the ulnar grasp is modified to include the middle fingers and the center of the palm (the palmar grasp). Next it is refined to include the index finger and the side of the palm (the radial grasp). The final refinement involves the use of the thumb with the forefinger, known as the pincer grasp. The pincer grasp becomes the preferred method of picking up all objects, large as well as very small in size. This final ability is achieved at twelve to fourteen months of age. From this point forward, an infant experiences great delight in this new mastery and becomes absorbed in searching for all kinds of objects to successfully transfer to its mouth.

Test Yourself

1. How does walking develop?
2. How do hand skills develop in infancy?

PERCEPTUAL DEVELOPMENT

Perceptual Development

Perceptual skill development is closely associated with changes in motor skills development. This association is clearly observed in the emerging abilities of infants to use visual-motor skills in many activities. Infants learn to guide their movements and make adjustments in motor actions based on what they see.

Much of the change that takes place in grasping behavior reflects the increasing ability of an infant's brain to organize and interpret visual feedback. Up until they are four to five months of age, infants devote a great deal of their time to gazing at their

Perceptual skill

The ability to perceive through sight and sound; especially those skills related to motor skill development, such as depth perception and pattern perception, that emerge in infancy.

hands. Even while reaching for an object, an infant will become fascinated with watching his own hand. In fact, he will often lose sight of the object because he is so intent on examining the movements his hand is making (Bower, 1977; von Hofsten & Fazel-Zandy, 1984).

By the time a baby is about five to six months old; her hand movements are more controlled by visual feedback (Hatwell, 1987). The infant is now more motivated to grasp and manipulate objects and less fascinated by her own hand movements. This important achievement results from continual practice in hand gazing. Hand gazing apparently establishes neural circuits in the brain, and these provide information about where the hand is in space, which way the arms and legs are moving in space, and what happens as a result of such actions. The development of kinesthetic sense, or knowledge of where one's body is in space, how it performs when making certain movements, and what happens as a result—will become significant in learning to walk.

In learning about visual-motor coordination, researchers have studied two other related areas: the acquisition of depth perception and pattern perception.

Depth Perception

The ability to detect differences in surface depths and three-dimensional perception seems to be inborn in many animal species. These skills in depth perception are not innate in human beings but emerge very early in their development. Their early emergence may serve to protect infants from falling and injuring themselves.

Psychologists Eleanor Gibson and Richard Walk (1960) conducted a famous investigation called the visual cliff experiment to study depth perception in infancy. An apparatus was constructed using checkerboard patterns. One pattern was part of one end of the surface of the apparatus; the other was on the floor but could be seen through glass that extended across the apparatus' surface. This gave the appearance of a change in surface depth. A group of infants from six and one-half to fourteen months of age were placed individually at the shallow end of the apparatus and encouraged to crawl to their mother, who was at the other end. The reactions of the majority of infants showed that they detected the apparent change in

The differences in surface depths and three-dimensional perception protects infants from falling and injuring themselves. (iStock)

depth of the surface. Some would approach the edge, touch the glass, and retreat back to the shallow end. Others cried in frustration at not being able to reach their mother. All of these infants clearly demonstrated avoidance of the apparent deep zone.

This experiment cleverly showed that stereoscopic or binocular vision appears by the time an infant is ready to begin actively exploring its environment by crawling and creeping. This is usually at about six months of age. Several studies have revealed that a rapid increase in this ability to perceive the world in a three-dimensional manner occurs between the age of three and six months as a result of the establishment of neural circuitry in the brain (Bertenthal & Camos, 1987; Yonas, Granrud & Pettersen, 1985). Other work has shown the importance of early visual experiences in the development of binocular vision (Hubel & Wiesel, 1970). The cells in the brain that are responsible for this ability apparently disappear if they are not stimulated with sensory signals from both eyes during the first few months of life. In effect, the brain will not establish the appropriate neural circuitry for this necessary visual ability unless the infant has adequate experience visually exploring his or her environment. This is a good argument in favor of providing visual experiences to infants during their alert periods.

Test Yourself

1. Describe what is meant by perceptual skills.
2. What do we know about infant depth perception?

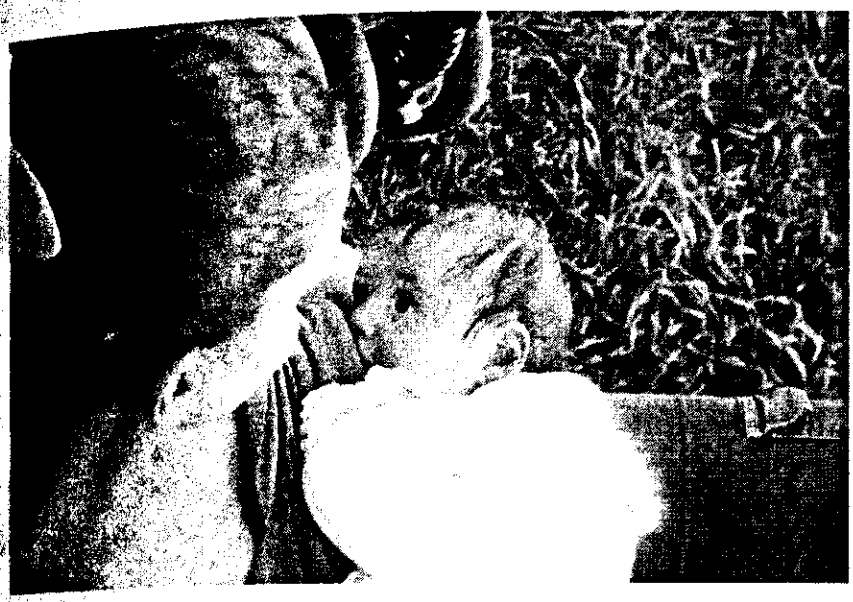
HEALTH ISSUES

Nutritional Needs

"Breast is best." Surely you have heard this mantra before. Overwhelming research indicates that breast milk provides the best nutrition for infants; it offers the perfect combination of carbohydrates, fats, and proteins. Breast milk also contains the mother's antibodies to help fight infections. In comparison to formula-fed babies, breastfed babies have lower childhood obesity rates, lower rates of illnesses and infections, lower rates of SIDS (sudden infant death syndrome), lower childhood cancer rates, lower rates of diabetes II, lower rates of allergies, and denser bones. Additionally, breastfeeding may be correlated to better cognitive development and visual acuity. Breastfeeding also provides benefits to the mother; including, lower stress levels, weight loss, and a sense of peace and bonding (thanks to hormones).

However, there are reasons as to why breastfeeding should be avoided. If the mother has a disease that can be transmitted through the breast milk (such as AIDS), breastfeeding should be avoided. Additionally, certain medications that may harm the baby may prevent a woman from breastfeeding.

Approximately two-thirds of women breastfeed while in the hospital, with about a third still breastfeeding six months later. Most medical professionals recommend breast-



Research has shown that breast milk has many benefits for infants. For example, breastfed babies have lower childhood obesity rates, lower rates of SIDS and denser bones. Breast milk also contains the mother's antibodies which helps fight infections. (iStock)

feeding for at least the first year. Women with social support are more likely to continue breastfeeding than women without such support.

Baby foods (special infant cereal is usually first) are introduced typically between four and six months. Unfortunately, some uneducated parents mix formula with cereal in a bottle before this time with the thought of helping the infant sleep through the night. This practice is highly discouraged because the infant's digestive system is not yet developed enough to handle the cereal and the parents may cause some serious health issues. By the first birthday, the infant is usually ready to eat some finely cut or mashed table food. Pediatricians often assist parents in knowing when it is appropriate to introduce certain foods. If certain foods are introduced too soon, parents can risk triggering allergic reactions that may create sensitivities that will last a lifetime.

Safety Concerns

As motor skills advance from crawling and creeping to upright walking, the infant's perspective of the world changes. Now an infant can move about with increasing speed and has more freedom to explore the physical surroundings. To grow and develop adequately, they need these experiences. They need to learn they are distinct persons, separate from other people and things, yet also a part of their surroundings. As children act upon their environment, they discover how their environment acts.

Childproofing

Arranging and adapting housing and physical space (e.g., by capping electrical outlets) to meet safety concerns for infants.

Naturally, parents are concerned about the infant's physical safety at this time. It soon becomes obvious that a child's quest to discover the environment can lead to danger. Parents generally react by **childproofing** their home—that is, they adapt it to the needs and behavior of a small child (Duvall & Miller, 1985). Cleaning solutions are placed out of reach, accessories are moved from tables, tablecloths are put away, protective gates are placed across doorways, and electrical outlets are plugged with specially designed caps. Often the entire family's lifestyle must be modified to protect an infant's safety.

In recent years, numerous baby products and toys have been recalled because of lead paint or other toxins. Because babies have the tendency to put everything in their mouth, it is especially important to avoid anything that may have lead or lead paint. Although steps have been taken to ensure the safety of infant and child products, safety should not be taken for granted. It is important for parents to stay up to date on product recalls.

Promoting Wellness

Health should be closely monitored during infancy. Periodic visits to health-care professionals help to promote well-being and normal growth patterns during this stage.

Immunizations

Immunizations protect infants against a variety of communicable diseases. (shutterstock)

Making sure that an infant is immunized against a variety of communicable diseases is an important aspect of health care. Most of the diseases that once killed people in infancy are now preventable by immunization. Although there is some debate in the general public as to whether a preservative in vaccinations may have triggered autism in children, medical professionals vehemently deny this assertion. Sadly, some once eradicated childhood illnesses are making a comeback because of parents not vaccinating their children. Parents who are concerned about vaccinations and potential health hazards should talk to their pediatrician.

