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Development: Conception Through *the* End *of* Life

We are constantly changing, growing, and developing throughout our lives, from conception to old age. At some periods, these changes take place very rapidly and are clear to anyone who is there to observe them; at other times, particularly later in life, they may not be so obvious. This chapter explores development throughout the lifespan.

10.1 Developmental Issues

A number of issues have influenced developmental theory and research; we explore three of the most important. The first is the ongoing nature versus nurture controversy: What are the relative influences of heredity and environment on development? A second question has to do with the way in which development proceeds: Do changes take place in a continuous fashion throughout our lives, or do they occur in stages, with qualitatively different changes taking place at different points in our lives? A third issue has to do with critical periods in development: Must certain experiences occur during a specific window of time in our lives in order for development to proceed normally, or can later experiences make up for earlier deficiencies? These three questions recur throughout the study of development; therefore, we will introduce each before proceeding with our discussion of human development.

10.1a Heredity and Environment

Some individuals are capable of prodigious intellectual feats; others have only average ability. Some of us are extroverted and outgoing; others are introverted and shy. A few of us are leaders; most are followers. Are such differences a consequence of inheritance, or are they learned?

The Nature-Nurture Argument

Nurture Argument One answer to this question is that we are products of the experiences that nurture our development from conception to death. The seventeenth-century English philosopher John Locke, who proposed that an infant's mind at birth is a *tabula rasa*, or blank slate upon which virtually anything can be written by experience, expressed this view. The behaviorist John Watson updated this view in the 1920s:

> Give me a dozen healthy infants, well-formed and my own specific world to bring them up in, and I'll guarantee to take any one at random and train him to become any type of specialist I might select—a doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors. (Watson, 1924)

Nature-Nurture Controversy Controversy over whether individual differences are the result of genetic endowment (nature) or the consequence of learning (nurture)

Maturation Orderly unfolding of certain patterns of behavior, such as language acquisition or walking, in accordance with genetic blueprints

Nature Argument

The opposing point of view in the **nature-nurture controversy** is that our genetic endowment, or nature, is what makes us who we are. The eighteenth-century French philosopher Jean-Jacques Rousseau saw human development as simply the unfolding of genetically determined attributes; in the twentieth century, developmental psychologist Arnold Gesell (1926) stated, "It is the hereditary ballast that conserves and stabilizes the growth of each individual infant" (p. 378).

Interaction Argument

Neither the nature nor the nurture position is supported today in its extreme form. Instead, contemporary theorists are interested in how genetics and experience interact. Although heredity predisposes us to behave in certain ways (and also sets limits on what we can do), the environment is also critical. For example, although genetics determines whether your biological sex is male or female, gender-associated behaviors—from manner of dress, to enjoyment of activities, to your role in a relationship—are highly influenced, if not entirely determined, by social learning. We explore the relative influence of heredity and environment on gender identity and gender roles later in this chapter.

Thus, human behavior develops within the context of our environments. While some behaviors or attributes are largely, if not exclusively, determined by experience, others seem to develop without any specific experience, as long as environmental conditions stay within a normative range. An example is the early stages of language acquisition, as we saw in Chapter 9. Another is the universal developmental sequence through which babies progress, from sitting without support to crawling and ultimately to walking. Virtually all babies crawl, commencing at around ten months, before they begin to walk at about thirteen or fourteen months. (Throughout this chapter, we quote average ages for different developmental milestones. Please note that there is a wide range of individual variation around these norms.) This biologically determined sequence occurs even if children are not encouraged to sit, crawl, or walk. Both language acquisition and walking are examples of **maturation**—the orderly unfolding of certain patterns of behavior in accordance with genetic blueprints.

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Virtually all babies crawl, commencing at around ten months, before going on to walk at about thirteen or fourteen months.

10.1b Continuous Versus Stage Development

A second issue confronting developmental psychologists concerns the nature of changes that occur over the life span. We all know that adolescents are quite different from infants and that most elderly people are noticeably different from young adults. Are these differences created by a gradual, cumulative growth, with each new developmental change building upon earlier developments and experiences in a fashion characterized by continuity? Contrarily, do these changes exhibit *discontinuity*—that is, are the behaviors expressed at each new stage of development qualitatively different from those of the previous stage?

In general, psychologists who emphasize the role of learning have tended to view development as a gradual, continuous process. According to this view, the mechanisms that govern development are relatively constant throughout a person's life. Individuals accumulate experiences; therefore, development is

seen as a *quantitative* change (change due to increases in the amount or quantity of experiences). Developmental psychologists who embrace this perspective believe that the only important difference between young people and those who are older is that the latter have experienced more in life and are likely to know more. In contrast, many psychologists who emphasize maturation view development as a discontinuous process that occurs in a series of steps or stages. A stage is a concept used to describe how a person's manner of thinking and behavior are organized and directed during a particular period in their life.

Stage theorists are inclined to interpret the differences between children and adults as being *qualitative* in nature (differences due to distinctions in the kind and nature of experiences). For instance, adults are viewed as better problem solvers than children not just because they know more but also because they think differently, in a more logical and systematic fashion. Here and later in the chapter we discuss two influential stage theories: Jean Piaget's theory of cognitive development and Erik Erikson's theory of psychosocial development.

An important aspect of the continuity-discontinuity issue is the question of whether development from infancy to old age is characterized more by stability or by change. For instance, will an introverted, withdrawn child grow up to be reclusive as an adult? How much can we rely on a person's present behavior to predict what that person will be like in the future? Many of us grow up to be older versions of our childhood selves. Stability is not inevitable, however, and at least some people develop into adults quite different from their earlier selves.

BVT Lab

Visit **www.BVTLab.com** to explore the student resources available for this chapter.

10.1c Critical Periods in Development

A third developmental issue is the relative importance of different periods of development. Is the timing of training essential for optimal acquisition of certain skills, and is timing also necessary for the development of behavioral traits? Is it necessary to have certain experiences early in life to ensure normal development later on?

According to one point of view, there are **critical periods** during which an infant or child must experience certain kinds of social and sensory experiences. If the proper experiences are not provided at the right time, later experiences will not be able to make up for earlier deficiencies. Psychologists who argue for critical periods often cite animal research for support. One widely quoted source of evidence is the research of biologist Konrad Lorenz (1937), who was curious about why ducklings begin to follow their mothers shortly after they are hatched. In a series of experiments, he demonstrated that newly hatched ducklings will begin to follow the first moving thing they see—their mother, a member of another species like a goose, or even Lorenz himself. Lorenz labeled this phenomenon **imprinting**.

Psychologist Harry Harlow and his associates at the University of Wisconsin conducted another famous study. Harlow found that when baby monkeys are deprived of "contact comfort" with their mothers during early development, the result is emotional and social impairment. For instance, infant monkeys who were reared in isolation for the first six months or more showed severely disturbed behavior such as incessant rocking, timidity, and inappropriate displays of aggression. These traits persisted into adulthood, even after the imposed isolation was ended (Suomi, 1976). We discuss this research in more detail later in this chapter.

The evidence of critical periods in human development is inconsistent. For example, institutionalized infants who are deprived of loving, responsive care during their first six months are significantly more likely to be emotionally and socially maladjusted than infants who are institutionalized after they have experienced a period of close contact

Critical Period Periods in the developmental sequence during which an organism must experience certain kinds of social or sensory experiences in order for normal development to take place

Imprinting Process by which certain infant animals, such as ducklings, learn to follow or approach the first moving object they see

with responsive caregivers during the early months of their lives. Some psychologists view this as evidence that the first six months are a critical period for starting a child on the proper path toward healthy emotional and social adjustment.

However, not all research supports this view. In one study, for example, infants who had been subjected to a profoundly impoverished orphanage environment for most of their first two years were then transferred to another institution where they received one-on-one contact with loving caregivers. Despite the early lack of love and stimulation, these infants developed into well-adjusted adults without identifiable behavioral problems (Skeels, 1966). Numerous other investigations have shown that children adopted after infancy and raised by loving parents can often overcome early disadvantages associated with severely deprived environments.

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Research shows that later life experiences can make up for social and sensory experiences that were lacking during early development.

Even Harlow's monkey studies cast doubt on the critical-period theory. If monkeys who had been deprived of contact comfort during infancy were later provided extensive contact with therapist monkeys, their behavioral deficits could be almost entirely overcome. Monkeys exposed to longer periods of isolation (twelve months instead of six months) also responded to this unusual therapy, but their recovery was not as complete (Novak & Harlow, 1975; Suomi & Harlow, 1972).

Another question related to the critical-period issue is whether bonding between parent and infant must take place at a certain point in early development. Most nonhuman mammals lick and groom their offspring during the first hours after birth, often rejecting their young if this early "getting acquainted" session is somehow prevented. Some child specialists have suggested that a similar critical period exists for humans in the first hours after birth, and that if contact is prevented, mother-infant bonding will not develop adequately; however, this notion has received little support from research. Instead, the parent-child relationship seems to be malleable, with plenty of opportunity to establish attachment throughout development.

In all, the evidence suggests that most effects of adverse early experience can be modified, if not overcome, by later experience. Certainly the kinds of experiences we have during our early development may strongly influence our feelings about ourselves and others, our styles of relating to people, our mode of expressing emotion, the degree to which we realize our intellectual potential, and countless other aspects of our adjustment. Most contemporary psychologists agree, however, that the concept of critical periods in infant development—at least when applied to emotional, intellectual, and behavioral traits—lacks supporting evidence.

10.2 Developmental Research

The task of developmental psychology is to describe and attempt to explain the nature of behavioral changes that occur throughout the life span. To realize this aim, researchers need to gather information about individuals at different points in their development.

Three research designs have been developed for this purpose: the cross-sectional, longitudinal, and cross-sequential methods.

10.2a The Cross-Sectional Design

The most widely used research method in developmental psychology is the **cross-sectional design**. Groups of subjects of different ages are assessed and compared at one point in time, and the researcher draws conclusions about behavior differences that may be related to age differences. For example, suppose we want to determine whether there are age differences in television-viewing habits. Using the cross-sectional method, we might attach program-monitoring devices to the television sets of a sample population ranging from young adults to retirees and then analyze several months of viewing records. The result would be a profile of viewing habits of different age groups.

The cross-sectional study gives an accurate "snapshot" of one point in time, but it leaves an important question unanswered: Do its findings reflect developmental differences or changes in the environment? For instance, suppose we discover that young adults watch very few comedies, whereas older adults spend most of their television time viewing comedies. Does this mean that when the young people in our sample grow older, they will spend more time viewing comedies, or does it simply reflect the fact that the older subjects developed their viewing habits in an era when situation comedies were featured in television programming? One way to find out if a behavioral change is related to development is to conduct a longitudinal study.

10.2b The Longitudinal Design

The **longitudinal design** evaluates behavior in the same group of people at several points in time to assess what kinds of changes occur over the long term. To apply this method to the study of age-related television preferences, we might begin by monitoring the viewing habits of a group of young adults at age twenty. The same subjects might then be repeatedly observed at five-year intervals over the next fifty years. This method would allow us to assess reliably whether or not the television consumption habits of our subjects actually change with age, and if so, in what direction.

A famous example of a longitudinal investigation is Lewis Terman's long-term study of gifted children with IQs above 135. A Stanford University psychologist, Terman began his research in the early 1920s with a sample of 1,528 gifted boys and girls of grade-school age. These subjects were evaluated and tested at regular intervals, first to see if they would maintain their intellectual superiority, and later to see how well they adjusted to life. Although Terman died in 1956, Stanford psychologists Robert Sears and Pauline Sears continued his research.

This classic study has provided a wealth of information about the impact of superior intelligence on life satisfaction and on the course of development. Over time, Terman's gifted subjects were shown to be healthier, happier, more socially adept, and more successful in their careers than comparably aged people of average intelligence. They also exhibited a much lower than average incidence of emotional disorders, substance abuse, suicide, and divorce (Terman, 1925, 1954). These findings have helped dispel the common myth that people of very high intelligence are more likely to exhibit severe behavior disorders than are people of average intelligence.

Unlike the cross-sectional design, the longitudinal approach allows researchers to track an individual's changes over time. However, the longitudinal approach does

Cross-Sectional Design
Research design in which groups of subjects of different ages are assessed and compared at one point in time, so that conclusions may be drawn about behavior differences which may be related to age differences

Longitudinal Design
Research design that evaluates a group of subjects at several points in time, over a number of years, to assess how certain characteristics or behaviors change during the course of development

have some drawbacks. One is the large investment of time that it requires. Relatively few researchers are ready to embark on a Terman-like study whose results will not be evident for years. Another problem is the shrinking sample. Over time, subjects may drop out of the study as they move away, die, or simply lose interest.

Finally, environmental factors still play a role in longitudinal studies, and so researchers must be cautious in generalizing their findings. For example, suppose that as part of a longitudinal study you interview a group of college students in 1960 and then again survey the same group in 1990, asking them their opinions about abortion. You might find that as middle-aged adults these subjects expressed more support for a woman's right to choose abortion than they did as young adults. Does this mean that attitudes toward abortion become more liberalized in the period between early and mature adulthood? Such a conclusion would overlook the dramatic social changes that have taken place over several decades. The attitudinal changes in our study group might well reflect social changes rather than a normal developmental pattern.