Sleep

In the last cycle we spoke about infant sleep cycles. Although babies differ as to when they will actually start sleeping through the night, parents can rest assured that it should happen sometime before the first birthday (although one of the author's daughter's did not sleep through the night until around sixteen to eighteen months of age).

Sudden infant death syndrome (SIDS)

A condition of unknown cause resulting in the sudden and unexpected death of an infant.

Sudden Infant Death Syndrome (SIDS) is a worry for parents of infants. What is SIDS? It is when an infant stops breathing during sleep and suffocates to death. SIDS claims approximately five thousand infant lives in the United States each year. The peak age for SIDS deaths is between two and four months of age.

Doctors and researchers are not sure what causes SIDS. A genetic predisposition and brain defect are likely candidates; however, there are known environmental factors that can place infants at risk. For example, exposure to maternal smoking in the womb, second-hand smoke, low-birthweight, premature birth, co-sleeping, heavy blankets/sleepwear, and a sibling death due to SIDS increase the risk of SIDS. Breastfeeding, sleeping in the parents' bedroom (but in a separate bed), sleeping with a fan on, and sleeping on one's back seem to help prevent SIDS.

Co-sleeping
Parents and children sleep in the same bed.

Co-sleeping is a controversial issue in the United States. **Co-sleeping** is when parents and children sleep in the same bed. Many cultures accept co-sleeping as a natural way of life. Many parents enjoy the time of closeness with their infant and it facilitates breastfeeding. However, many U.S. medical professionals advise against co-sleeping because of the risk of rolling over on the infant and suffocating them. Some American parents are opting to have an infant room-in with them—the infant sleeps in the same room (making breastfeeding easier), but a separate bed.

Baby Exercise

Infants are typically active on their own. They work very hard, almost nonstop, toward reaching their next motor milestone (e.g., rolling, crawling, or walking). Free movement and playtime, while being supervised, is encouraged for infants. Structured exercise, however, is largely unnecessary and potentially dangerous. Because infants cannot directly communicate if a parent is going too far in helping them exercise, it is usually recommended that parents hold off on the structured exercise classes until the child is older. An obvious exception to this general rule is if the infant has a developmental disability that requires physical therapy.

Test Yourself

1. Do vaccines cause autism?
2. What are risk factors for SIDS? What can help prevent SIDS?

2. COGNITIVE DEVELOPMENT DURING INFANCY

LEARNING OBJECTIVES:

1. *Understand the general progression of cognitive development during the sensorimotor stage*
2. *Describe infant information-processing skills*
3. *Identify milestones in infant language development*

We are going to begin this section by discussing Piaget's first stage of cognitive development: the sensorimotor stage. This stage lasts from birth until around the age of twenty-four months. Remember, Piaget posited that individuals go through four stages

of cognitive development, each qualitatively different from one another. The stages must be gone through in order, and no stage may be skipped. However, in Piagetian theory, not all individuals reach the fourth stage of cognitive development, which we will discuss later in the book.

If you remember back to Chapter 1, Piaget's cognitive developmental theory saw assimilation and accommodation as two processes that help individuals adapt or change their schemas based upon their experiences in the world. This means that we can view cognitive development as driven by intellectual adaptation to the world.

This would be a good time to introduce two other key concepts in Piagetian theory: equilibrium and disequilibrium. There was probably a time back in your childhood when you believed in Santa Clause, the Easter Bunny, and the Tooth Fairy. When you accepted their existence without question, you were in a state of equilibrium. However, as you grew, you started to have some questions. Santa has a sleigh, but how does the Easter Bunny get around the world in one night? What does the Tooth Fairy do with all these teeth? Why does Tommy down the street keep saying that there is no Santa Claus? These, and many other doubts, started entering your mind. You entered a state of disequilibrium, an uncomfortable cognitive state in which your experiences and beliefs are no longer perfectly aligned. When this happened, you were forced to seek out answers and go through a process of equilibration, until your beliefs and experiences/observations were once again aligned.

Therefore, cognitive development is driven by adapting our thinking to our experiences in the world. When our thoughts and beliefs are no longer in equilibrium with our experiences, we are thrown into a state of disequilibrium. As we go through the equilibration process, we use the processes of assimilation and accommodation to adapt our schemas; hence, we grow cognitively.

After we finish discussing Piaget's sensorimotor stage, we will highlight information processing and language development during infancy. Although the infancy period lasts from only about two weeks after birth until the age of two, cognitive development is astronomically quick. When you compare the cognitive abilities of a two-year-old child with a two-week-old child, the amount of growth seems incomprehensible. Yet, it is a task that occurs in all cognitively healthy infants and toddlers.

PIAGET'S COGNITIVE DEVELOPMENT THEORY AND THE SENSORIMOTOR STAGE

Piaget uses the term sensorimotor to describe the integration of sensory input (perceptions of sound, sight, taste, smell, and touch) with motor behavior during infancy. Motor skills that are quickly developed in infancy, such as walking, grasping, and manipulating objects, are increasingly guided by sensory input as the infant matures. In Piaget's view, self-differentiation is accomplished through sensory and motor activities. With adequate

brain maturation, an infant can learn about the world, discover how to react to it, and develop schemes to solve problems in interactions with it. At first, the child is able to do this only through such sensory means as taste and touch and through motor actions. An infant's understanding of the world is therefore limited. However, it is through such means and level of functioning that lifetime mental development begins.

One of the infant's major accomplishments is learning that objects, people, and things are permanent. This enables an infant to realize that she or he is a distinct and separate entity from the things and people that populate the environment. This realization requires the construction of a concept known as **object permanence**—the understanding that something continues to exist even though it is hidden or removed from sight. The reason the game of peek-a-boo is so fascinating to young infants is that they do not yet understand this principle. As they develop and discover that things can be moved and manipulated, they master this cognitive skill.

Object permanence
The understanding that something exists even though it is not in sight or has been removed from the field of vision; accomplished between 18 and 24 months of age.

One other accomplishment during this time of the life span is the elementary ability to represent the external world by internal, mental images. An infant takes the first step in this rather complicated process (which is not mastered until later in life) by understanding the world through sensory means. Things are known by how they feel, taste, look, and smell, as well as by how they can be manipulated. If it were possible for an infant to use language effectively and she was asked to define a ball, her likely answer would be in words noting sensory and motor characteristics: "It's something that's slick on my tongue, and rolls across the floor when I hit it." This is probably the only way a ball can be understood at this stage in life.

The cognitive changes during this period happen in a sequence Piaget describes as beginning with reflexes at birth and culminating in symbolic reasoning at eighteen to twenty-four months of age (see Table 3-1). They are facilitated by the acquisition of the ability to use language in communication with others. The next section discusses the order of this sequence.

Substages of the Sensorimotor Stage:

1. *Use of existing reflexes* to progress toward developing sensorimotor schemas occurs between birth and one month of age. Reflexes present at birth provide much of the basis for motor behavior at this time. The infant performs these reflex actions more efficiently with practice. As the infant's brain structures mature, the same actions come more under willful control. Searching for a nipple, for example, is first guided by the rooting reflex. Such behavior becomes learned rather than automatic as the reflex is replaced by willful action by virtue of the maturation process. In adapting from automatic to willful acts, infants gain more control over their interactions with the world.

Circular reactions
Actions that occur by chance and then are repeated and modified through practice.

2. *Primary circular reactions* are formed between one and four months of age. **Circular reactions** are actions that occur by chance and then are repeated and modified through practice. We will use the act of sucking to illustrate how primary circular reactions are formed. An infant accidentally happens to put a finger in her mouth. This stimulates sucking, an action based on a strong reflex present before birth. Because this is a pleasurable act, the baby repeats it. The repetition leads to learning how to suck on a thumb. As maturation proceeds, anything

TABLE 3-1 SUMMARY OF THE SUBSTAGES OF THE SENSORIMOTOR STAGE

SUBSTAGE	DESCRIPTION
1. Use of reflexes (birth to one month)	Use of reflexes present at birth to adapt to the environment.
2. Primary circular reactions (one to four months)	Repetition of pleasurable acts that happen first by body acts; object permanence not yet developed.
3. Secondary circular reactions (four to nine months)	Focus shifts to environment as infant learns that chance, then deliberate, actions produce certain results.
4. Coordination of secondary schemas (nine to 12 months)	Coordination and integration of secondary schemas achieve goals; increasing awareness of object permanence.
5. Tertiary circular reactions (12 to 18 months)	Purposive variation of behavior to experiment and vary schemas; trial-and-error used in solving problems and reaching goals.
6. Symbolic logic (18 to 24 months)	Primitive reasoning system used; object permanence achieved, symbol user.

the baby grasps is brought to her mouth to be sucked upon. These actions involve hand-eye and hand-mouth coordination. They are called primary because they occur first in reference to the infant's body. They are called circular because they are habitual actions based on continual repetition.

3. *Secondary circular reactions* are formed between four and nine months of age. In forming secondary circular reactions, the infant's reference shifts from the body (primary reactions) to the physical environment. The baby observes that random, chance movements produce specific results and outcomes—for example, a particular kicking motion in his crib produces wild, swinging movements of the mobile hanging overhead. This pleases, delights, and fascinates the infant. He rapidly learns that willfully controlled actions of his body produce results in the physical environment. As this type of association between a personal action and its environmental result is repeated, a secondary circular reaction is formed. Later in the infancy stage, a baby may modify his physical actions to produce similar results with different objects. For example, the baby who formed a secondary circular reaction to make his crib mobile move learns to modify basic movements to make a similar piece of equipment move when placed in his playpen. It is in such simple ways that an infant learns to act in certain ways to make certain things happen. This is a very significant advance. The ability to make a connection between action and result (cause and effect) is the very foundation of human learning ability.

Object permanence, as far as we know, is not understood this early in infancy. Infants are mastering this skill, however, as they recognize and recover objects only partially hid-

den from their view. But they still will not try to discover an object's whereabouts if it is hidden from their view.

4. *Coordination of secondary schemas* occurs between nine and twelve months of age. If you can remember from Chapter 1, schemas (or schemes) are the basic building blocks of mental life. They are consistent, reliable patterns or plans for processing information, experiences, or perceptions of the world. Individuals change or modify their schemas with experience throughout life. Piaget suggests that the numerous schemas formed in interaction with the physical environment earlier are combined and coordinated at this particular time in infancy. New behavior patterns emerge from existing ones as an infant learns new ways to solve problems and interact with the surroundings. An infant may learn, for example, to search for an object that she saw hidden. She will grasp the object once she has located it. Piaget describes this as intentional behavior. The infant established a goal before acting and purposely tailored her physical actions to enable her to reach that goal. The infant can adapt behavior to attain goals effectively in the social and physical environment.

An example of secondary circular reaction is when a baby is able to make a mobile move by kicking his legs. (iStock)

5. *Tertiary circular reactions* are formed between twelve and eighteen months of age. Piaget describes infants as true scientists now because of their incessant motivation to explore their environment, to discover new understandings, and to experiment with new approaches to solving problems and attaining goals. A new skill learned by the infant is the ability to make new events happen. These refinements in cognition are shown by the baby's first efforts to learn the cause-and-effect nature of bodily movements and physical acts. Toys are dropped or thrown repeatedly. This is because the infant observes that they always fall, make certain sounds, or produce particular actions when treated in this manner.

Infants' exploration of their environment is largely by trial-and-error. This is the hallmark of the type of change taking place in their mental functioning at this time. It explains their fascination with banging pots and pans, investigating waste cans, playing in the toilet, splashing water in the bath, and exploring everything in detail with their

fingers. Childproofing the home is a necessity at this time.

6. *Symbolic (or elementary) logic* emerges between eighteen and twenty-four months of age. There are first indications of simple internalization as infants gradually develop mental images of objects and actions. Object permanence usually becomes fully established now. The first sign of symbolic thought processes is that infants require little or no experimentation to reach solutions to their problems. For instance, an infant at this age may try to wake her father by placing eyeglasses on his face because she associates this feature with his being awake and seeing to her needs.

An example of tertiary circular reaction is when a baby repeatedly throws or drops a toy. (iStock)

Infants this age engage in much imitation of others' actions and pretend play. As they learn to incorporate others' actions into their own range of behaviors, they learn other ways to solve problems and reach goals. Ways to solve future problems and reach goals are anticipated.

Characteristics of Sensorimotor Thought

In summary, sensorimotor thought is based largely on motor actions. Two important milestones are reached during this stage: object permanence and symbolic thought. During this stage, the infant already actively explores the environment and adapts his or her schemas based upon these experiences. By the end of the sensorimotor stage, the child is capable of symbolic thought, meaning he or she can use mental representations when thinking.

Critiques of Piaget's Theory

The critiques to Piaget's theory will seem familiar to issues discussed in Chapter 1. Piaget's theory allowed us to view infant thought as unique, not as simply a rudimentary form of adult thought. Indeed, infants do not think less than adults, they think differently (hence the idea of qualitative changes).

Current research indicates that Piaget underestimated the cognitive abilities of infants. As developmentalists have created amazing research techniques that allow us a glimpse into an infant's mental world, it has become apparent that infants are far more cognitively capable than we previously thought. For example, there is some evidence that they achieve

object permanence and deferred imitation earlier than Piaget thought (Crain, 2005). As we continue to progress in our research abilities it should be interesting to see what cognitive skills infants achieve far earlier than we ever dreamed.

Test Yourself

1. What is object permanence? What would your life be like if you thought people and objects ceased to exist if they left your view?
2. Describe what sensorimotor thought is like.

INFORMATION-PROCESSING IN INFANCY

Although Piaget viewed cognitive development as occurring through qualitatively distinct stages, information-processing theories view cognitive development as a continuous process during which specific processes increase in efficiency to a certain point, and then, perhaps, decline.

Basic processes

"Frequently used, rapidly executed, memory activities such as association, generalization, recognition, and recall. They are among the building blocks of cognition, in the sense that all more complex cognitive activities are built by combining them in different ways."

Within the information-processing paradigm, **basic processes** are defined as "frequently used, rapidly executed, memory activities such as association, generalization, recognition, and recall. They are among the building blocks of cognition, in the sense that all more complex cognitive activities are built by combining them in different ways" (Siegler, 1998, p. 180). Basic processes are functional at birth, with some functional prenatally. Although infants lack knowledge structures, memory strategies, and such, their ability to use basic processes allow them to form and access memories.

Explicit memories

Conscious memories that can be visualized as well as provide a verbal account.

Implicit memories

Unconscious memories that influence our behavior.

First, we should distinguish between the basic processes of explicit and implicit memories. **Explicit memories** are memories of which we are conscious. We can typically visualize these memories and provide a verbal account. **Implicit memories** are unconscious memories that influence our behavior. For example, most of you have probably been driving for a while. You do not need to (hopefully) consciously try to remember which pedal is for the gas and which is for the brake. You implicitly know this and this knowledge directs your behavior. This is an example of an implicit memory. However, if I asked you to recount your scariest driving moment, you would verbally relate the story to me as you consciously extricate it from your memory. This would be an example of an explicit memory. Both types of memory are important; yet, they have their own developmental timetable.

It appears that infants are capable of forming implicit memories from birth, if not prenatally. However, it is not until around six to eight months that infants seem able to form explicit memories. Evidently, implicit and explicit memories utilize different parts of the brain that mature at different times (Siegler, 1998).

Association is the most fundamental of basic processes and it is the ability to form a connection between a stimuli and a response. **Recognition** is another basic process. Once

Association

The ability to form a connection between a stimuli and a response.

Recognition

Awareness or recollection of having seen something before.

Habituation/ dishabituation

An experimental technique that allows researchers to measure recognition in babies.

Imitation

The basic process of a newborn being capable of immediately imitating your behavior.

Recall

The basic process of a newborn being capable of recalling observed behavior experiences.

again, both of these are certainly present at birth and are most likely present prenatally. Association can be tested through the classical conditioning process discussed in Chapter 1. Recognition has been tested in preterm and full term infants using the **habituation/dishabituation** process. For example, newborns like to gaze at novel visual stimuli. Once a stimulus becomes familiar, their gazing time decreases. However, if you present a new, novel stimulus, gazing time increases again. This basic knowledge allows us to test both visual preferences and recognition. Using habituation/dishabituation, we know that two-month-olds recognize old visual stimuli for more than two weeks after initial exposure.

Have you ever stuck your tongue out at a newborn? I suppose most of you haven't, but guess what would happen if you did? The newborn would stick his or her tongue out at you in reply. The newborn isn't being rude; instead, they are imitating observed behavior. **Imitation** and **recall** are also basic processes present at birth. Not only is the newborn capable of immediately imitating your behavior, but they still recall the experience twenty-four hours later. Newborns that have observed tongue protrusion behavior are more likely to engage in such behavior for the twenty-four hours afterward than newborns who did not observe such behavior. This pattern holds true not just for tongue protrusion behavior but also for opening and closing of mouth behavior. As infants grow older, the amount of time between observation and imitation/recall increases. Shortly after the first birthday, infants can demonstrate imitation and recall more than four months after the initial observation (Siegler, 1998).

Rovee-Collier (1995) demonstrated the memory capabilities of infants across a series of experiments utilizing infant mobiles (the circular things that hang above cribs with dangling toys that play music). Rovee-Collier would tie a string connected to a mobile to the ankle of an infant. If the infant kicked, the mobile would make sounds. The studies showed that three-month-olds would experience an "aha" moment in which they would learn that their kicking behavior caused the mobile's noise. Infants were able to recall and generalize their learning across similar situations if comparable experiences were provided within three days of each other.

Spotlight

15. What are the two basic types of memories discussed in this chapter?

In summary, infants are born with basic processes that allow for quick learning about the surrounding world. These basic processes provide the foundation for all information-processing throughout life. Future chapters will discuss the specifics of intelligence, attention, memory, and problem-solving development.

Infantile Amnesia

Infantile amnesia

The inability to remember much about the first two or so years of life after birth.

What is your earliest memory? How old are you in this earliest memory? Most of us do not remember much about the first two or so years of our life after birth. This is referred to as **infantile amnesia**. It used to be assumed that infants could not form long-term memories; however, we now know that is false. Experiences at the age of eleven months can sometimes be recalled a year later and some three-year-olds can remember experiences from when they were one. So why is it that we cannot remember our own birth? Why can't

we remember our first steps, walks, or piece of birthday cake? These seem like worthwhile memories to keep, so where have they gone?

There are three leading theories in regard to the causes of infantile amnesia. The first theory is that the parts of the brain instrumental in storing long-term, explicit, retrievable memories continue to mature well past infancy. The frontal lobes seem to be particularly important for these memories (Siegler, 1998).

The second theory highlights the importance of practicing information in order to retain information (and access ro that information) in long-term memory. For example, the more young children hear stories about their first birthday—and relate stories about their first birthday—the more likely it is that they will form enduring memories about their first birthday. Parents seem to naturally begin having these dialogues with their children around the age of three, which may be why some of our earliest memories are around that age (Siegler, 1998).