10.2c The Cross-Sequential Design

In an attempt to overcome some of the drawbacks of both the cross-sectional and longitudinal designs, researchers have combined the best features of each in a **cross-sequential design**. Subjects in a cross-sectional design are observed more than once, but over a shorter span of time than is typical of longitudinal studies. Subjects in cross-sequential studies with the same year of birth are said to belong to the same *birth* **cohort**. Developmental psychologists who use this research design generally choose cohorts whose ages will overlap during the course of the study. This method helps to avoid both the longitudinal shortcoming of limited generalization of findings and the potential cross-sectional problem of confusing the effects of growth with those of societal conditions.

10.3 The Beginning of Life

Cross-Sequential Design Research design that combines elements of the cross-sectional and longitudinal designs, observing subjects more than once over a relatively short period of time

Cohort An experimental group of participants with similar characteristics or who share a particular experience

Gamete The reproductive cells, or sperm and ovum—also called germ cells

Chromosome A strand of DNA that contains the organism's genes

DNA (Deoxyribonucleic Acid) Chemical substance whose molecules, arranged in varying patterns are the building blocks of genes

For all of us, life begins in the same way. Shortly after a ripened ovum is released from one of our mother's ovaries, a sperm cell penetrates the ovum, fertilizing it. The sperm and ovum, collectively called **gametes** or **germ cells**, normally unite in the upper portion of the *fallopian tube*. The resulting new cell, called a zygote, then travels downward through the fallopian tube to the *uterus* or womb (see Figure 10-1).

The nuclei of the sperm and ovum each contain twenty-three rod-like structures called **chromosomes**, twenty-two of which are autosomes (not sex-determining) and one of which is a sex chromosome. After fertilization, the zygote contains a complement of forty-six chromosomes arranged in twenty-three pairs, one chromosome in each pair from the sperm and one from the egg (see Figure 10-2).

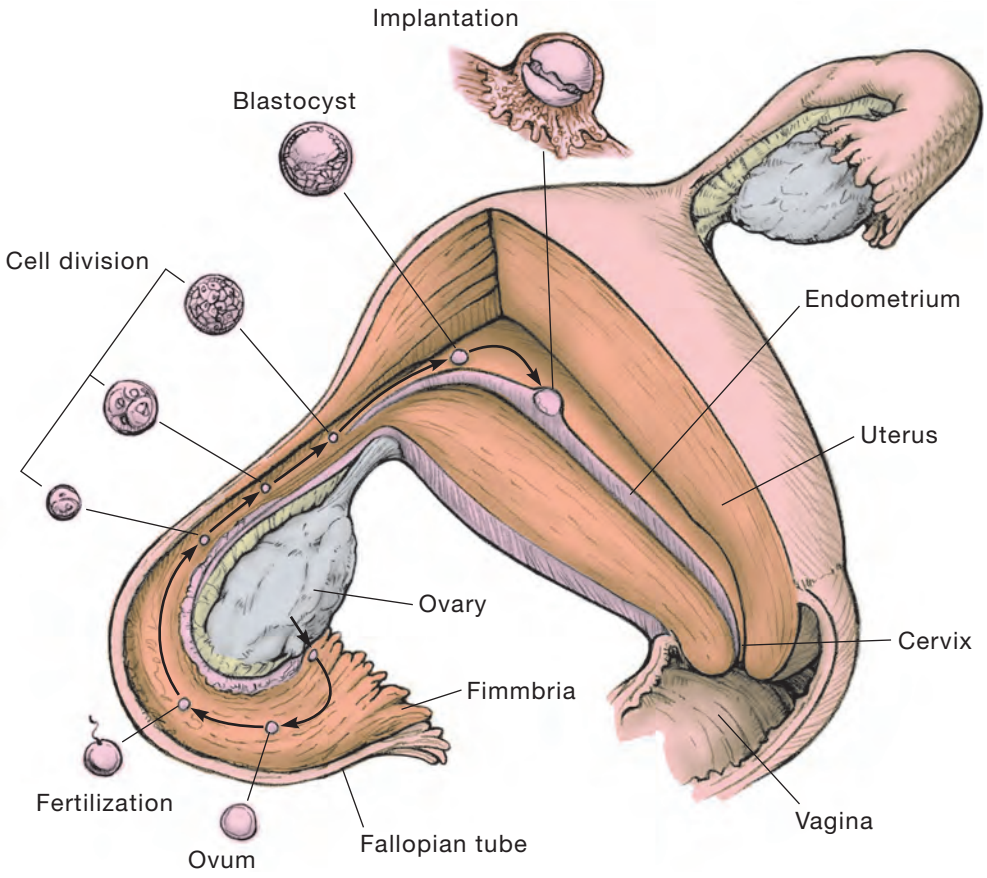
10.3a Genes and Chromosomes

Chromosomes are composed of thousands of genes, the chemical blueprints of all living things. Genes determine physical traits such as eye color, blood type, and bone structure; they also have a significant impact on behavioral traits such as intelligence, temperament, and sociability.

Genes are made of **DNA** (**deoxyribonucleic acid**) molecules. Under high amplification, a DNA molecule looks like a long double strand arranged in a spiraling staircase fashion (Figure 10-3). Although DNA molecules are composed of the same chemical

Figure 10-1 From Ovulation to Fertilization

The egg travels to the fallopian tube, where fertilization occurs. The fertilized ovum divides as it travels toward the uterus, where it becomes implanted.



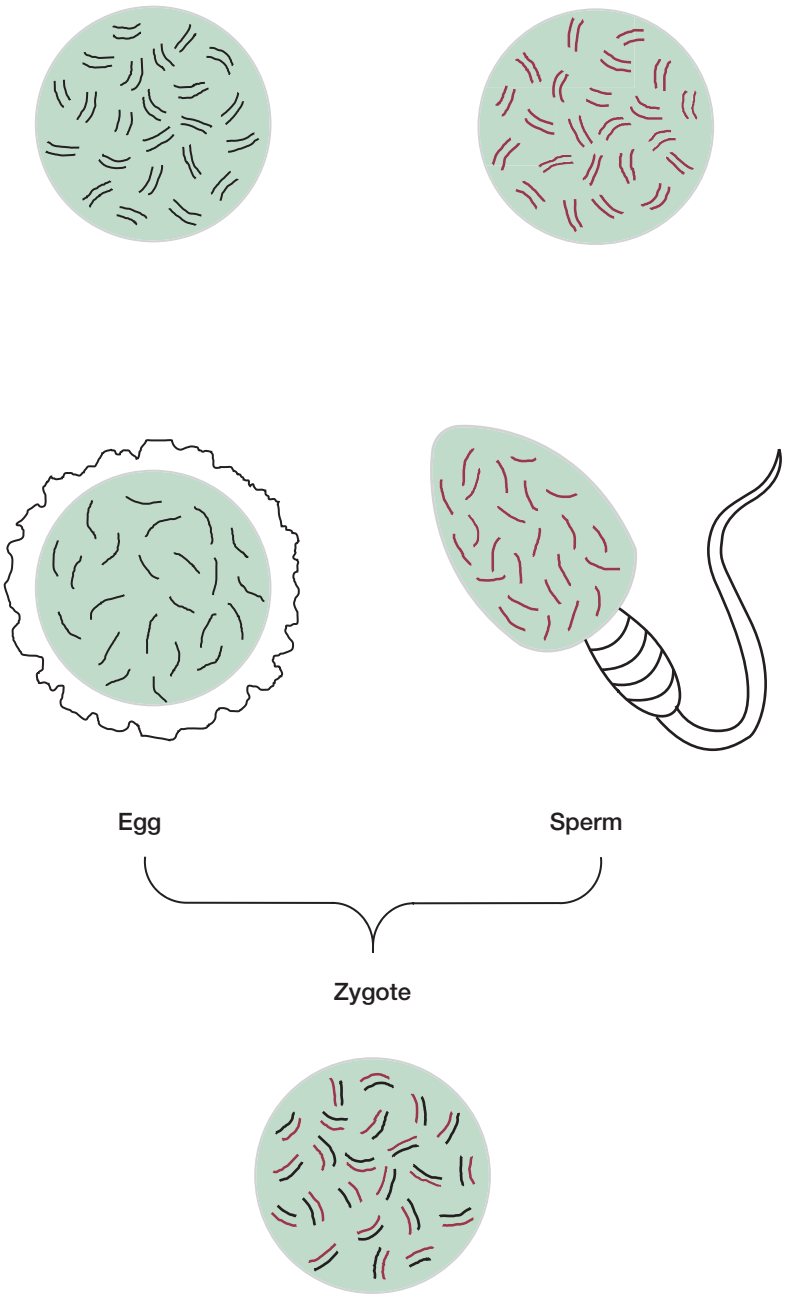
bases, the exact arrangement of chemicals varies, causing different DNA molecules to have different effects. A person's genetic code thus consists of a variety of patterns of DNA molecules arranged in gene groupings on specific chromosomes within a cell's nucleus. Each individual's genetic code is unique.

The exception, of course, is **identical twins** (also called **monozygotic** or **one-egg twins**), who share the same genetic code. Identical twins originate from a single fertilized ovum that divides into two separate entities with identical genetic codes. Identical twins are always same-sex individuals who physically appear to be carbon copies of each other. Since they have the same genes, any differences between them must be due to environmental influences.

Identical twins may not be as identical as researchers assume, however. Recent genetics research suggests that identical twins may result from tiny genetic mutations that lead one part of the developing embryo to reject the other part, resulting in two nearly identical embryos (Hall, 1992). At present we do not know the significance of these genetic differences on human development and behavior.

Identical Twins Twins who share the same genetic code—also known as one-egg or monozygotic twins

Figure 10-2 Chromosome Complement of the Zygote After Fertilization

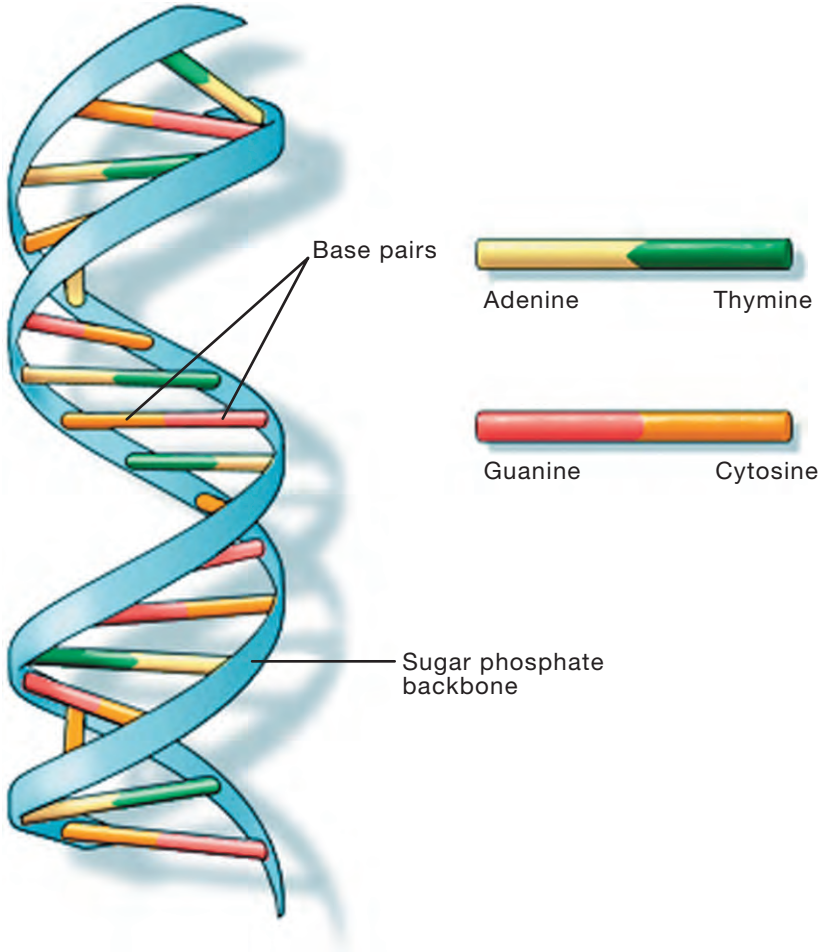


Fraternal Twins Twins produced when two ova are fertilized by two different sperm cells, so that their genetic codes are no more similar than those of any other siblings—also known as two-egg or dizygotic twins

In contrast, **fraternal twins** (also known as **dizygotic** or **two-egg twins**) occur when the woman's ovaries release two ova, each of which is fertilized by a different sperm cell. Since fraternal twins result from the fusion of different germ cells, their genetic makeup is no more alike than that of any other siblings. Physical and behavioral differences between fraternal twins may be due to genetic factors, environmental influences, or a combination of the two.

Figure 10-3 Deoxyribonucleic Acid Molecule (DNA)

Arranged from two nucleotide strands that form the double helix structure connected by different arrangements of the base pairs adenine, cytosine, guanine, and thymine.