The third theory is in regard to how infants and older individuals may encode information differently. For example, when you try to remember something, how do you do it? Do you use words (verbal codes)? Do you use mental images (visual codes)? It has been theorized that infants are more likely to encode their memories using smells, tastes, and touches rather than our preferred verbal and visual codes. However, as children acquire language and begin using verbal codes to encode and retrieve information, they may lose the ability to access memories encoded in different modalities (Siegler, 1998).

In all likelihood, it is a combination of these three theories, and perhaps some other theories not considered here, that will eventually explain the phenomenon of infantile amnesia. But honestly, even if you could remember your own birth, would you really want to?

Test Yourself

1. Give a description of information-processing abilities in infancy.
2. In your own words, explain the three explanations for infantile amnesia discussed above. Which explanation seems the most plausible to you?

LANGUAGE DEVELOPMENT IN INFANCY

One characteristic that is uniquely human emerges during infancy. This is the ability to use language to communicate information, ideas, feelings, and thoughts to others. Before individuals emerge from infancy, they are expected to be able to pronounce words so that others can understand them. They are also expected to learn meanings associated with words, so that they can understand others.

An infant's acquisition of communication skills is a very complex process and one that is not completely understood. Our human brain structure is extremely important to language development and seems to hint that aspects of language acquisition are innate with proper exposure. This means that humans are hardwired with the ability to learn language with

proper social interaction. Two basic areas of the brain appear to be responsible for speech and language skills. They are located deep within the left hemisphere.

Language
"A system of abstract symbols and rule-governed structures, the specific conventions of which are learned."

Hulit and Howard (1997) define **language** as "a system of abstract symbols and rule-governed structures, the specific conventions of which are learned" (p. 3). Although language is related to speech, they are not one and the same. **Speech** is orally expressing language; however, language can be conveyed through modalities other than verbal speech. Both speech and language are important processes for communication.

Speech
Orally expressed language.

Language has some basic components. **Phonemes** are the simplest and most elementary sounds in speech, or the building blocks of speech. **Morphemes** are meaningful units of speech. **Syntax** comprises the rules for making grammatical sentences. **Semantics** is the ability to express meaning through language. **Pragmatics** is the ability to adjust speech in socially and culturally appropriate ways. Each of these components is mastered at different points in development. They are typically understood before they are fully able to be mastered in speech production (Dixon, 2003; Hulit & Howard, 1997; Piper, 2003).

Phonemes
The simplest and most elementary sounds in speech, or the building blocks of speech.

Morphemes
Meaningful units of speech.

Syntax
The rules for making grammatical sentences.

Semantics
The ability to express meaning through language.

Pragmatics
The ability to adjust speech in socially and culturally appropriate ways.

Mastering the complexities of language is important for several reasons. First, language permits communication. It is through the medium of language that an infant is given information about many things. Cognitive changes, which allow the developing individual to understand the world in which he lives, are motivated and based on language. Words are the means by which the individual is educated, not only about facts of the world, but also about the rules by which his family operates, what his parents expect of his behavior, how people in his community live, and how society, in general, functions on a daily basis.

Second, language permits individual expression. By using language, an individual is able to express her inner feelings, attitudes, and thoughts and to connect her personal experiences with those of others. That is why language is often viewed as the observable expression and extension of inner thought processes and seen as reflective of the individual's level of cognitive development (Galatzer-Levy & Cohler, 1993; Kolata, 1987; Piper, 2003).

Theories of Language Acquisition

In the first year following birth, an infant comes to understand others' speech and to use some speech in an elementary and limited fashion. The change from uttering incomprehensible sounds to making sounds that are given meaning by others happens dramatically. There are some basic avenues to this dramatic change, according to developmental researchers.

Language Acquisition Device (LAD)
An innate brain structure proposed by Chomsky that regulates the means by which an individual learns language.

Some developmentalists believe that there is an innate language structure, or **language acquisition device (LAD)**, within the brain that regulates the means by which an individual learns language (Chomsky, 1959). This is a very nativistic theory, focusing on the biological innateness to language acquisition.

The LAD is theorized to be a deep brain structure which is identical in all human beings, and allows any infant to acquire the language of the family and culture into which she or he is born. The human brain appears to be sensitive to the sound of language. The LAD organizes these sounds into meaningful understandings according to

the grammatical structure of the particular language the child is exposed to daily. This explanation rests on the proposition that humans are born with a predetermined ability to learn any language, and that this is what makes them distinctly different from every other species. It does not completely explain just how language acquisition takes place, however.

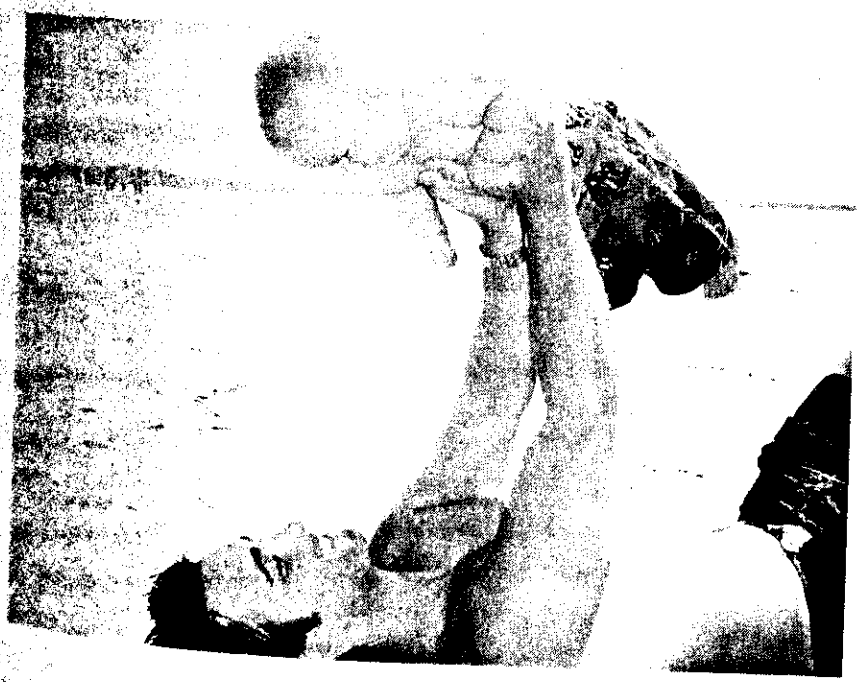
Infant-directed speech
Speech that is more accentuated and of a higher pitch.

Language acquisition is also thought to be influenced by environmental factors (Hulit & Howard, 1997). Imitation, caretaker speech (i.e., **motherese** or **infant-directed speech**), and reinforcement appear to play some role in speech development. However, the behavioral principles of reinforcement and imitation are not enough to explain language acquisition entirely. For example, we will learn soon that the vocabulary explosion that occurs in early childhood happens too quickly to be explained by imitation and reinforcement alone.

Linguists currently seem to favor an interactionist approach to understanding language development. This approach appreciates both biological endowments and social interactions in the acquisition of speech (Hulit and Howard, 1997). Over time, research may clarify what aspects of speech are primarily genetically preprogrammed (or primed) and which are highly dependent upon social interaction.

The General Sequence

There is a general sequence to language learning during infancy. First, infants cry at birth to communicate with their caregivers. Around one to two months of age, infants begin to coo. Next, around three months of age, infants enjoy making consonant sounds. It is around six months of age that babbling begins. Babbling involves combining consonant and vowel sounds and repeating them. Typically, babies will mimic the intonation that



Babies try to mimic the sounds of their caregivers, and by their first birthday they say their first word. (photo courtesy of J. James)

their caregiver is using in communicating with them. Babies appear to understand their first word around eight months of age. Finally, around the first birthday, infants say their first word (Siegler, 1998).

The typical age range for generating their first word is between ten and thirteen months. First words are usually focused upon people, objects, and actions. Vehicles and food are among their favorite objects to speak about.

After achieving their first word, infants quickly progress to speaking in one-word phrases, commonly referred to as **holophrases**. Speaking seems to tax their cognitive resources, so infants use the least amount of words (and simplest words) possible to get their message across (Siegler, 1998).

Holophrases
An early speech form used by infants in which single words convey a wide number of meanings.

Between the ages of eighteen and twenty-four months, the average toddler will begin speaking in two-word sentences. These sentences, again, leave out the niceties of speech (e.g., adjectives, adverbs, prepositions, etc.), and focus on conveying meaning. There are some common errors that occur during this time in regards to word meanings.

Toddlers will often commit errors of underextensions, overextensions, and overlaps (Siegler, 1998). An **underextension** is when a child limits the meaning of the word too narrowly. For example, a child may think that the word chair can refer only to a dinner table chair, not to office chairs, recliners, rocking chairs, or other forms of chairs. An **overextension** is when a child applies the meaning of a word too broadly. For example, all flying insects may be called a fly, including butterflies, bees, hornets, and mosquitoes. **Overlaps** occur when a word is underextended on some occasions and overextended on other occasions. For example, the word dress may not be appropriately used to refer to a wedding gown (underextension), but may be used to refer to a bathrobe (overextension).

Underextension
When a child limits the meaning of the word too narrowly.

Overextension
When a child applies the meaning of a word too broadly.

Overlaps
When a word is underextended on some occasions and overextended on other occasions.

Vocabulary development begins slowly in early infancy and then speeds up substantially during toddlerhood. For example, it is estimated that a child has a vocabulary of three words at his or her first birthday. However, a vocabulary explosion begins between eighteen months (with a vocabulary of 22 words) and twenty-one months (with a vocabulary of 118 words). Then there is another major jump by twenty-four months (with a vocabulary of 272 words). Such **fast-mapping** of words continues through early childhood with five-year-olds having a vocabulary of more than two thousand words and ten-year-olds having a vocabulary of more than forty thousand words. Mathematically, this works out that between the ages of eighteen months and ten years of age, a child learns about ten words a day (Siegler, 1998). Can you imagine trying to achieve this at your current age? Flashcards, anyone? Yet, these children achieve this with little or no effort through basic, everyday social interactions and educational experiences. Amazing!

Fast-mapping
A language skill used by young children; the meaning of a new word is acquired by comparing it with one that is familiar.

Sentence structure and grammar is understood before it is produced by children. Grammatical knowledge is connected with vocabulary development. Typical two-word sentences will typically follow basic grammar rules (e.g., subject/verb). We will discuss how grammar, semantic, and pragmatic skills continue to develop across childhood in future chapters. The important thing to realize is that by the end of the second year

children can effectively communicate their intentions and messages. The children also enter the early childhood period with a basic grasp of the language rule systems.

Test Yourself

1. What is the difference between language and speech?
2. Summarize language development between birth and two years of age.

3. GENETICS

LEARNING OBJECTIVES:

1. *Describe emotional development during infancy*
2. *Explain infants self-understanding, family influences, and societal influences*
3. *Understand psychosocial development during infancy*

Social and emotional development during infancy is a fascinating topic. What emotions can an infant feel? What purpose do these emotions serve? When does an infant realize that he or she is a person? How does an infant develop psychosocially? This section will attempt to answer these questions as we take a peek into socioemotional development from birth through the second year.

EMOTIONAL DEVELOPMENT

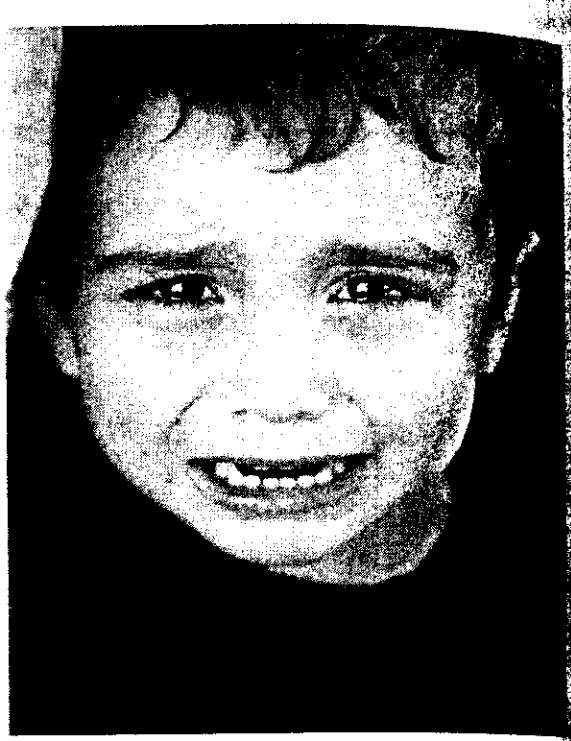
Emotions
Subjective feelings such as love or joy that help to define our existence as human beings.

Emotions are subjective feelings such as love or joy that help to define our existence as human beings. Without these feelings and the ability to express them our lives would be impoverished. Emotions are also among the earliest means of communication that infants have with their caregivers, allowing infants to learn about the world, themselves, and others (Galatzer-Levy & Cohler, 1993; Gallese, 2005).

Emotional development is dependent upon brain development. As the brain develops, we see emotion expression, emotion recognition, and emotion regulation evolve. One neural circuit in the brain that seems important for emotional and social understanding (among other things) is the mirror neuron system (Gallese, 2005; Keestra, 2008). The mirror neuron system (MNS) seems to allow for early imitation and empathy. The research on the MNS is new and complicated, but it appears that the brain is hardwired in a way that allows us to "feel" what certain motor behaviors and emotions in others feels like to them. Said another way, sports and movies can emotionally move us because we vicariously experience the athletes and actors emotions via these mirror neurons. Our brains mimic the athlete and actor brains, allowing us to empathize with their emotions. Thus, it is currently hypothesized (and actively being researched) that these mirror neurons play a key role in early emotional development. However, let's take a step back and take a slightly broader view of what research in emotions has entailed up to now.

22. What neural circuit in the brain seems important for emotional and social understanding?

Behavioral scientists have described emotions in various ways. Some descriptions focus on the physiological basis of emotional reactions—for example, the changes that occur in blood vessels, heart rate, kidney, and digestive system function when someone feels angry or frightened. Other descriptions focus on the subjective aspect of emotions—people's own words describing their feelings. Others focus on the ways that emotions are expressed—for example, crying when feeling sad or using physical force when angry. This means that behavioral scientists can focus on the *physiological, cognitive/subjective feeling,* or *behavioral* aspects of emotions.



Crying when feeling sad is one way of expressing emotions. (iStock)

Just as behavioral scientists can focus on different manifestations of emotion, developmentalists can have different theoretical viewpoints as to the importance and purpose of emotions. One notion is to view *emotion* as *communication.* Darwin was among the first to view human emotion as communication with the potential to provide us with an evolutionary advantage. For example, emotion communication (such as dominance and submission) can allow for the settlement of disputes without fighting to the death (Galatzer-Levy & Cohler, 1993). Such communication, within this viewpoint, greatly facilitates infant/caregiver interactions allowing for sensitive, responsive, and appropriate caregiving behavior.

Just as the physiological manifestation of emotion can be the focus of research, it can also provide an overarching theoretical perspective into the study of emotion (Galatzer-Levy & Cohler, 1993). *Emotion as bodily change* is a perspective with a long and diverse history. One main idea that is of particular importance to emotions in infancy is that emotions learn to label and monitor their physiological states as emotions via interactions with caregivers. Although an infant may exhibit physiological arousal and accompanying stress, the parent may help label that bodily change as anger or frustration. Hence, it is through the caregiver's response to an infant's bodily change that an infant comes to recognize and label such changes as a particular emotion. It is theorized that if a child is raised by caregivers that are dismissive or repressive of emotional expression, the child may lack the ability to label and express emotions throughout life.

A third viewpoint is *emotion as a means to discharge tension* (Galatzer-Levy & Cohler, 1993). This viewpoint is largely based upon Freud's psychodynamic theory discussed in chapter one. From this perspective, emotion is energy that compels a person to action.

regards to emotion in infancy, caregivers can help infants to understand and channel their emotions into appropriate behaviors, as well as learn emotional control in general.

The fourth perspective that we will discuss here views *emotion as an indicator of importance* (Galatzer-Levy & Cohler, 1993). This position views emotion as a motivating system that is hardwired in all healthy people and allows for communication. Much like some of the other perspectives mentioned previously, this position views emotion as an important mechanism through which infants can hope to educe appropriate caregiving responses.

There are, of course, other perspectives on emotion; however, these four will serve as an excellent basis from which to begin our study of emotional development. Other perspectives will be introduced throughout the book as appropriate. In all likelihood, human emotion is complex enough to allow for all of the above perspectives to provide insight into emotional development. In summary, emotions probably provide humans with an evolutionary advantage by means of providing us with an early and effective communication system. Emotions are correlated with bodily changes that, when labeled correctly, enhance emotion communication. Emotions can motivate us, or distract and impair us. It is important for children to learn to understand, control, and channel emotions in adaptive ways.

As an example of how emotions enable communication, let's examine crying. Crying is one of the infant's most powerful means of communicating with others because it almost invariably brings someone to investigate his or her needs. Four basic patterns have been identified in infant crying. Hunger cries are a rhythmic series of cries associated with feeding needs. Angry cries are a loud series of rhythmic cries associated with distress. Frustration cries involve a long cry and holding the breath. Painful cries are loud, sudden cries that may be prolonged and are associated with injury.

Crying shows the strong effect a small child's behavior can have on adults' behavior. It is an infant's most powerful means of getting a caregiver's nurturing attention. It is never a good idea to ignore a young infant's cry. First, it is their only way of communicating many needs (such as a hurting ear or stomach). Second, when an infant has caregivers that are reliably responsive to his or her cries, the infant will learn to self-soothe sooner and more effectively, cry less, and trust their caregivers more. You will not spoil your child by responding to his or her cries, but you may harm your child by ignoring them.

Basics of Emotional Development

Primary emotions

Emotions which are present at birth or shortly thereafterwards. They are believed to be hardwired into the brain and serve an adaptive purpose.

Emotions can be broken into two main categories during infancy, primary (or basic) emotions and secondary (or self-conscious, discrete, or complex) emotions (Izard, 1991; Lewis, 2000; Saarni, Mumme & Campos, 1998). **Primary emotions** are present from birth or are evident shortly thereafter. The emotions appear to be universal, meaning that all healthy infants from anywhere in the world display these emotions early in life. Given the universality of these emotions and the early stage at which they develop, two theories emerge: one, these primary emotions are hardwired into the brain; two, these primary emotions must serve some evolutionary purpose. **Secondary emotions** are dependent

Secondary emotions

Emotions that develop during the second year or so after birth, as cognitive development advances. They can be a blend of two or more primary emotions, culturally-specific, or self-conscious/self-evaluative in nature.

upon cognitive development and the internalization of parental/societal standards and expectations. Secondary emotions can vary by culture.