Source: U.S. National Library of Medicine

Psychologists who seek to understand the relative roles of genetics and environment in determining behavioral traits often compare the degree to which both members of a twin pair express a particular trait. When identical twins are more alike (**concordant**) than fraternal twins in a particular trait, we can assume that the attribute has a strong genetic basis. Conversely, when a trait shows a comparable degree of concordance in both types of twins, we can reasonably assume that environment is exerting the greater influence. We will have more to say about twin studies throughout the remaining chapters of this text.

Concordance Degree to which twins share a trait—expressed as a correlation coefficient

(Featureflash Photo Agency/Shutterstock)

Identical twins, such as actors Matthew and Benjamin Royer, are always same-sex individuals who physically appear to be carbon copies of each other.

Genotypes and Phenotypes

The assortment of genes we inherit at conception is known as our **genotype**; the characteristics that result from the expression of various genotypes are known as **phenotypes**. Sometimes genotypes and phenotypes are consistent, as when a person with brown eyes (phenotype) carries only genes for brown eye color (genotype). However, a phenotype is often inconsistent with its genotype, so that a person with brown eyes may carry a blue-eye gene as well as a brown-eye gene. This happens because genes occur in pairs, one of which is contributed by the mother and one by the father.

If your genetic blueprint contains different genes for a trait, you are said to be **heterozygous** for that trait. In contrast, if you inherit identical genes from both your parents, you are **homozygous** for that trait. What determines how a phenotype will be expressed when a person is heterozygous for a particular trait?

Dominance and Recessiveness

Suppose you received a gene for brown eyes from one parent and a gene for blue-eyes from the other. The principles of *dominance* and *recessiveness* would allow us to predict that the actual color of your eyes would be brown because genes for brown eyes are dominant over blue eye genes. A **dominant gene** is one that is always expressed in the phenotype; it is the gene that prevails when paired with a subordinate or **recessive gene**. A recessive gene is one that may be expressed only in the absence of a dominant gene, or when it is paired with a similar recessive gene. Table 10-1 lists some dominant and recessive traits.

Not all human traits can be predicted as easily as eye color. Several traits, such as growth or metabolic rate, result from gene pairs working in consort with each other. This is a more complicated form of genetic transmission, in which several gene pairs interact.

Sex-Linked Inheritance

You may be aware that certain undesirable traits, such as red-green color blindness and hemophilia (abnormal bleeding) are far more common among males than females. Have you ever wondered why males are more susceptible to these and other diseases that demonstrate **sex-linked inheritance**? The answer lies in the fact that the smaller Y chromosome carries fewer genes than the much larger X chromosome. (The sex chromosome pair in males is XY; in females it is XX.) The genes that determine whether or not a person develops these diseases are carried only on the X chromosome.

In the case of hemophilia, as long as a person has at least one dominant gene for normal blood clotting (which we designate as H: geneticists use uppercase letters to denote dominant genes and lowercase letters for recessive genes), the disease will not be expressed (see Figure 10-4). Thus, a female can carry the recessive gene for hemophilia (h) on one of her X chromosomes but, nevertheless, have blood that clots normally due to the presence of a dominant H on the other member of her XX pair. A male, however, will be a bleeder if he inherits only one h gene from his mother, since the gene-deficient Y chromosome does not carry a gene that regulates blood clotting.

Genotype Assortment of genes each individual inherits at conception

Phenotype The characteristics that result from the expression of an assortment of genes

Heterozygous Genotype that contains different genes for a trait (for instance, both brown-eye and blue-eye genes)

Homozygous Genotype that consists of the same gene for a trait (for instance, brown-eye genes inherited from both parents)

Dominant Gene Gene that prevails when paired with a recessive gene, so that it is always expressed in the phenotype

Recessive Gene Gene that is expressed in the phenotype only in the absence of a dominant gene, or when it is paired with a similar recessive gene

Sex-Linked Inheritance Genetic transmission involving genes that are carried only on the X chromosome (females carry the XX chromosome pair; males carry the XY pair)

Table 10-1 Some Common Dominant and Recessive Traits

Dominant Traits	Recessive Traits
Dark hair	Light hair
Nonred hair (brunette or blond)	Red hair
Normal hair growth	Baldness
Curly hair	Straight hair
Brown eyes	Blue, green, hazel, or gray eyes
Normal color vision	Red-green color blindness
Normal visual acuity	Nearsightedness
Normal protein metabolism	Phenylketonuria (inability to convert phenylalanine into tyrosine)
Type A or type B blood	Type O blood
Normal blood clotting	Hemophilia
Normal blood cells	Sickle-cell anemia
Normal skin coloring	Albinism (lack of pigment)
Double-jointedness	Normal joints
Huntington's disease	Normal health
Abnormal digits in fingers or toes	Normal digits

Epigenetics

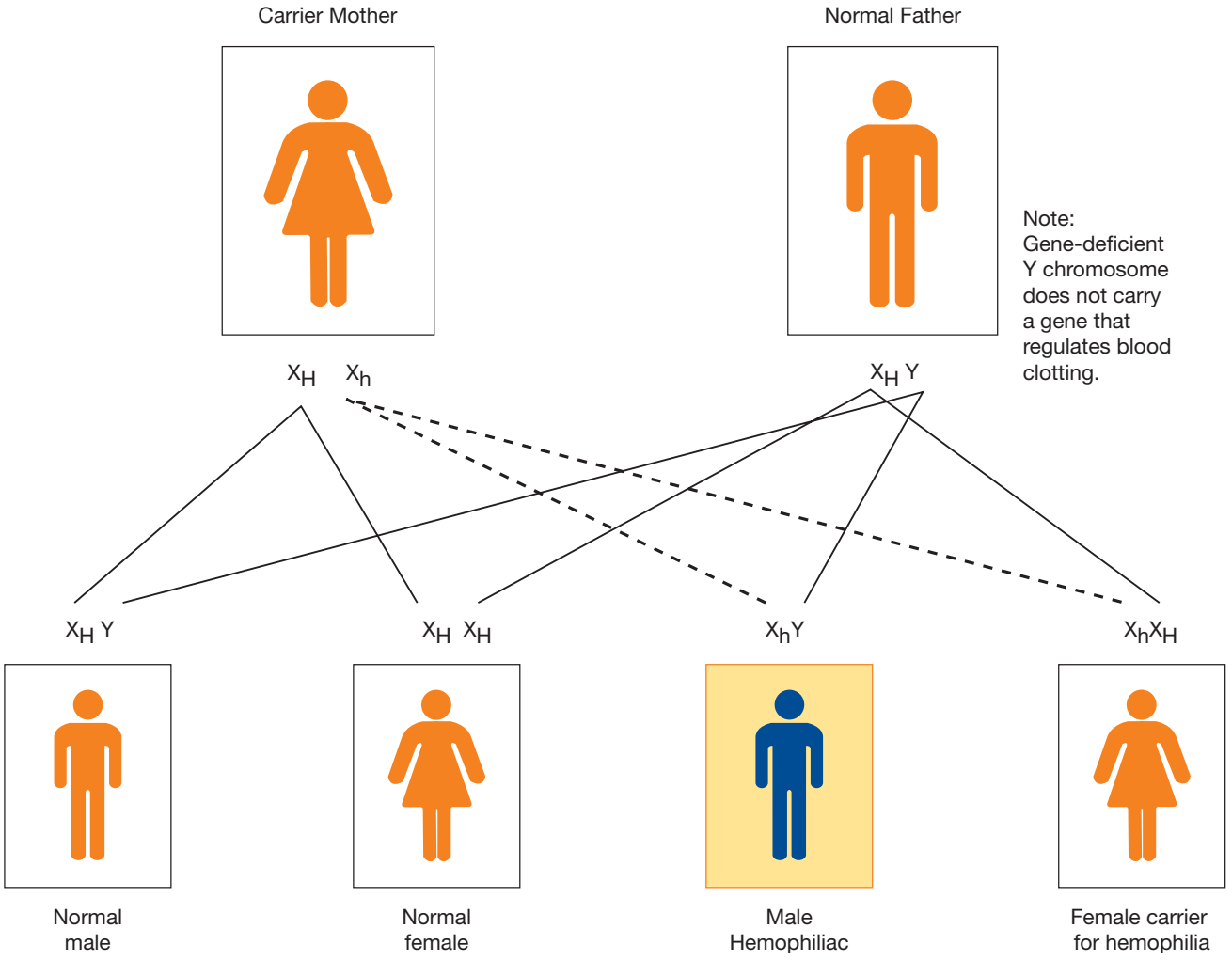
Epigenetics is a relatively new field of genetics investigating how the expression of genes is influenced by environmental factors such as individual experiences, diet, and other environmental factors. Most psychologists no longer view development processes as influenced exclusively by either nature (genes) or nurture (an individual's experiences). Rather, development occurs as a continual interaction between the environment and an individual's genetic makeup. The expression of particular genes depends on environmental input, and this results in individual differences in behavior and personality.

One of the earliest discoveries in behavioral epigenetics demonstrates this by showing that the type of mothering an infant rat received early in life determined how it responded to stressful events later. Rats that received less nurturing were more sensitive to stress than those receiving adequate nurturing during early development (Meaney & Szyf, 2005). Other studies with animals have demonstrated how maternal behavior during early development alters genes that control for variations in sexual behaviors in adults (Cameron et al., 2008). An environmental event, such as the type of maternal care an infant receives, alters the way genes express for a variety of traits as well as for patterns of neuronal growth and development (McGowan et al., 2011). Clearly this emerging field will have a significant impact on how we understand the processes occurring during human development.

Epigenetics A field of genetics that investigates how gene expression is influenced by a number of environmental events including experiences, diet, and environmental toxins

Figure 10-4 Sex-Linked Inheritance of Hemophilia

A female can carry a recessive gene for hemophilia (h), a blood clotting disorder, on one of her X chromosomes but not express the disease. A male, however, will express hemophilia if he inherits only one h gene from his mother, since the Y chromosome does not carry a gene that regulates blood clotting. The probability of a male inheriting this disease under these conditions is 0.50, or 50 percent.



10.3b Genetic Abnormalities

Perhaps the greatest hope of most expectant parents is that their baby will be born healthy and normal. Thankfully, the odds are very high, about 99 percent, that this wish will be granted. This statistic means that about 1 percent of all babies born each year in the United States have some gene defect or chromosomal abnormality that produces a major physical and/or mental handicap. Some of these defects are apparent at birth or shortly thereafter; others do not show up until later in life. About half of all spontaneous abortions are due to chromosomal abnormalities. The following paragraphs describe

some inherited abnormalities. These abnormalities range from harmless variations to severe clinical disorders.

Huntington's Disease A genetically transmitted disease that progressively destroys brain cells in adults, also known as Huntington's chorea

Huntington's Disease

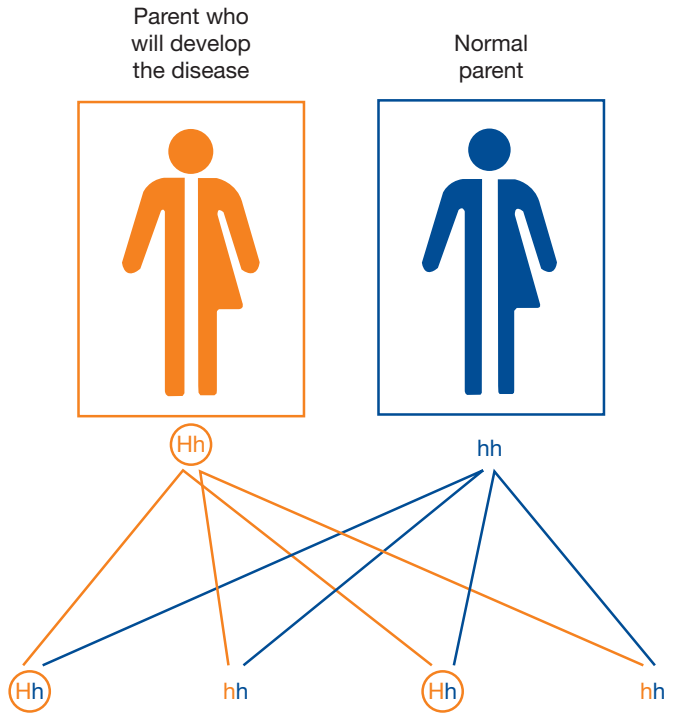
Huntington's disease, or Huntington's chorea, is one of the cruelest of all genetic diseases. Common symptoms include jerky, uncontrollable movements, loss of balance, intellectual impairment, and emotional disturbance (depression, irritability, etc.). Not uncommonly, the disease is confused with disorders such as Parkinson's disease, Alzheimer's disease, and schizophrenia.

A dominant gene that does not produce symptoms until a person is thirty-five to forty-five years old causes Huntington's disease. Unfortunately, by that age a person is likely to have already had children, unaware that each child has a 50 percent chance of inheriting the illness. (Figure 10-5 illustrates the genetic transmission of Huntington's disease.)