Primary Emotions

Emotions in infancy are largely assessed via facial expressions, vocalizations, and other observable behaviors. Some primary emotions include pleasure, distress, joy, anger, and fear. Pleasure and distress are evident at birth; whereas joy, anger, and fear are measurable within the first six months. It is always important to be mindful that just because we fail to measure something until a certain age (such as a specific emotion), it is not the same as the infant lacking that skill or emotion (Galatzer-Levy & Cohler, 1993). Developmentalists are continually amazed at the emotions and cognitions that infants possess as we develop better ways to assess such emotions and cognitions. Therefore, at the moment, we believe that infants develop joy around two or three months of age. However, it is possible that a decade from now some bright young researcher will develop a new technique of assessing joy and find that it is present as early as one month or even one day of age.

Social smile

Smiling in response to social stimulation from others.

One way researchers have ascertained that infants experience joy is by social smiling. The first **social smile**—smiling in response to social stimulation from others—is usually observed at about six weeks of age. Before that babies smile, but researchers assume that this is either a reflex activity seated in the brain, a random occurrence, such as gas, or by being about to fall asleep (Sroufe & Waters, 1976). Of course, many parents disagree with researchers on this particular issue.

Smiling is a powerful method for eliciting caregiving. It reinforces nurturance from caregivers and forms the basis for positive interactions between the baby and his or her parents (Tautermannova, 1973). At about four months of age, babies begin to laugh to express their delight at positive experiences such as being kissed, or seeing interesting and

Infants seem to experience joy by social smiling. They smile in response to social stimulation from others. (iStock)

unfamiliar things (Sroufe & Wunsch, 1972). One of the authors used to elicit the biggest belly laugh from one of their children by walking toward them like a big ogre with a silly face. Another good way of getting a laugh is by pretending to drink or eat the baby's food.

Developmentalists believe that anger emerges around four months of age and fear around six months of age. Anger expression can be provoked by thwarting goal directed behavior, such as preventing a baby from obtaining a desired toy. Fear is easily observable around six months of age because **stranger wariness** (or stranger anxiety) develops around this time. Stranger wariness can serve an adaptive purpose because it emerges around the same time that a child begins creeping or crawling; hence, it can prevent babies from straying too far from parents. Stranger wariness can also be mitigated by the environment (i.e., it is less likely in a familiar versus unfamiliar place) and stranger behavior. If the stranger gives an infant some space and interacts with the adults first, the infant will usually initiate some interaction in a few moments (after he or she has had a chance to see how mom or dad is interacting with the stranger). This means that Aunt Lucy from Omaha, who sees the baby only once a year, should wait for the baby to initiate contact instead of entering the room and swooping the fear-struck infant up immediately.

Stranger wariness
Or stranger anxiety, which is observable around six months of age.

Social referencing, when infants look at their parents' faces and behavior for information about something, emerges around the first birthday (Dickson & Parke, 1988; Klinnert et al., 1986; Sorce et al., 1985). This is a valuable way for infants to obtain knowledge about the world. They use it to make decisions about acting as well as reacting. Apparently, the emotional reactions of our parents condition many of our own reactions in the early years.

Social referencing
When infants look at their parents' faces and behavior for information about something.

Secondary Emotions

As mentioned earlier, secondary emotions are dependent upon cognitive development and the internalization of at least some parental expectations and/or societal norms. These emotions may vary by culture and may involve a blend of two or more primary emotions. Examples of secondary emotions include embarrassment, pride, guilt, and contempt. Secondary emotions begin to emerge around eighteen to twenty-four months, at the end of Piaget's sensorimotor stage of cognitive development. If you try to recall your earliest memory, there is a good chance that it will involve a secondary emotion (such as embarrassment over not making it to the potty in time or pride over writing your name correctly).

Emotion Regulation

Emotion regulation is also evident in infancy, although with limited strategies (Galatzer-Levy & Cohler, 1993; Saarni, Mumme & Campos, 1998). For a moment, imagine that you are lying in your bed, trying to catch some shut eye, and some strange giant keeps shaking a noisy rattle in your face. Also assume that you do not have very good control of

your speech, hands, arms, or legs at the moment. What would you do? What would you be feeling? Infants can become overstimulated when adults fail to read their body language. One way infants deal with their annoyance (i.e., regulate their emotion) is by withdrawing. Clearly, a young infant can't up and move away from the imbecile, so they use basic strategies such as closing the eyes or looking away. Infants also learn to regulate fear by moving close to loved ones when feeling afraid.

Revisiting Temperament and Goodness-of-Fit

Differences in temperament are an aspect of emotional and personality development in infancy (Thomas & Chess, 1984). About two-thirds of infants studied can be classified into one of three categories: easy, difficult, or slow-to-warm-up. Infants and children can be placed into these classifications based upon their behavior on nine dimensions: activity level, adaptability, approach/withdrawal, attention span/persistence, distractibility, intensity of reaction, quality of mood, rhythmicity, and threshold of responsiveness.

In general, easy babies are happy, have rhythmic bodily functioning, and are accepting of new experiences. These are the babies that have a predictable bodily schedule for when they will be hungry, tired, or in need of a diaper change. These are the babies that can go anywhere and will allow themselves to be admired and cuddled by just about anyone. These are the typical American parents' dream baby.

Difficult babies are generally irritable, have irregular bodily function, and show more intense emotional expressions. These are the babies that, biologically, struggle with feeding or sleeping schedules. It is best to feed them on demand (when their body tells them they are hungry) and be flexible with their other body functions.

Slow-to-warm-up babies have generally mild emotional expressions and are slow to adapt to new experiences. Although both the difficult and slow-to-warm-up infants have negative reactions to new experiences, the slow-to-warm-up infants' emotional reactions are lower in intensity and they will eventually accept the situation.

Temperament is assumed to have a genetic component, because it is observable so early in life. Interestingly, literature given to expectant mothers often suggests that an active baby in the womb will be an active infant, whereas a quiet baby in the womb will be a quiet infant. Talk about setting up parent expectations! Temperament also shows some stability during early childhood. However, temperament is not carved in stone.

Thomas, Chess, and Birch spent more than two decades studying temperament (among other developmental issues) in a longitudinal study known as the New York Longitudinal Study. One concept which they presented was that of goodness-of-fit.

Goodness-of-fit

How adaptable a child's environment is to his or her temperament.

Goodness-of-fit can be defined as how adaptable a child's environment is to his or her temperament. For example, a difficult temperament child with a difficult-type parent would often clash heads and may result in adjustment problems. However, a difficult temperament child with an easy-going-type parent would be in a more flexible and responsive environment, allowing for optimal development. Hence, a good fit between child and parent can lead to good developmental outcomes. Alternatively, a poor fit

can place a child at risk for poor developmental outcomes, such as behavioral disturbances (Dixon, 2003). Future chapters will discuss the relationship between temperament and cognitive and socioemotional development in early and middle childhood. We will also see what aspects of temperament appear most likely to remain stable, and which are more malleable.

Attachment

Attachment
A strong affectional tie or emotional bond between two individuals.

What is attachment? Every healthy infant develops an attachment to someone. **Attachment** is a strong affectional tie or emotional bond between two individuals (Ainsworth, 1973). The attachment between an infant and his or her primary caregiver is one of the few psychological phenomena that is universal in human development. It occurs in every cultural setting known. Attachment appears to be essential to an infant's well-being. Without it, children suffer damage to their emotional, physical, social, and psychological functioning.

Infants have a strong drive to explore their environment that conflicts with their equally strong drive for security and comfort (Ainsworth, 1977). Attachment to an adult allows the baby to use his or her caregiver as a secure base for exploring the world. This helps the child to grow mentally and socially. In the long run, successful attachment in infancy generates greater competence throughout life. This is shown in a greater capacity to cope with novelty, handle failure, persist in problem-solving, participate in loving relationships, and maintain a healthy self-esteem (Sroufe, 1985; Galatzer-Levy & Cohler, 1993).

Attachment involves mutual interaction between an infant and his or her primary caregivers. If the infant is normal, he will behave in ways that signal his desire to be near those who provide for his care. These behaviors include crying, smiling, vocalizing, looking at the person(s), and active physical movements such as clinging, clutching, and touching. The caregivers react in nurturing ways that promote the attachment process. They smile at, gently handle, stroke, feed, and diaper the infant, for example.

Spotlight

Q: What are the four developmental phases of attachment?

The attachment development process has four phases (Bowlby, 1982). The first, *undiscriminating social responsiveness*, occurs at about two to three months of age. This phase is characterized by an orientation to all humans. An infant visually tracks and explores, listens when being addressed, and relaxes when being held.

The second phase, *discrimination in social responsiveness*, occurs at about four to five months of age. An infant shows that it recognizes familiar as well as unfamiliar people. She does this by smiling and vocalizing when a familiar person comes into her view. She also is observed by exhibiting restless, crying behavior when this person leaves her field of vision. This is the age when stranger anxiety is a reaction to unfamiliar people.

In the third phase of the attachment development process, the infant *actively seeks physical proximity and contact* with familiar persons. This phase starts at about seven months of age. An infant clings to, crawls toward, and otherwise seeks active contact with the familiar person.

Goal-corrected partnership is the fourth and final phase of the attachment process. At about the age of three years, the child learns to predict his parent's movements and adjusts his own to maintain some degree of physical proximity.

Many factors influence the quality of the bonding between parents and infants. Responsive, dependable, warm caregiving that is flexible to the child's needs is critical in order for a secure attachment to develop. A lack of sensitive parenting can result in an insecure attachment.

How do we know what type of attachment infants have? It all goes back to Ainsworth's idea of infants using their parents as a secure base when infants go out to explore the world. Ainsworth and colleagues (1978) conducted a series of experiments utilizing what is now known as "the strange situation." Through a series of separations and reunions in a laboratory room, infants (around age one) and their mothers were observed. By observing the infants reactions to the mother's leaving and returning, their play behavior, and their interaction with the mother and a stranger, a few patterns of attachment emerged. These studies have been repeated over time by many researchers and four patterns are evident.

One attachment pattern is secure and the other three are considered insecure. All of these attachment patterns (or types/styles) are adaptive for the situation in which the child is being raised. Although the insecure patterns are not optimal, they are also not considered a disorder. Attachment disorders are different than having an insecure attachment pattern.

Secure attachment style

An infant misses their mother when she leaves the room and greets her upon returning.

Avoidant-insecure attachment style

An infant does not seem to care if the mother leaves or returns.

Preoccupied-insecure attachment

An infant is terribly upset when the mother leaves and is inconsolable when she returns.

Disorganized/disoriented attachment style

An infant that lacks a cohesive strategy in coping with the strange situation.

The **secure attachment style** is the most prevalent pattern (60–65 percent). These infants miss their mother when she leaves the room and greet her upon return. The **avoidant-insecure attachment style** is the second most prevalent pattern (20 percent). These infants do not seem to care if the mother leaves or returns. The **preoccupied-insecure attachment style** (a.k.a., resistant or ambivalent) is the third most prevalent pattern (10–15 percent). These infants are terribly upset when the mother leaves and are inconsolable when she returns. The **disorganized/disoriented attachment style** is the least prevalent pattern (5–10 percent). The infants seem to lack a cohesive strategy for interacting with their mother, or dealing with her departure and return. They may cling to the mother while leaning away or go through a series of approach/withdrawal behaviors.

It is important to remember that attachment is a process between two people. Attachment is important regardless of what type of relationship we are discussing. We will focus upon attachment between a child and caregivers in the childhood years. Later, we will examine attachment in friendships and romantic relationships during adolescence and adulthood. Attachment is of lifelong importance, and early attachments lay the foundation for later attachments.

You have just been introduced to the attachment styles and it can be easy to just start thinking about people in terms of their attachment "types." However, this would be a mistake. People tend to have a predominant attachment style; nevertheless, attachment is a dyadic process. This means that a person may have a secure attachment to his mother, brother, and sister, but an insecure attachment to his father. As you will learn, attachment does not just have important implications for emotional development, but also for social and cognitive development as well.

Attachment and Mental Models

Early parent-child interactions provide the early environment in which infants begin to develop mental models regarding themselves and others (Dixon, 2003; Galatzer-Levy & Cohler, 1993). If a caregiver is dependable, warm, and responsive, an infant will come to trust that the caregiver will be there when needed. The infant will also come to believe that they must be worthy of such care and attention and learn to love and trust him or herself. If, on the other hand, the caregiver is undependable, emotionally inept, and unresponsive, an infant will come to believe that the caregiver cannot be trusted to be there when needed. The infant may also begin to question whether they have any self-worth, and/or if he or she can trust him or herself. Of course, an infant neither verbally encodes this information, nor consciously has these thoughts. Nonetheless, these early experiences set mental expectations that can last a lifetime if not challenged or questioned. Future chapters devoted to social and emotional development will discuss how attachment impacts development.

Test Yourself

1. What is the difference between primary and secondary emotions?
2. How does attachment develop?

SELF AND OTHERS

In this section, we will highlight the development of self-awareness, play behavior, and daycare.

Understanding of Self and Others

When does a baby know that they are a person, separate from the rest of the world? There is a cool experiment involving a baby, a mirror, and some make-up (rouge) that has tested this question. First, place the baby in front of the mirror and observe her behavior. Next, place some rouge on her nose (or other face location) without her noticing what you are doing. Then, place her back in front of the mirror and observe? Does she seem to notice the make-up on her nose? Does she touch her face as she views her reflection in the mirror? The mirror test is one research technique that has been used to assess when self-recognition emerges in infancy. Self-recognition is measurable around fifteen months of age.

Self-awareness
A child's use of self-referencing pronouns, using their own name, and occasionally labeling themselves by sex and age.

Between fifteen months and two years of age, a child's growing sense of **self-awareness** is evident in their use of self-referencing pronouns (i.e., me or I), using their own name, and occasionally labeling themselves by sex and age. Toddlers seem to have some awareness of how others see them and strive to please their caregivers (Galatzer-Levy & Cohler, 1993).

The mirror test is a technique used to assess when self-recognition emerges. (iStock)

Prosocial behavior

A growing sense of others (e.g. comforting other children who seem sad or worried).

Not only do toddlers have a growing sense of self, but they also have a growing sense of others. Toddlers often spontaneously display **prosocial behavior.** They will try to offer comfort to others that seem to be sad or worried. Toddlers will often pat or hug someone or say in their telegraphic speech something like "It okay." Such early prosocial behaviors demonstrate early emotion recognition in others and empathy.

Family Influences

Parallel play

The side by side playing of two toddlers who occasionally observe each other, but do not interact with each other.

Cooperatively play

The willingness to play with one another.

Exploratory play

Object oriented play.

Symbolic play

Using objects in a pretend fashion (e.g., tea parties).

Play is another behavior that emerges during the toddler period. Between twelve and fifteen months, parallel play appears. **Parallel play** entails two toddlers playing side by side, occasionally observing each other, but not interacting with each other. It is not until around the age of two that children learn to **play cooperatively**. Parents with children this age will often arrange "play dates" so that their child can play with others and learn early social skills with peers.

Some research has examined mother-child play. Mother's who engage in exploratory play (object-oriented play) tend to have children who engage in **exploratory play**. Mother's who engage in **symbolic play** (using objects in a pretend fashion—like tea parties) tend to have children who engage in symbolic play. Hence, children seem to imitate the type of play modeled by their parents. That said, boys are more likely to engage in exploratory play, whereas girls are more likely to engage in symbolic play (Bornstein et al., 1999). Parent-child play interactions facilitate social and cognitive development in children.

The Outside World

The United States is one of only a few industrialized societies that do not offer paid parental leave after the birth of a child. At least partly for this reason, the majority of American infants are placed into some form of child care before their first birthday.

The developmental consequences of daycare depend upon the quality of the daycare, the number of hours spent there, and parent-child interaction when at home. High quality daycare on a part-time basis, coupled with sensitive parenting at home will either have no negative consequences for the child or even lead to positive cognitive and socioemotional outcomes for the child. Unfortunately, the majority of daycare is of low quality (NICHD Early Child Care Research Network, 2001). Low quality daycare, long hours, and inadequate parent-child interactions are all predictive of poor cognitive and/or socioemotional outcomes. Can daycare be harmful to infants? Yes. Is daycare always harmful for infants? No. However, many children do suffer suboptimal developmental outcomes because quality daycare is the exception in this country, instead of the rule.

Test Yourself

1. How do researchers test for self-recognition in infants?
2. What is the difference between exploratory and symbolic play?

PSYCHOLOGICAL DEVELOPMENT

In Chapter 1, we were introduced to Erikson's psychosocial theory. We will discuss the first two stages of psychosocial development in this section.

Establishing Basic Trust

Basic trust
The sense that others are predictable and can be relied on.

Erikson (1950, 1964) describes the development of an attitude of **basic trust** as a primary task of psychosocial development in infancy. This sense usually is established between birth and eighteen months of age. It is believed to have long-range implications for a person's social and psychological adjustments throughout the life span.

Impressions of infants, gained both from informal observations and empirical study, suggest that the sense of basic trust emerges through numerous interactions and activities between the mother and the baby. The father becomes a significant force in the infant's development at a later time, according to Erikson's theory. Feeding situations provide ample opportunities for the infant to explore its caregivers both through vision and touch. Feeding is thought to be a significant event for the infant in encouraging attachment. It also assists to identify the caregiver as a primary source of physical and psychological nurturance.

A consistent caregiver who holds the infant consistently and who has a consistent pattern of behavior toward the infant in the feeding situation, for example, leads the child to learn to trust the integrity of others. This elementary attitude is based on the infant's discovery that there is predictability in his or her world. The early learning that there is consistency in life and in activities helps an infant to predict how it will be treated. It learns that certain events or sensations will occur if he or she behaves in particular ways. For example, a baby learns that a lusty cry will produce the appearance of the caregiver who

attends to his or her needs. Other interactions with the physical environment contribute to an infant's learning that there is predictability or consistency in many things. The baby discovers, for example, that movement in the crib makes a mobile move in response. As babies gain better motor control, they learn that fingers and toes move in accordance with their will. Their behavior becomes instrumental or goal-oriented.

As the body matures, an infant learns that objects can be manipulated and that they can move their bodies from one location to another. In essence, they learn to experience and explore their physical setting. They actively reach out to interact with their environment.

An infant learns to trust the caregiver when held and fed consistently. (iStock)

An attitude of mistrust may prevail if an infant learns that routines and the physical and social environment are unpredictable and inconsistent. This is especially true regarding people who are its primary caregivers. Infants who have been deprived of consistent nurturing show such a pervasive sense of mistrust regarding others' integrity. This attitude also is characterized by apathy, delayed developmental progress, poor appetite, and even illness. Such an attitude makes infants less vulnerable to emotional pain. It is devastating, however, in preventing the child from loving and being loved. This can adversely affect progress through other developmental stages.