The National Huntington's Disease Association has reported that at least 25,000 Americans have the illness and that an additional 50,000 to 100,000 people may have inherited the disease but do not yet know that they have it. Until recently there was no

Figure 10-5 Genetic Transmission of Huntington's Disease

One parent who will eventually develop Huntington's disease (usually by age forty-five) has a single faulty gene (H) that dominates its normal counterpart (h). The probability that a child from this union will inherit Huntington's disease is 0.50, or 50 percent.



way to identify people who had inherited the gene until symptoms began to appear. However, in the early 1980s Harvard molecular biologist and geneticist James Gusella and his colleagues (1983) announced that they had located a genetic marker for Huntington's disease on chromosome 4. Subsequent research has confirmed that a gene mutation on this chromosome is responsible for the disease (Lanska, 2000). Presently, markers for Huntington's disease can be identified in the blood before symptoms appear, making early medical intervention more successful (Borovecki et al., 2005).

The rapid emergence of genetic tests for a variety of serious diseases has also raised serious ethical dilemmas for health practitioners. If a genetic test indicates that a child will develop a deadly illness that will result in a painful and/or premature death, should that child be told his or her fate? Should such a test even be performed? Genetic counselors who struggle with these issues note that many people at risk for a serious genetic disease do not want to know if they carry a life-ending defective gene, for fear that such depressing news will be a blight on whatever healthy years remain. However, what if these at-risk individuals choose to have children while electing to remain ignorant about their chances of passing a defect on to their offspring? Does society have the responsibility or right to take steps to ensure against this eventuality? What kinds of legal and ethical issues might be encountered by people who, in spite of being aware of their genetic flaws and the associated risks, opt to become parents? Should insurance companies be allowed to withhold medical insurance from people whose medical records reveal they carry a gene that one day will be a cause of major medical expenses?

The ethical dilemmas just described are only a sample of issues that medical ethicists, genetic researchers and other concerned professionals discuss and debate as they seek to deal with the social, ethical, and moral issues that accompany the emergence of amazing new genetic technologies. Researchers work to understand what the genes can tell about predicting and someday curing inherited diseases as geneticists, lawyers, and counselors grapple with the many ethical questions in an effort to help people take advantage of the genetic revolution without falling prey to its pitfalls.

Phenylketonuria

Phenylketonuria (**PKU**) is another potentially devastating genetic disease. A recessive gene causes PKU that, when present in a double dose, results in the absence of an enzyme necessary to metabolize the protein phenylalanine found in milk. A newborn with phenylketonuria cannot metabolize milk to form phenylalanine. Unmetabolized phenylalanine converts to phenylpyruvic acid. The consequence is an excessive accumulation of phenylpyruvic acid, which damages the baby's developing nervous system and can lead to intellectual disability and a variety of other disruptive symptoms.

Fortunately, a routine screening process can be used to test levels of phenylpyruvic acid shortly after birth. Infants who show high levels of phenylpyruvic acid test positive for PKU, and they can be placed on milk substitutes. They must remain on the diet for several years, until their brains have developed to the point the acid can no longer damage them.

There are many other examples of diseases caused by genetic defects. These include such conditions as *muscular dystrophy, cystic fibrosis, sickle-cell anemia* (a blood disorder that primarily affects black people), and *Tay-Sachs disease* (a disorder characterized by progressive degeneration of the central nervous system that occurs primarily in Jewish people of Eastern European origin). However, many inherited diseases are caused not by the transmission of faulty genes but rather by chromosomal abnormalities. One of the best-known conditions caused by chromosomal abnormalities is Down syndrome (previously called Down's syndrome).

Phenylketonuria (PKU)
Disease caused by a recessive gene that results in the absence of an enzyme necessary to metabolize the milk protein phenylalanine

Down Syndrome

Down syndrome is the most common chromosomal disorder. It is characterized by a distinctive physical appearance—short stature, small round head, flattened skull and nose, oval-shaped eyes with an extra fold of skin over the eyelid, a short neck, a protruding tongue, and sometimes webbed fingers or toes. People with this syndrome also demonstrate marked intellectual disability. Down syndrome children tend to be cheerful, affectionate, and sociable. Most are educable, and some acquire simple skills that allow them to earn an income and live independently in special environments.

(Shutterstock)

Down syndrome is the most common chromosomal disorder. It is characterized by a distinctive physical appearance and marked intellectual disability.

Down syndrome is an autosomal chromosome disorder in which the twenty-first chromosome (why it is also known as trisomy 21) pair has an additional chromosome attached to it. A person with Down syndrome thus has forty-seven chromosomes rather than the normal forty-six. While there is inconclusive evidence that a small percentage of Down syndrome cases may have a genetic basis, most if not all instances of this disorder are caused by a chromosomal accident (Hamamy, al-Hakkak, & al-Taha, 1990). Older women are at greater risk of bearing Down syndrome children, a fact that has led many researchers to attribute this disorder primarily to deterioration of the mother's ova with age. However, evidence suggests that the syndrome may also be caused by a defect in the father's sperm (Abroms & Bennett, 1981; Malan et al., 2006; Martin, 1987).

Several techniques for assessing fetal development and diagnosing birth defects like Down syndrome in utero have encouraged some couples with a history of genetic disease to conduct prenatal screening. If a woman and her physician have some reason to suspect that there may be fetal abnormalities, amniocentesis or another method of genetic analysis can help establish whether a problem exists. As Figure 10-6 illustrates, a needle is inserted through the woman's abdominal wall and into the uterus to draw a sample of the amniotic fluid (fluid surrounding the fetus). Fetal cells from the fluid are cultured for chromosome analysis, and the fluid is then tested. A variety of birth defects can be detected by this means. However, amniocentesis cannot detect all fetal abnormalities, and it is an invasive procedure requiring hospitalization. Other genetic screening tests are continually being developed and used.

Down Syndrome Chromosomal disorder characterized by marked mental retardation as well as distinctive physical traits including short stature, a flattened skull and nose, and an extra fold of skin over the eyelid (also known as trisomy 21 because it is caused by an extra [third] copy of the twenty-first chromosome)

10.4 Prenatal Development

The nine months, or approximately 266 days, of prenatal development take place in three stages: germinal, embryonic, and fetal. These stages of prenatal development are not to be confused with the customary convention of dividing pregnancy into three-month segments called *trimesters*.

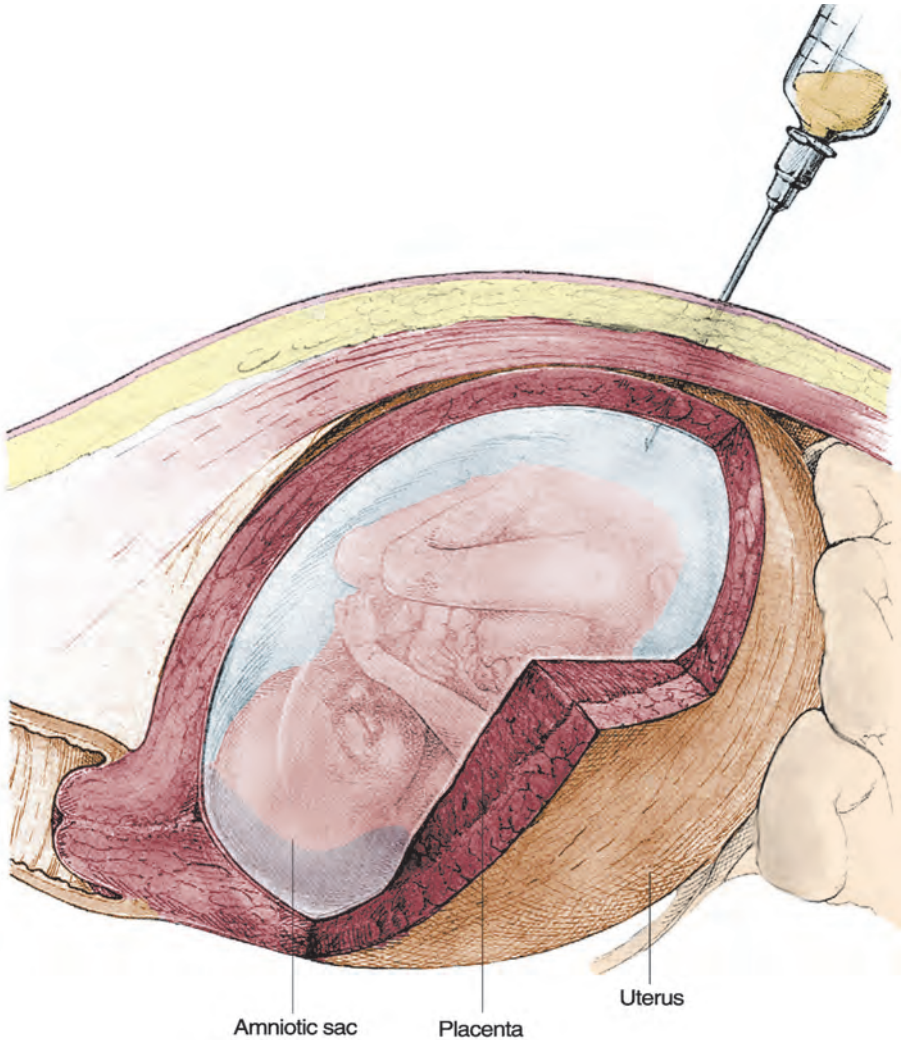
10.4a Germinal Stage

During the **germinal** or **zygote stage** (the first two weeks after fertilization), the zygote develops rapidly as it becomes attached to the walls of the uterus. By the end of

Germinal Stage First of three stages in prenatal development of a fetus, this stage spans the first two weeks after fertilization—also known as the zygote stage

Figure 10-6 Amniocentesis Procedure

This procedure consists of inserting a needle through the woman's abdominal wall into the uterine cavity to draw out a sample of amniotic fluid (fluid surrounding the fetus). Fetal cells from the fluid are cultured for chromosomal analysis.



the second week, various auxiliary structures—the amniotic sac, umbilical cord, and placenta—are well established, and the cell mass is called an embryo.

Embryonic Stage Second stage of prenatal development, lasting from the beginning of the third week to the end of the eighth week after fertilization, characterized by fast growth and differentiation of the major body systems as well as vital organs

10.4b Embryonic Stage

The second stage, the **embryonic stage**, lasts from the beginning of the third week to the end of the eighth. It is characterized by very fast growth and differentiation of the heart, lungs, pancreas, and other vital organs, as well as the major body systems. During this stage, the embryo is extremely vulnerable to negative environmental influences such as

faulty nutrition, drugs, or maternal disease. Because any of these environmental insults may have devastating, irreversible effects on the developing baby, the embryonic period is viewed as a critical stage of development. The vast majority of environmentally induced prenatal development defects, as well as most spontaneous abortions (miscarriages), occur during this period. By the end of the embryonic stage almost all of the baby's structures and organs are formed; a few organs, like the heart, are already functioning. By the end of eight weeks the baby, now called a **fetus**, has clearly discernible features and a prominent head.

(iStock)

The three stages of prenatal development that occur during the nine months of pregnancy are: germinal, embryonic, and fetal.

10.4c Fetal Stage

During the final **fetal stage**, which extends from the beginning of the third month to birth, bone and muscle tissue form, and the various organs and body systems continue to mature and develop. By the end of four months, external body parts—including fingernails, eyebrows, and eyelashes—are clearly formed. Fetal movement may be felt at this time. Future prenatal development consists primarily of growth in size and refinement of the features that already exist.

Throughout pregnancy, the fetus depends on the mother for nutrients, oxygen, and waste elimination as substances pass through the placenta and the umbilical cord to the fetus. Fetal and maternal bloods do not mix. Fetal blood circulates independently within the closed system of the fetus and inner part of the placenta; maternal blood flows in the uterine walls and outer part of the placenta. All exchanges between fetal and maternal blood systems take place as substances pass through the walls of the blood vessels.

10.4d The Effects of Alcohol and Drugs on Development

As we mentioned above, substances that can pass through the walls of the circulatory system can leave the mother's blood supply and enter the blood of the fetus. Many of the drugs discussed in Chapter 2 easily pass through capillary walls and other cell membranes, such as neurons. The reason some substances can pass through cell membranes and others cannot has to do with their ability to dissolve in cell membranes. This **lipid solubility** allows a substance to leave the blood supply and pass through other cell membranes. All drugs that affect the central nervous system are lipid soluble. That is, they can dissolve through capillary walls and enter other tissues, including neurons in the brain and tissues of a fetus. A number of lipid-soluble substances can have catastrophic effects on a developing fetus, particularly if they enter the fetal blood supply during **critical periods** of development. Because the brain of a fetus is undergoing rapid changes throughout pregnancy, it is particularly sensitive to chemical exposures. Any chemical that alters the course of normal development is considered to be a **teratogen**.

One of the most potent teratogens is alcohol. Alcohol consumed during pregnancy readily leaves the maternal blood supply and enters the blood, and ultimately all tissues of the developing fetus. Consequences of fetal exposure to alcohol depend on the phase

Fetus The developing infant after the embryonic stage up to the time of its birth (See also fetal stage of development.)

Fetal Stage Third and final stage of prenatal development, extending from the beginning of the third month to birth, during which bone and muscle tissue form and the organs and body systems continue to develop all fetal tissues

Lipid Solubility Substances that are lipid soluble can dissolve in a cell's membrane, making it possible to leave the blood supply and enter other cells including neurons in the brain or all fetal tissues

Critical Period A time during development when specific systems, structures, or abilities are most sensitive to external factors (these factors include specific stimuli and experiences as well as the chemical environment surrounding tissues)

Teratogen Any substance (drug or toxin) that alters the course of normal development of a fetus (the term *teratogen* means monster in Greek)

of pregnancy and which systems and structures are in their critical periods of development during exposure. Some of the symptoms of fetal alcohol exposure include stunted growth, facial abnormalities, brain damage, and severe cognitive disabilities (Drinking and Your Pregnancy, 2006). This pattern of symptoms is called **fetal alcohol syndrome**. It is estimated that nearly 16 percent of pregnant women ages fifteen to seventeen abuse alcohol, while only 13 percent of similar-aged nonpregnant women abuse it.

A number of other drugs can be teratogens as well, including nicotine, cocaine, methamphetamine, and even marijuana. All of these substances can cause developmental abnormalities and cognitive deficits—for example, low birth weight, premature birth, impaired movement, inattention, delayed language acquisition, and behavioral adjustment problems (Drinking and Your Pregnancy, 2006). Barry Lester at Brown University analyzed data from 1,618 mother-infant pairs, 84 of whom were exposed to methamphetamine. On average, the methamphetamine-exposed infants weighed about 10 percent less at birth than nonexposed infants. In addition, the meth-exposed infants showed greater lethargy, signs of physiological distress, and abnormal breathing. In general the meth-exposed infants were significantly distressed and developmentally delayed (Smith et al., 2008).

Exposure to a wide range of drugs and toxins can alter the course of fetal development. Even prescription drugs used to treat anxiety, depression, and other psychological disorders can have profound effects on fetal development. It is critical that pregnant women restrain from alcohol and illicit drug use throughout their pregnancies as well as throughout the duration of breast feeding. Women taking prescription medications should notify their prescribing physician as soon as they suspect they may be pregnant.

10.5 Physical Development

The period from *infancy* (birth to roughly the toddler stage) through *childhood* (toddlerhood to the onset of adolescence) is marked by many important developmental changes. The remainder of this chapter deals with various aspects of physical, cognitive, and psychosocial development that occur during the first twelve or thirteen years. We begin by discussing physical development, including development of the brain, physical growth, and motor development.

10.5a Development of the Brain

A newborn's brain has most, if not all, the neurons it will ever have. However, it is still far from mature. At birth, the brain is only about 350 grams (25 percent of its adult weight), and the complex neural networks that form the basis for our skills and memories are just beginning to form. Growth occurs rapidly: By six months, the brain is 50 percent of its adult weight; at two years, 75 percent; and at five years, 90 percent of its adult weight. At age ten, the figure is 95 percent. These figures stand in sharp contrast to the weight of the entire body, which at birth is only about 5 percent of adult weight and at ten years is only about 50 percent. During this period of rapid growth (and to a lesser extent in the years that follow), neural networks become increasingly complex as changes take place in the size, shape, and density of interconnections among neurons.

Fetal Alcohol Syndrome A pattern of physical, neurological, and cognitive abnormalities that result from fetal exposure to alcohol

The brain develops in an orderly fashion after birth. In the first few months, the primary motor area of the cerebral cortex develops rapidly as the infant progresses from involuntary reflexive activity to voluntary control over motor movements. The cortical

areas that control vision and hearing develop somewhat more slowly. By three months, however, these sensory areas, particularly those controlling visual perception, are more fully developed so that infants can reach out and touch objects they see. In the ensuing months, further development and refinement of sensory and motor capabilities are closely linked to changes in the brain and the rest of the nervous system.

(Shutterstock)

A newborn's brain has most of, if not all, the neurons it will ever need.

Recall from Chapter 2 that certain cognitive functions tend to be localized in one of the cerebral hemispheres. At one time it was believed that much of this hemispheric specialization, or localization of cortical functions, occurs gradually throughout childhood. Recent evidence suggests, however, that this specialization begins very early. One study demonstrated that most newborns are better able to process speech syllables in their left than right hemispheres. (Remember that verbal functions tend to be localized in the left hemispheres of most people.) By age three, nine out of ten children show this specialization for verbal processing. Left- or right-handedness also develops early, providing further evidence of hemispheric specialization during infancy.

Effects of Experiences on Brain Development

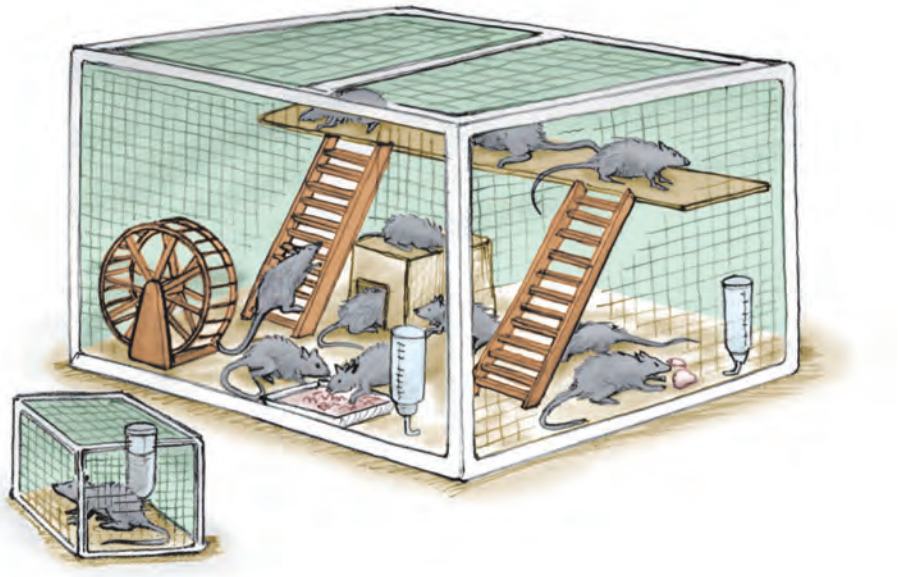
Do our early experiences influence the way our brains develop? Some experiments performed in the late 1960s indicate that they do. Mark Rosenzweig and his colleagues at the University of California, Berkeley, conducted a series of experiments to compare how being raised in enriched as opposed to impoverished environments affected rats (Rosenzweig, 1966). Some of the rats were reared in sterile, dimly lit, individual cages with solid side walls that prevented them from seeing or touching other animals; others were raised in a large cage with ten to twelve other rats and plenty of toys such as ladders, wheels, and boxes (see Figure 10-7).

The researchers were not originally looking for significant brain differences. Most psychologists, at the time, had not considered that experience might alter brain anatomy. However, Rosenzweig and his associates routinely recorded brain weights as part of their research, and as a result they made an important discovery: The brains of the rats reared in the enriched environments were heavier than those of rats raised in solitary confinement. These variations were most pronounced in the cerebral cortex, where the average weight difference was 4 percent. Rats raised in the impoverished, sterile environments tended to develop a lighter and thinner cortex, with smaller-than-normal neurons (Rosenzweig, Bennett, & Diamond, 1972).

Other evidence provided by researchers at the University of Illinois has supported these findings, linking enriched early experiences with expanded networks of dendrites in the precise areas of the brain where the experiences are processed (Greenough & Green, 1981). The increased number of dendrites seems to preserve newly established neural networks. More branches mean more and larger synapses, suggesting that greater amounts of information can be transmitted more efficiently in these animals' brains. We now believe these environmental differences contribute to epigenetic changes in genes controlling neuronal growth and development (Kiefer, 2007).

Figure 10-7 The Environment Has a Profound Effect on the Development of the Brain

Mark Rosenzweig and his colleagues found that rats reared in enriched environments developed larger brains with thicker cerebral cortexes than rats reared in impoverished environments.



Early experience seems to affect brain biochemistry as well as anatomy. In the enriched rats, Rosenzweig and his colleagues also found a significant increase in the activity of two enzymes, acetylcholinesterase and cholinesterase, both of which play an important role in the synaptic transmission of neural messages (Rosenzweig et al., 1972).

In both the Berkeley and University of Illinois studies, the anatomical and biochemical effects were not restricted to the earliest periods of development. Rats that were reared under normal laboratory conditions in their early days and then subjected to either impoverished or enriched environments showed similar weight and biochemical changes in their brains. Although the effects of environmental stimulation may be greater during early development, these findings indicate that the brains of rats, and possibly humans, are malleable throughout development.

Research during the past ten years has confirmed that some genetic blueprint waiting to be completed does not predetermine the development of the brain as development progresses. Rather, brain development, including the elaborate interconnections between neurons, depends upon neural stimulation. Even though infants are born with almost all of the 200 billion neurons they will ever have, the mass of their brain is only about one-fourth that of an adult. The brain becomes bigger not because more neurons develop but because the existing neurons get larger. Both the number of axons and dendrites, as well as the complexity of their connections, continue to increase. Contrary to popular belief, neuronal growth continues throughout adulthood and can be affected by both emotional stress and environmental enrichment. Stress, and the cascade of hormones associated with it, can reduce neuronal growth and turnover,

while environmental enrichment and exercise can increase it (Ekstrand, Hellsten, & Tingström, 2008). The term used to describe how modifiable the brain is, especially during early development, is **plasticity**. As we have seen, the brain is continually modified by developmental processes and environmental events.

How are neural connections increased? What is the mechanism that allows experience to rewire the brain? These questions are partially answered by the mechanism proposed by Donald Hebb many years ago, now referred to as *Hebbian synapses*. Hebbian synapses were described in considerable detail in Chapter 6 as a neural mechanism for memory. As you may recall, Hebbian synapses refer to long-term changes in synaptic connections that are dependent upon particular patterns of neuronal activity. In a sense, cells that fire together get wired together.

10.5b Physical Growth

Changes that take place in the brain are only part of the picture of what happens during development. Another significant change is physical growth. Children grow more rapidly during the first few years than at any other time. During the first six months, in fact, infants more than double their weight, and by their first birthday most infants have tripled their birth weight (the average newborn weighs 7 pounds) and increased their birth height by 50 percent. In the next two years, they gain another 8 inches and 10 pounds, on the average. After their third birthday, this early growth levels off somewhat to about 2 or 3 inches per year, until the adolescent growth spurt.

Both physical growth and motor development follow two basic patterns. The first pattern is **cephalocaudal** (that is, from head to foot); the second pattern is **proximodistal** (inner to outer). The cephalocaudal pattern of development occurs first and most rapidly in the head and upper body, which is why newborns have large heads. It is also why a one-year-old's brain weighs approximately two-thirds of its eventual adult weight while the rest of the body is a much smaller proportion of its adult size. The cephalocaudal principle also explains why babies can track things with their eyes before they can effectively move their trunks, and why they can do many things with their hands before they can use their legs. Because development is also proximodistal, infants gain control over the upper portions of their arms and legs, which are closer to the center of the body, before they can control their forearms and forelegs. Control of the hands, feet, fingers, and toes comes last.

Plasticity A term used to describe how modifiable the brain is, especially throughout development

Cephalocaudal Pattern of physical and motor development that is normal among humans, in which the head and upper portion of the body develop first and more rapidly

Proximodistal Pattern of development normal to humans in which infants gain control over areas that are closest to the center of their bodies (so that, for instance, control is gained over the upper arms before the fingers)

10.5c Motor Development

Another basic rule of development is that it proceeds from the simple to the more complex. This progression is particularly apparent in the acquisition of motor skills. The motor movements of young babies are dominated by a number of involuntary reflexes that offer either protection or help in securing nourishment. An example is the rooting reflex: When babies are stroked on the cheek, they turn their heads toward the sensation, vigorously "rooting" for a nipple. Other common reflexes are listed in Table 10-2. As development progresses, voluntary, cortically controlled movements begin to take over, and the primitive reflexes disappear according to the timetable shown. Some reflexes—such as coughing, sneezing, gagging, and the eye-blink—remain with us throughout our lives.

As the nervous system and muscles mature, more complicated motor movements and skills begin to emerge. There is wide variation in the ages at which babies are able to

Table 10-2 Primitive Reflexes in Human Infants

Name of Reflex	Stimulation	Behavior	Age of Dropping Out
Rooting	Cheek stroked with finger or nipple	Head turns, mouth opens, sucking movement begins	9 months
Moro (startle)	Sudden stimulus such as a loud noise or being dropped	Extends legs, arms, and fingers, arches back, draws back head	3 months
Darwinian (grasping)	Palm of hand stroked	Makes such a strong fist that the baby can be raised to standing position if both fists are closed around a stick	2 months
Swimming	Put in water facedown	Well-coordinated swimming movements	6 months
Tonic neck	Laid down on back	Turns head to one side, assumes "fencer" position, extends arms and legs on preferred side, flexes opposite limbs	6 months
Babinski	Sole of foot stroked	Toes fan out, foot twists in	6–9 months
Walking	Held under arm, with bare feet touching flat surface	Makes steplike motions that look like well-coordinated walking	2 months
Placing	Backs of feet drawn against edge of flat surface	Withdraws foot	1 month

roll over, sit without support, stand, and walk, but the sequence of these developments is universal.