Acquiring a Sense of Autonomy

Autonomy

Refers to establishing personal boundaries and self-differentiation from things and others.

Shame and doubt

Refers to the belief that one is unable to be autonomous and that one's inner self is basically flawed and defective.

Erikson proposes that individuals establish a sense of **autonomy** versus **shame and doubt** between eighteen months and three years of age. Parents may view interactions with their infant as a series of troublesome encounters. This is because so much of his or her behavior is directed toward developing an initial identity as a person independent of parents.

What may amaze and confound parents of a child this age is not so much that changes are experienced; rather, it is the rapid nature and intensity by which they occur. Stubborn insistence on having their own way and expressing their own point of view in interactions with parents are common. These are predominant behavioral patterns among many children who are in the process of developing an attitude about their autonomy. An emerging sense of self is shown for the first time in the swings from independent to dependent behavior and back again. The behavior and nature of the

infant at these ages appears to be unpredictable in many ways. This relates to their attempts to develop a sense of autonomy.

From a family systems theory perspective, what are occurring for the infant at this period in its life are experiences that teach about personal boundaries. The attachment process in the early period of infancy apparently leads an infant to believe that there is a symbiotic relationship between him or her and the parents. This may be the case especially with the mother as she is very often the principal caregiver. The relationship is described as emotionally enmeshed. Both an infant and the mother may have difficulties in perceiving the personal boundaries that distinguish them as distinct individuals.

Both mothers and infants experience blurred personal boundaries because of the intense closeness and intimacy of their relationship. It is thought that an infant may have difficulty in perceiving that he or she is not an extension of the parent and vice versa. Lack of such distinctions between the self and others cannot continue indefinitely, however, as this is unhealthy psychologically. Self-differentiation from others begins when an infant learns to erect personal boundaries by behaving in ways that establish its autonomy.

For many infants, there is a change in personality at this time of their life span. The smiling, friendly, accepting child is replaced on many occasions by what seems to be a surly, whining, little demon. This child now is obstinate, gets into mischief, refuses to cooperate or obey parents' requests, and has only one apparent and very overworked word in his or her vocabulary: "NO!" This is the terrible two-year-old at his or her very worst, according to many parents. Yet, some parents can be very preoccupied or motivated with using power to gain control over their child's unacceptable actions. Many may be unaware that these difficult interactions are a very necessary part of the child's healthy psychosocial development.

The attitude of feeling ashamed and doubtful occurs when parents restrict or fail to encourage an infant's attempts to be autonomous. This is an unhealthy attitude that may stem in part from many parents' overreaction to negativistic behavior from an infant. However, such behavior is normal at this time in life. Many adults were raised by parents who used strict, rule-oriented methods. It is only to be expected that these methods are likely to be repeated in raising their own children. This is done unthinkingly because our society does so very little to train people to be parents.

Reliance on rules and rigid standards of acceptable behavior becomes imposed on children at this time as appropriate childrearing by such parents. This is likely because of the parents' belief that strict control is called for. It also is implemented because so much of a toddler's behavior appears to be acting out against parental authority. These attempts to control the rebelliousness of a child are seen as necessary and appropriate. However, many parents are apparently too successful and relentless in trying to achieve this end. The result is that many infants emerge from this period of their lives with the basic negative belief about the inner core of their self. This is the part that is basic to the self-concept and their essence as a human being. The belief is that they are bad, flawed, unacceptable, undesirable, and unlovable.

This is what Erikson calls an attitude of shame and doubt. For many children, the overwhelming majority of interactions with parents are corrective in nature. This relates to their behavior that is seen as problematic by parental standards (John-Roger & McWilliams, 1990). The focus of parental attention toward an infant shifts from unconditional and unadulterated adoration prior to this time, to being one of exasperation and punitiveness. Infants are more active now than ever before. They are more liable to do things that are dangerous and disruptive.

The challenge of parents who want to facilitate a child's healthy psychosocial development now is to focus on the behavior rather than on the child's character. Behavior that is appropriate deserves as much or more attention than behavior that is not. A parent may say, for example, "You're just the most rotten kid I've ever seen." This promotes feelings of shame and doubt by labeling the child's inner self negatively. It is more helpful to say, "I'm glad you're so interested in touching the cat but I can't let you pull its tail because it may scratch and you can get hurt." This promotes feelings of autonomy while teaching limits for the child's behavior.

Some biologically-oriented events contribute to preparing and assisting an infant to achieve the psychosocial attitude of autonomy. These include learning to walk and to feed oneself, controlling eliminations, and so on. Toilet training is an especially significant developmental event that assists in this endeavor.

Test Yourself

1. What can assist in the development of basic trust?
2. What can assist in the development of autonomy?

SUMMARY

1. Many physical changes occur during infancy. First, there is a continuation of growth patterns established before birth, in that changes occur in cephalocaudal (head-to-foot) and proximodistal (inner-to-outermost) directions. Second there are significant increases in weight and height. The birthweight is doubled by four months of age, and tripled by the infant's first birthday. Height increases by about 50 percent the first year. The brain shows a rapid increase in connections during infancy. Fat, muscle, and bones all show growth during infancy as well.
2. Basic motor skills occur sequentially. Use of the hands in manipulating objects also progresses sequentially. It begins with use of the full hand in grasping objects, then proceeds to use of

combinations of fingers, and culminates in the ability to use the forefinger and thumb with accuracy in picking up objects.

Perceptual skills advance with motor skill development. Perceptual changes at this stage primarily involve the ability to use eyesight to guide and make adjustments in motor behaviors. They may be observed in the ways infants use their eyesight in learning to judge depth or surface changes.

Health concerns for infants include meeting their nutritional needs, protecting them from diseases, and taking steps to prevent SIDS. Breastfeeding provides the best nutrition for infants. Vaccinations help prevent many childhood diseases and do not appear to cause autism. Infants should be kept away from second-hand smoke and put to sleep on their back in order to prevent SIDS.

A major stage in cognitive development, the sensorimotor period, is experienced during infancy. This period primarily involves changes that result in the integration of sensory input and perceptions with motor behaviors. Infants acquire an understanding of their environment through these means. A major accomplishment at this stage is understanding object permanence, or the notion that something continues to exist even though it has been removed from the child's field of vision. This understanding is part of the process of self-differentiation, according to cognitive development theory.

The changes observed during the sensorimotor period occur in a graduated sequence. It begins with an infant's use of reflexes present at birth and progresses to more complex circular reactions. These are habitual actions that are constructed through continual repetition. The process culminates in the use of symbolic logic and reasoning at the end of infancy. Sensorimotor schemas are rudimentary ideas about the nature of the world. They are constructed and modified through experience in interacting with the environment by sensory and motor actions.

7. Infants are born with some basic processes that allow for learning and information-processing. Many of these processes are evident prenatally, but we can test them more definitively after birth. Infants are capable of forming memories, association, recognition, imitation, and recall. These early basic processes pave the way for future problem-solving, memory strategies, and other information-processing development.
8. The ability to use language to communicate with others emerges in infancy in a series of gradual advancements. Infants are born with the ability to cry, then progress through cooing, babbling, understanding words, and producing their first word. Speech begins with one-word sentences, then progresses to two-word sentences. Infants typically understand the rules of language prior to being able to fully utilize these rules.
9. Developmental changes are observed in the emerging emotional expression of infants. Infants become gradually capable of expressing a wide range of feelings through facial gestures, vocalizations, and other behaviors.
10. An infant develops an emotional attachment to his or her primary caregivers. This attachment provides the infant with a sense of security and promotes his or her exploration of the environment. Attachment is believed to occur in four distinct phases: undiscriminating social responsiveness, discrimination in social responsiveness, active seeking of physical proximity and contact, and goal-corrected partnership.
11. Attachment can be assessed in infants by utilizing the strange situation paradigm. There are four patterns of attachment: Secure, avoidant, preoccupied, and disorganized/disoriented. Each attachment style has distinct mental models of self and others. Although a person may

have a predominant attachment style, attachment is a process between two people and can vary by relationship.

12. Self-awareness increases during the toddler period. Prosocial behavior and play behavior also emerge during this time. Parents can influence type of play behavior in infants and gender differences are apparent. Daycare can be correlated to positive or negative developmental outcomes, dependent upon quality of daycare, hours spent in daycare, and parent-child interactions.
13. Establishing a sense of basic trust as opposed to mistrust is the first of a series of psychosocial tasks the individual experiences during the life span. The optimal time for acquiring the healthy attitude of trust is between birth and eighteen months of age. It is derived principally from consistent, positive interactions with the maternal caregiver, according to Erikson. Favorable interactions with the physical environment also contribute to this attitude. According to psychosocial theory, the accomplishment of basic trust signifi- cantly improves the chances of healthy develop- ment at subsequent stages of the life span.
14. Acquiring a healthy sense of personal autonom as opposed to an unhealthy attitude of sham and doubt is the principal psychosocial ch lenge for the individual between eighteen a thirty-six months of age. The behaviors leadi to the acquisition of a healthy sense of auto omy are often quite troublesome to parent They are necessary, however, if the infant is accomplish self-differentiation and establi personal boundaries. An infant who feels com fortable in separating from primary caregiver able to explore his or her environment. Certa developmental tasks of infancy, such as toil training, contribute to this healthy attitude. unhealthy attitude of personal shame and doub is promoted when infants are discouraged fro becoming autonomous and made to feel th exploratory behaviors are inappropriate.

KEY TERMS

TERM	PAGE	TERM	PAGE
Proximodistal growth pattern	99	Childproofing	107
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Neuron	100	Co-sleeping	109
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