Can different environmental experiences influence the rate at which we acquire motor skills? A number of studies have explored this question, and within a normal range of experiences, the answer seems to be no. As long as children are well fed, healthy, and free to initiate motor skills when they are ready, the role of environmental influences on motor development is quite limited. For example, regardless of the amount of training or encouragement children receive, they will not walk until the cerebellum has matured enough to create a readiness for walking, an event that occurs at about age one.

In certain Native American cultures, infants are wrapped in swaddling clothes and bound to cradleboards during most of their waking hours for the first twelve or more months of their lives. We have just seen that children will not walk until they reach a certain level of biological readiness. Is the converse true? Will children begin to walk when their biological clocks reach a certain point, even if they have not had earlier opportunities to crawl and otherwise move about on their own? Make a reasoned prediction before reading on.

In the discussion of maturation earlier in this chapter (see "10.1a. Heredity and Environment"), we noted that certain biologically determined sequences occur even if children do not receive encouragement. As we have noted, studies have shown that babies who have been virtually immobilized on cradleboards during their first year typically begin to walk at about the same age as infants from other cultures who are free to practice sitting, crawling, and pulling themselves up on furniture. This finding does not mean that the environment has no influence at all. Babies who spend most of

their first year of life lying in a crib develop abnormally slowly. Other studies of children raised with insufficient love, stimulation, or proper nutrition often show profound physical and intellectual disability.

If early training does not significantly accelerate the rate at which children master motor skills such as standing or walking, does the same rule apply to other physical skills such as bowel and bladder control? A classic early study assessed the effect of differential toilet training on twin boys. One was placed on a toilet once on the hour every day from two months of age, while the other did not begin training until age twenty-three months. The first twin did not demonstrate any control until twenty months, but by twenty-three months he had mastered bladder and bowel control. The other twin, with no prior training, caught up in short order as soon as training began (McGraw, 1940).

Later research has generally confirmed this finding, but at a later age. It is now widely recognized that no amount of encouragement, reinforcement, punishment, or pleading will induce successful toilet training until the necessary muscular and neurological maturation has occurred. Typically girls learn this skill slightly before boys (thirty-two versus thirty-five months). Unfortunately, toilet training is often begun long before an infant can voluntarily control the sphincter muscles in order to retain waste. While an early start does not hasten toilet training, it may result in emotional strain, particularly if parents put too much pressure on a child (Schum et al., 2002).

Most infants begin to walk, climb on furniture, and climb stairs between their fourteenth and eighteenth months. This is largely determined by the development of the cerebellum, which is involved in motor learning, maintaining posture, and muscle coordination.

Although the milestones are no longer so dramatic, motor development continues beyond infancy and early childhood. Parents are sometimes amazed to realize one day that the awkward child they observed banging around the house has been transformed into a coordinated athlete who performs with distinction.

10.6 Cognitive Development

Cognitive development refers to the development of various behaviors such as perceiving, remembering, reasoning, and problem solving. When do children begin to remember? How do they categorize experiences? When can they see things from another's perspective, reason logically, and think symbolically? Most efforts to answer such questions lead inevitably to the writings of the late Swiss psychologist Jean Piaget.

10.6a Piaget's Theory of Cognitive Development

No one has provided more insights into cognitive development than Jean Piaget (1970, 1972). In the early 1920s, Piaget became interested in how children think while he was working with Alfred Binet in Paris on standardizing children's intelligence tests. At first, his goal was to find certain questions that the average child of a specific age could answer correctly. However, Piaget soon became intrigued with another finding: The mistakes made by many children of the same age were often strikingly similar (and strikingly different from those made by children of other ages). It occurred to Piaget that children's cognitive strategies are age-related and that the way children think about things changes with age, regardless of the specific nature of what they are thinking about. These observations led Piaget to refocus his research. From this point until his

death in 1980, he devoted his efforts to understanding how cognitive abilities develop. Piaget's theory gradually evolved from years of carefully observing and questioning individual children, including his own three offspring. The following paragraphs provide an overview of his major themes.

Schemas

According to Piaget, the impetus behind human intellectual development is an urge to make sense out of our world. To accomplish this goal, he theorized, our maturing brains form "mental" structures or **schemas** that assimilate and organize processed information. These schemas guide future behavior while providing a framework for making sense out of new information.

Newborns are equipped with only primitive schemas that guide certain basic sensorimotor sequences such as sucking, looking, and grasping. According to Piaget, these early schemas become activated only when certain objects are present—for example, things that can be looked at, grasped, or sucked. However, as an infant evolves into a child and later an adult, these schemas become increasingly complex, often substituting symbolic representations for objects that are physically present (Piaget, 1977).

By the time we reach adulthood, our brains are filled with countless schemas, or ways of organizing information, that range from our knowledge of how to play a tune to the fantasies we concoct when we are bored. To Piaget, cognitive growth involves a constant process of modifying and adapting our schemas to account for new experiences. This adaptation takes place through two processes: assimilation and accommodation.

Assimilation and Accommodation

Assimilation is the process by which we interpret new information in accordance with our existing knowledge or schemas. In this ongoing process, we may find it necessary to modify the information we assimilate in order to fit it into our existing schemas. At the same time, however, we adjust or restructure what we already know so that new information can fit in better—a process Piaget called **accommodation**.

Schemas In reference to memory, conceptual frameworks that individuals use to make sense out of stored information: in Piaget's theory, the mental structures we form to assimilate and organize processed information

Assimilation In Piaget's theory, the process by which individuals interpret new information in accordance with existing knowledge or schemas

Accommodation In vision, the focusing process in which the lens adjusts its shape, depending on the distance between the eye and the object viewed, in order to project a clear image consistently onto the retina; in Piaget's theory, the process of adjusting existing knowledge so that new information can fit more readily

For instance, an infant who is accustomed to taking nourishment from the breast uses a simple "suck and swallow" schema to guide this basic sensorimotor sequence. When switched from the breast to the bottle, the infant assimilates this new experience into the existing schema and continues to suck and swallow. What happens when the parents introduce a notable variation by filling the formula bottle with apple juice instead of milk? The baby's initial reaction may be to spit out the strange new substance. With time, the infant may come to like apple juice but dislike other types of juice. Basically, the infant has accommodated the new information by modifying the suck and swallow schema to one of "suck, taste, and swallow (maybe)."

Piaget believed that we learn to understand our world as we constantly adapt and modify our mental structures through assimilation and accommodation. As we develop, assimilation allows us to maintain important connections with the past while accommodation helps us to adapt and change as we gain new experiences.

Four Stages of Cognitive Development

Piaget viewed cognitive growth as a four-stage process with qualitatively different kinds of thinking occurring in each of these stages. Although all people progress through these stages in the same sequence, Piaget noted that the speed of this progression might

Table 10-3 Piaget's Four Stages of Cognitive Development

Cognitive Developmental Stage	Approximate Age	General Characteristics
Sensorimotor	Birth to about 24 months	Infants experience their world primarily by sensing and doing. They learn by their actions, which gradually evolve from reflexes to more purposeful behaviors. Cognitive growth marked by improving ability to imitate behavior and gradual development of object permanence.
Preoperational	2–7 years	The child begins to acquire the ability to use symbols to represent people, objects, and events. However, the child cannot reason logically, and thought tends to be limited by the inability to take into account more than one perceptual factor at the same time and to perceive the world from any perspective other than one's own.
Concrete operations	7–12 years	The child makes a major transition in cognitive development by shifting from a single-dimensional emphasis on perception to a greater reliance on logical thinking about concrete events. During this stage children master the principle of conservation.
Formal operations	12 years and older	Abstract reasoning emerges during this stage. Teenagers acquire the ability to make complex deductions and solve problems by systematically testing hypothetical solutions.

vary from person to person. Table 10-3 outlines these four stages: sensorimotor, preoperational, concrete operations, and formal operations.

Sensorimotor Stage (Birth to About Twenty-four Months)

During the **sensorimotor stage**, infants learn about their worlds primarily through their senses and actions. Instead of thinking about what is going on around them, infants discover by sensing (sensori-) and doing (motor). They learn by their actions, which gradually evolve from reflexes to more purposeful behaviors. For example, an infant might learn that shaking a rattle produces a sound or that crying at night produces parents. Thus, some of the schemas that develop during this stage are organized around the principle of causality, as the infant begins to perform cognitively organized goal-directed behaviors.

Another key aspect of the sensorimotor stage is the gradual development of **object permanence**—the realization that objects (or people) continue to exist even when they are not immediately in view. Up to about the age of four months, an object ceases to exist for the infant when it is out of sight. After about four months, babies begin to look for objects they no longer see, and sometime between eight and twelve months they begin to retrieve objects they see being hidden manually. By age two, most children are able to incorporate into their schemas symbolic representations of objects that are clearly independent of their perception of these articles. At this point in development, toddlers gleefully and systematically search all kinds of possible hiding places for objects they have not seen hidden. Research by University of Illinois psychologist Rene Baillargeon (1987) revealed that object permanence in infants might occur as early as age two and a half months (Aguiar & Baillargeon, 2002; Baillargeon, 2008; Wang, Baillargeon, & Paterson, 2005).

During this stage infants are also capable of understanding numbers. In a series of experiments, psychologist Karen Wynn has demonstrated that children as young

Sensorimotor Stage In Piaget's theory, the period of development between birth and about age two during which infants learn about their worlds primarily through their senses and actions

Object Permanence Realization that objects continue to exist even when they are not in view (Piaget sees this awareness as a key achievement of the sensorimotor stage of development.)

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As children reach age two and beyond, they master object permanence, and can think representatively using symbols rather than depending on what they see or touch.

as nine months can understand both addition and subtraction of a large number of objects and areas (McCrink & Wynn, 2004). In addition, nine-month-old infants demonstrate *operational momentum*—a tendency to overestimate the outcome of addition and underestimate the outcome of subtraction. In a clever experiment, Wynn and her colleagues showed infants short videos of events involving either the addition or subtraction of objects. Each event type had several outcomes. The outcomes were numerically correct, too small, or too large. Infants gazed longer at the outcomes that violated operational momentum than either of the other outcomes, suggesting an early disposition to operational momentum (McCrink & Wynn, 2009).

Another important cognitive skill of the sensorimotor stage is imitation. Even a tiny baby may try to imitate the facial expression of an older person. Under controlled laboratory conditions, researchers have found that attempts at imitation are clearly present even among newborns seven to seventy-two hours old (Meltzoff & Moore, 1983). For example, when an experimenter stuck his tongue out at a newborn, the infant responded in kind. This cognitive skill continues to be refined, and by the end of the sensorimotor period children imitate all kinds of behaviors (Anisfeld, 2005).

Preoperational Stage (Ages Two to Seven)

As children move beyond their second birthday, they increasingly use symbolic thought. Having mastered object permanence, they are now ready to think representatively, using symbols rather than depending on what they see or touch. The ability to use words to represent people, objects, and events allows children to make giant steps in cognitive development. Imagination becomes important as children's play activities become increasingly focused on make-believe. Three- and four-year-olds can now imitate another person's behavior after a lapse of time—a qualitative change from the immediate imitation that took place during the sensorimotor stage. The use of language, imaginative play, and delayed imitation all demonstrate an increasing sophistication.

Preoperational Stage According to Piaget, the second major stage of cognitive development—ages two to seven (Preoperational children can develop only limited concepts, and they are unable to evaluate simultaneously more than one physical dimension.)

Despite these advances, however, preoperational thought remains somewhat limited, for it depends largely on how things appear or seem to be. Children at this stage have yet to master logical reasoning processes based on rules and concepts, which is why Piaget used the term **preoperational stage**: Young children are able to develop only immature concepts, or *preconcepts*, in their effort to understand the world. For example, an adult has no problem distinguishing between a sports car and a sedan, or a new versus an old car. However, a small child has only an ill-defined, immature concept of a car—something that has wheels and doors and goes *"vroooom."*

Centration Inability to take into account more than one perceptual factor at a time (In Piaget's theory of cognitive development, centration is characteristic of the preoperational stage of development.)

Another limitation of preoperational thought is apparent in the phenomenon of **centration**—the inability to take into account more than one perceptual factor at the same time. (The ability to evaluate two or more physical dimensions simultaneously, a process called **decentration**, does not emerge until the end of the preoperational period.)

Decentration Ability to evaluate two or more physical dimensions simultaneously

Piaget demonstrated centration and decentration in a simple experiment. When he poured equal amounts of liquid into two identical glasses, five-, six-, and seven-year-old children all reported that the glasses contained equal amounts. However, when the liquid from one glass was poured into a taller, narrower glass, the children had different opinions about which of the two glasses contained the most liquid. The

five- and six-year-olds knew that it was the same liquid, but they were unable to generalize beyond the central perceptual factor of greater height, which normally indicates "more." Thus, they indicated that the tall glass had more juice. In contrast, the seven-year-olds generally reported there was no difference, a fact they knew to be true since they were able to decentrate, or simultaneously take into account the two physical dimensions of height and width.

The ability to decentrate enables children to master **conservation**, the understanding that changing something's form does not necessarily change its essential character. Research conducted by Piaget and others has demonstrated that children do not understand the principle of conservation until the concrete-operations stage of cognitive development.

Piaget also stressed the egocentric nature of preoperational thinking. **Egocentrism** does not imply selfishness but rather the inability to perceive the world from any perspective other than one's own. In essence, Piaget said that preoperational children view life as though everyone else were looking at it from their perspective.

Piaget's conclusions about the degree of egocentric thinking in young children have not gone unchallenged. Did his young subjects perform poorly because their thinking was egocentric or because the problem was too difficult? Some later studies have shown that even three- and four-year-olds can successfully manipulate movable versions of simple scenes to show another's view (Borke, 1975). Researchers have also noted that four-year-olds seem to understand that two-year-olds perceive things differently, since they change their way of speaking when conversing with toddlers (Shatz & Gelman, 1973).

Although preoperational children are not necessarily incapable of viewing things from the perspectives of others, it is generally agreed that young children tend to be egocentric, as Piaget suggested. This explains why children, who see themselves as central to all events in their world, often view themselves as causing certain outcomes. For example, young children of divorcing parents may think that they are the cause of the estrangement. Needless to say, children in such highly vulnerable situations may require a great deal of assurance that they are not the cause of calamitous events such as divorce.

During the preoperational stage, infants begin to demonstrate an understanding that others have intentions, beliefs, and minds of their own (Kovács, Téglás, & Endress, 2010; Senju, Southgate, Snape, Leonard, & Csibra, 2011; Scott, He, Baillargeon, & Cummins, 2012). This **theory of mind** is demonstrated when a child begins to anticipate another's actions, show empathy, and understand what makes another happy or angry.

Conservation The understanding that changing the form of an object does not necessarily change its essential character (Conservation is a key to achievement in Piaget's theory of cognitive development.)

Egocentrism The tendency of young children to view the world as being centered around themselves

Theory of Mind The ability to attribute beliefs, desires, knowledge, and emotions to others

Concrete Operations Stage (Ages Seven to Twelve)

Between the ages seven and twelve, children again make a qualitative leap as they learn to engage in decentration and to shed their egocentrism. Whereas intuitive thinking and a dependence on imagination and the senses characterize the preoperational stage, children in the **concrete operations stage** begin to use *logical operations* or rules. This shift from a single-dimensional emphasis on perception to a greater reliance on logic is a major transition in cognitive development.

As we saw earlier, Piaget viewed mastery of the concept of conservation as a milestone of the concrete operations stage. Children master different aspects of conservation at various times during the concrete operations stage. For example, a child who understands conservation of substance will realize that a ball of clay rolled into the shape of a hot dog still has the same amount of clay. However, when the same child sees two identical clay balls weighed on a balance scale, and then watches as one of the balls is rolled into a hot dog shape, a strange thing may happen. Although the child understands conservation of substance, he or she may not yet understand the more abstract principle

Concrete Operations Stage Third stage of cognitive development in Piaget's theory (ages seven through twelve), during which children begin to use logical mental operations or rules, mastering the concept of conservation

Formal Operations Stage Fourth and final stage in Piaget's theory of cognitive development (ages twelve and older), during which individuals acquire the ability to make complex deductions and solve problems by systematically testing hypotheses

of conservation of weight—and thus does not realize the hot dog and ball will weigh the same. By the end of the concrete operations stage, children typically master all of the various dimensions of conservation: substance, length, number, weight, and volume.

Throughout this stage, thinking is still somewhat restricted by a tendency to limit the use of logical operations to concrete situations and objects in the visible world. For example, if you played the game Twenty Questions with an eight-year-old, the child would be likely to stick with concrete questions that, if correct, would solve the problem ("Is it a carrot?" "Is it a rabbit?"). In contrast, older children in the final stage of cognitive development might approach the problem more abstractly, asking general questions such as "Is it a vegetable?" or "Is it an animal?" before making specific guesses.

In the concrete operations stage, children are not yet able to deal with completely hypothetical problems of a "what if" nature in which they must compare what they know to be true with what may be true. For instance, if you ask concrete operational children what it would be like if people could fly, their answers would probably reflect what they have actually seen (in cartoons and movies as well as in real life) rather than total abstractions. Thus, you might be told that people would look funny with wings or that people cannot fly. In contrast, older children are more able to imagine things beyond their own experiences. Thus, a teenager might tell you that if people could fly, department stores would no longer need elevators, or that no one would need to take drugs to "get high."

Formal Operations Stage (Age Twelve and Older)

In the **formal operations stage**, individuals acquire the ability to make complex deductions and solve problems by systematically testing hypothetical solutions. Adolescents can now think about abstract problems. For example, younger children in the concrete operations stage would indignantly reject the syllogism, "People are faster than horses, and horses are faster than cars; therefore people are faster than cars" because it runs counter to concrete, observable facts: They know cars are faster than humans. In contrast, adolescents in the formal operations stage are able to evaluate the logic of this syllogism separately from its content.

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The use of logical operations or rules can be demonstrated in a game of logic such as chess.

Although Piaget originally believed that the formal operations stage almost always begins at about age twelve, he later revised this position to allow for a variety of situations that could either postpone or prevent the arrival of this stage. Piaget did maintain that once children enter the stage of formal operations, there are no longer any qualitative differences between their thought processes and those of older teenagers or adults. Any further advances in cognitive functions are merely refinements in the ability to think logically and reason abstractly.

This stage of cognitive development is marked by the emergence of the capacity to manipulate object representations, when they are not physically present, and by the ability to engage in deductive reasoning. Deductive reasoning requires manipulations of complex thoughts and concepts. Piaget devised the pendulum problem to illustrate deductive reasoning in the formal operations stage. An adolescent is shown a pendulum consisting of an object suspended from a string. The adolescent is then shown how to manipulate four variables: the length of the string, the weight of the suspended object, the height in the pendulum arc from which the object is released, and the force with which the object is

pushed. Then the adolescent is instructed to determine which of these factors, singly or in combination, influences how fast the object swings.

Piaget discovered that typical seven- or eight-year-olds try to solve the problem by physically manipulating the four variables in a random fashion. For instance, they might release a light weight from high in the arc, and then release a heavy weight from a low point in the arc. Because they did not test each variable systematically, these younger children often arrived at erroneous conclusions (and then insisted that their answers were correct!). At age ten or eleven, children are more systematic in their approach, but they still lack the capacity to engage in careful hypothesis testing and deductive logic.

By adolescence, perhaps as early as age twelve, children's strategies change radically. Now they systematically keep one variable constant while manipulating the others. In this fashion, they can deduce that only one factor (the length of the string) determines how fast the pendulum swings. Adolescents also tend to work out a plan or strategy for approaching the pendulum problem before commencing their tests. The ability to think a problem through before actually performing any concrete physical manipulations represents a major qualitative change in cognitive functioning (see Table 10-3).

Evaluation of Piaget's Theory

Piaget's theory of cognitive development has been criticized for placing too much emphasis on the maturation of biologically based cognitive structures while understating the importance of an infant's social and cultural environment on their experience throughout development.

He has also been criticized for ignoring individual differences in his attempt to portray developmental norms. Despite these criticisms, however, his theory has had a profound impact on developmental psychology and on educational procedures in the Western world. Its basic tenets have been repeatedly tested and largely supported. Particularly noteworthy is recent research revealing that the occurrence of growth spurts in the development of human cerebral hemispheres tends to overlap with the timing of the major developmental stages described by Piaget. These findings add credibility to Piaget's assertion that biological maturation and cognitive development are closely associated. In conclusion, we can say that Piaget's theory has provided immense insights into understanding the development of thought, stimulating more research than any other developmental theory and providing the impetus for many valuable changes in both education and childcare.

10.7 Psychosocial Development

Children's physical and cognitive growth is accompanied by psychosocial development—changes in the way they think, feel, and relate to their world and the people in it. This section first describes two areas of psychosocial development: the establishment of attachment and the impact of parenting styles. It then concludes with Erik Erikson's theory of psychosocial development.

10.7a Attachment

You may have observed babies at the age of seven or eight months and up to eighteen months who are content as long as a parent is nearby, but who cry virtually inconsolably

if the parent leaves the room. Many a babysitter has spent frustrating hours cuddling, bouncing, and singing to a baby who refuses to take comfort from anyone but the real thing—Mom or Dad.

Such experiences demonstrate one of the earliest and most profound aspects of early psychosocial development: **attachment**. Attachment is the term applied to the intense emotional tie that develops between two individuals, in this case an infant and a parent. Attachment has clear survival value in that it motivates infants to remain close to their parents or other caregivers who protect them from danger. Infants may establish intense, affectionate, reciprocal relationships with their parents, older siblings, grandparents, or any other consistent caregiver. However, the most intense attachment relationship that typically occurs in the early stages of development is between mother and child, and most of the available longitudinal research has focused on the development of this bond and its effects throughout one's lifespan.

Attachment develops according to a typical sequence (Ainsworth, 1963, 1981; Bowlby, 1980; Schachere, 1990). During the first few months, babies exhibit **indiscriminate attachment**. Social behaviors such as smiling, nestling, and gurgling are typically directed to just about anyone. This pattern continues for about six to seven months until babies begin to develop selective, **specific attachments**. At this time, they often show increased responsiveness to their parents or other regular caregivers by smiling more, holding out their arms to be picked up, and vocalizing more than to other people. This specific attachment is likely to become so strong that infants will show great distress when separated from their parents. When strangers attempt to offer solace, their overtures may be merely tolerated or perhaps overtly rejected.

Fortunately for the countless babysitters, grandparents, and friends who are distressed to be rejected, most infants progress to a third stage of **separate attachments** by about twelve to eighteen months. During this stage infants take an active social interest in people other than their mothers or fathers. Fear of strangers also typically diminishes during this period.

Attachment Intense emotional ties between two individuals, such as an infant and a parent

Indiscriminate Attachment Attachment typically displayed by human infants during the first few months, when social behaviors are directed to virtually anyone

Specific Attachment Highly selective attachment often displayed by human infants sometime between six and eighteen months, when increased responsiveness is displayed toward primary caregivers and distress may be displayed when separated from parents

Separate Attachment Attachment typically displayed by infants by about twelve to eighteen months, when fear of strangers diminishes and interest in people other than primary caregivers develops

How Attachment Develops

How do babies form attachments to primary caregivers? A number of early developmental theorists believed that feeding was the key ingredient in the development of attachment. Because the mother provides nourishment, so the reasoning went, the baby learns to associate the mother with a sense of well-being and consequently wants her to remain close at hand. The popularity of this idea persisted until Harry Harlow and his associates released a series of landmark studies (Harlow & Zimmerman, 1958; H. Harlow & M. Harlow, 1966; H. Harlow, M. Harlow, & Suomi, 1971).

Harlow's research began as the study of learning abilities in rhesus monkeys. To eliminate the possible variable input of early experiences, he separated baby monkeys from their mothers shortly after birth and raised them in individual cages that were equipped with soft blankets. Unexpectedly, the monkeys became intensely attached to the blankets, showing extreme distress when they were removed for laundering. The behavior was comparable to that of baby monkeys when they are separated from their mothers.

Harlow and his colleagues were intrigued, for this finding contradicted the notion that attachment develops through feeding. The researchers decided to conduct some experiments to find out whether contact comfort is more important than food in developing attachment. They separated infant monkeys from their mothers, rearing them in cages containing two artificial "mothers." One was made of a wire mesh cylinder; the

other was a similar wire cylinder wrapped with foam rubber and covered with terry cloth to which the infant could cling. A bottle could be attached to either artificial mother so that it could serve as the monkey's source of food.

If attachment were linked to feeding, we would expect the monkeys to form attachments consistently with the "mother" hooked up to the bottle. However, this anticipated outcome was not what happened. Monkeys who were reared with a nourishing wire mother and a nonnourishing cloth mother clearly preferred the latter, spending much more time clinging to their contact-comfort mother. Even while they were obtaining nourishment from the wire mother, the monkeys often maintained simultaneous contact with the cloth. The cloth mother also provided the baby monkeys with a secure base for exploring new situations. When novel stimuli were introduced, the babies would gradually venture away from their cloth mothers to explore, often returning to home base before exploring further. When a fear stimulus (such as a toy bear beating loudly on a drum) was introduced, the frightened infants would rush to their cloth mothers for security. If their cloth mothers were absent, the babies would freeze into immobility or cry and dash aimlessly around the cage.

(Courtesy of Harlow Primate Laboratory)

Harry Harlow raised monkeys with two mothers—one made of wire and the other of cloth. The infant monkeys preferred to be near the cloth figure over the wire figure, even though they received milk from the wire figure.

The researchers concluded that the satisfaction of contact comfort was more important in establishing attachment than the gratification of being fed. When other qualities were added to the cloth mother, such as warmth, mechanical rocking, and feeding, the bonding was even more intense. Clearly, a strong parallel exists between this artificial situation and what often occurs when human infants have contact with the warm bodies of parents who cuddle, rock, and feed them. Harlow's demonstration that attachment does not depend on feeding should be reassuring to fathers of breast-fed babies.

Effects of Attachment Deprivation

Although Harlow's experiments were aimed at determining whether or not food was the crucial element in forming attachments, they also provided some valuable information about emotional and social development. One particularly interesting finding has to do with the long-term effects of being raised without a real mother.

The young monkeys in Harlow's experiments seemed to develop normally at first. However, a different picture emerged when the females reached sexual maturity. Despite elaborate efforts to create ideal mating circumstances, most of them rejected the advances of male monkeys; only four out of eighteen females conceived as a result of natural insemination (many more were artificially inseminated). Most of these unmothered mothers rejected their young; some were merely indifferent, while others pushed their babies away. In spite of this rejection, the babies persisted in their attempts to establish a bond with their mothers (and in some situations, they actually succeeded). In subsequent pregnancies, these deprived mothers became more adept at nurturing their offspring.

How does this finding relate to human behavior? Do human infants deprived of attachment with nurturing caregivers develop in a similar way, and if so, are the emotional scars permanent? Up until the 1970s, most developmental psychologists were inclined to

answer "yes" to both of these questions, citing numerous studies of infants raised from birth in orphanages (Bowlby, 1965; Ribble, 1943; Spitz, 1945). These studies found that orphanage children who were provided adequate physical care and nutrition but were deprived of close nurturing relationships with adult caregivers often developed problems such as physical diseases of unknown origin, impaired physical and motor development, and impaired emotional and social development. In one study of ninety-one orphanage infants in the United States and Canada, more than one-third died before reaching their first birthday, despite good nutrition and medical care (Spitz & Wolf, 1946).

These studies clearly demonstrate that an early lack of nurturance can have devastating effects. More recent evidence, however, adds some significant corollaries. Several studies conducted in the 1970s indicate that damage associated with emotional and social deprivation in early infancy can be overcome if the child later receives plenty of loving nurturance (Clarke & Clarke, 1976). Furthermore, as we saw earlier, Harlow found that he could reverse, or at least moderate, the effects of early environmental impoverishment by providing deprived monkeys with extensive contact with "therapist monkeys" (Novak & Harlow, 1975).

One of the most impressive indications that there is hope for babies deprived of early bonding was provided by evidence collected by Harvard University's Jerome Kagan and his associates. This research team studied a Guatemalan Indian society in which infants routinely spend the first year of their lives confined to small, windowless huts. (Their parents believe that sunlight and fresh air are harmful to babies.) Since the parents are occupied with subsistence tasks, they rarely cuddle, play with, or talk to their babies. The infants are listless, unresponsive, and intellectually impaired, as judged by standards of normal development. However, when they emerge from the dark huts shortly after their first birthdays, they rapidly evolve into youngsters who play, laugh, explore, and become attached just like youngsters who have not been similarly deprived (Kagan & Klein, 1973).

(Getty Images)

The relationship between mother and child is the most intense attachment relationship that typically occurs in the early stages of development.

We do not mean to suggest that the effects of early deprivation are always transitory. There is a big difference between being raised from infancy to childhood in a sterile orphanage environment and receiving loving care at age six months, one year, or two years. It is also important to note that all infants who do establish early attachments do not necessarily express this bonding in the same manner. As the following discussion points out, some attachments are more secure than others.

Secure and Insecure Attachments

In the effort to find out more about infants' attachments, developmental psychologist Mary Ainsworth (1979) used a laboratory procedure that she labeled the "strange situation." In this procedure, a one-year-old infant's behavior in an unfamiliar environment is assessed under various circumstances—with the mother present, with the mother and a stranger present, with only a stranger present, and totally alone.

Ainsworth discovered that infants react differently to these strange situations. Some, whom she labeled *securely attached*, would use their mothers as a safe base for happily exploring the

new environment and playing with the toys in the room. When separated from their mothers, they expressed moderate distress, and when reunited, they would seek contact and subsequently stay closer to their mothers. *Insecurely attached* infants reacted differently. They showed more apprehension and fewer tendencies to leave their mothers' sides to explore. They were severely distressed when their mothers left, often crying loudly; when the mothers returned, the infants seemed angry, behaving with hostility or indifference.

What accounts for these differences? The answer probably lies in a combination of two factors: parenting practices and the inborn differences among infants themselves. There is good evidence that some infants may be innately predisposed to form more secure attachments than others, just as some newborns seem to respond more positively to being held and cuddled (Thomas & Chess, 1977). A second factor in the babies' different reactions was the way in which their mothers responded to them at home. Mothers of the securely attached babies were inclined to be sensitive and responsive to their babies, noticing what they were doing and responding accordingly. For example, they would feed their infants when they were hungry, rather than following a set schedule. They also tended to cuddle their babies at times other than when feeding and diapering. In contrast, mothers of insecurely attached babies tended to be less sensitive and responsive. For example, they might feed their babies when they felt like it and perhaps ignore the child's cries of hunger at other times. These mothers also tended to avoid close physical contact with their babies. Research has also shown that mothers of anxious, insecurely attached children are less likely to become actively involved in the play of their offspring than are mothers of securely attached children (Roggman, Langlois, & Hubbs-Tait, 1987; Slade, 1987).

The establishment of a trusting secure attachment between child and parent appears to have demonstrable effects on a child's later development. Several studies have indicated that children who are securely attached by eighteen months are likely to demonstrate much greater social competence as two- to five-year-olds than are insecurely attached babies. In general, securely attached children have been found to be more enthusiastic, persistent, cooperative, curious, outgoing, socially involved, competent, and appropriately independent.

Father-Child Attachment

We have seen that most investigations of attachment have focused on the mother-child bond. This tendency to overlook fathers probably reflects, at least in part, a general societal conception of fathers as less interested in or capable of providing quality childcare. In recent years, however, these notions have begun to change, and researchers have turned their attention to the role of fathers in their children's early lives (Ainsworth, 1989).

They have discovered that many fathers form close bonds with their offspring shortly after birth and that most infants form specific attachments to their fathers at about the same time as they establish these relationships with their mothers. Fathers tend to interact with their children somewhat differently than mothers. They often spend less time with their children, and that time is more likely to be devoted

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A traditional societal conception of fathers maintains the idea that they are less interested in or capable of providing quality childcare. In recent years, however, these notions have begun to change, and researchers have turned their attention to the role of fathers in their children's early lives.

Permissive Parenting style in which parents adopt a hands-off policy, making few demands and showing reluctance to punish inappropriate behavior

Authoritarian Style of parenting in which parents rely on strictly enforced rules, leaving little room for children to discuss alternatives

Authoritative Style of parenting in which parents enforce clear rules and standards but also show respect for children's opinions

to play than to providing care. When fathers become the primary caregivers, however, they interact with their babies in a nurturing, gentle fashion no less effective than a mother's (Lamb, 2005; Roggman, 2004).

10.7b Parenting Styles and Social-Emotional Development

Most parents, naturally, want their children to grow up to be socially and emotionally competent. Certainly there is no shortage of "expert" child-rearing advice from talk shows, how-to books, parents and in-laws, and well-meaning friends. Unfortunately, much of this advice is based on armchair logic rather than solid empirical evidence. However, a good deal of psychological research provides important insights into how different parenting styles affect a child's social and emotional development. We briefly summarize the evidence here. Research has identified three specific styles of parenting: permissive, authoritarian, and authoritative.

Permissive Parents

Permissive parents are inclined not to control their children, preferring instead to adopt a hands-off policy. They make few demands and are reluctant to punish inappropriate behavior. Permissiveness sometimes stems at least in part from the parents' indifference or preoccupation with other functions. More commonly, however, permissive parents hope that providing their children with plenty of freedom will encourage the development of self-reliance and initiative.

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A child of overprotective parents or of parents who disapprove of the child's initiative is likely to become doubtful, hesitant, and perhaps ashamed.

Authoritarian Parents

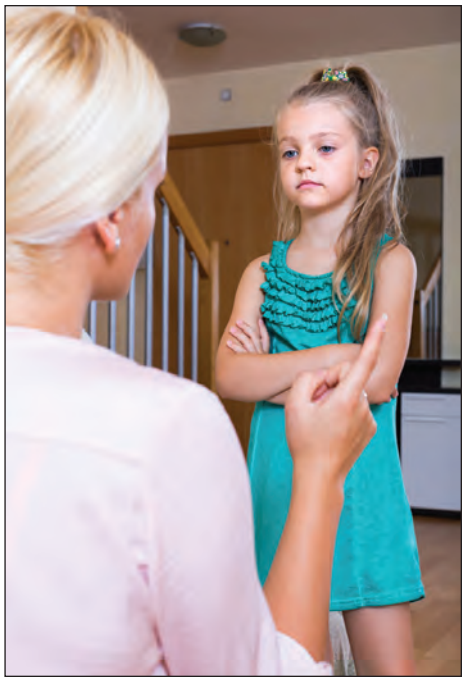
In sharp contrast to the permissive style, **authoritarian** parents rely on strictly enforced rules as they try to make their children adhere to their standards. Authoritarian parents tend to be autocratic, leaving little room for discussion of alternative points of view and often using punishments to ensure compliance. Authoritarian parents generally direct minimal warmth, nurturance, or communication toward their children.

Authoritative Parents

The third type of parents, **authoritative** parents, also have definite standards or rules that children are expected to follow. Unlike authoritarian parents, however, they typically solicit their children's opinions during open discussions and rule-making sessions. Although children understand that certain standards of behavior are expected, they are also encouraged to think independently and they acquire a sense that their viewpoints carry some weight. Both authoritarian and authoritative parenting styles seek to control children's behaviors. However, the former tries to achieve this goal through restrictive control without open communication, while the latter establishes reasonable rules in an atmosphere of warmth and open dialogue.

There is convincing evidence that neither the permissive nor the authoritarian parenting styles are conducive to developing social and emotional competence in children. Children of permissive parents tend to be immature, impulsive, dependent on others, and low in self-esteem. Since they have received so little guidance, they are often indecisive in new situations. Children from authoritarian homes may also have difficulty deciding how to behave because they are worried about their parents' reactions. Authoritarian-reared children are also less likely to express curiosity and positive emotions, and they tend to have few friends.

It is probably no surprise to you that well-adjusted children in these studies tended to be those of authoritative parents. This style of parenting provides a structure reflecting parents' reasonable expectations and realistic standards within an overall atmosphere of love and trust. Perhaps one of the primary advantages of this style is that it provides children the greatest sense of control over their lives. Their participation in family discussions means that the rules that ultimately emerge have been negotiated, rather than being arbitrarily imposed. Also, since authoritative parents tend to enforce rules with consistent, predictable discipline, children are more likely to acquire a sense of control over the consequences of their actions.



(Shutterstock)

In studies, well-adjusted children tended to be those of authoritative parents.

We have seen that parenting styles seem to influence the behaviors children express as they develop. However, the evidence is of a correlational nature, and as we learned in Chapter 1, correlation does not necessarily imply cause and effect. Perhaps authoritatively reared children are more socially and emotionally competent because of the manner in which they have been reared. However, it is also possible that some other characteristic coincidentally associated with authoritative parents may be the key factor. For example, parents who raise children in such a reasonable fashion may also have better relationships with one another; thus, their children's emotional and social development is likely to progress in a healthy fashion free of the stresses imposed by family conflicts. It may also be that children who are socially and emotionally well adjusted, for reasons other than parenting practices, may elicit more reasonable, democratic responses from their parents than do children who are less competent and more belligerent. Research conducted by Diana Baumrind tends to confirm that children reared by authoritative parents tend to be more competent and be better protected from substance abuse (Baumrind, 1991, 2012). The difference between authoritarian and authoritative parenting, which are equally demanding, is in how power is asserted. Authoritarian parents tend to be arbitrary, domineering, and concerned with status distinctions. Authoritative parents, on the other hand, tend to be reasonable, negotiable and outcome-oriented.

In all, we cannot conclude with absolute certainty that child-rearing practices influence all aspects of the social and emotional competence of children. Nevertheless, the evidence certainly indicates a high probability that this is the case.

10.7c Erikson's Theory of Psychosocial Development

Our discussion of psychosocial development would not be complete without a brief outline of Erik Erikson's *stage theory* (1963). Erikson has proposed the only theory of normal psychosocial development that covers the entire life span. He outlined eight

stages, each of which involves specific personal and social tasks that must be accomplished if development is to proceed in a healthy fashion. Each of the eight stages is defined by a major crisis or conflict, suggesting that an individual's personality is greatly influenced by the success with which each of these sequential conflicts is resolved.

Only the first four stages in Erikson's theory apply strictly to the years of infancy and childhood. We briefly outline all eight stages here, however, providing a look ahead to later in the chapter when Erikson's thoughts regarding psychosocial development during adulthood are discussed.

Stage 1: Trust Versus Mistrust

During the first stage, which covers the first twelve to eighteen months of life, infants acquire either a sense of *basic trust* or a sense of *mistrust*. In this stage, infants acquire a feeling of whether the world is to be trusted, a conclusion that is shaped largely by the manner in which their needs are satisfied. If they are cuddled, comforted, talked to, and fed when hungry, infants are likely to learn to trust their world, but if these interactions are not provided, they will probably become fearful and mistrusting.

Stage 2: Autonomy Versus Shame and Doubt

Erikson's next major stage occurs between eighteen months and three years, when children who have developed a basic trust become ready to assert some of their independence and individuality. How well this task is accomplished determines whether the child will achieve a sense of *autonomy* or a sense of *shame and doubt*.

During this stage, children learn to walk, talk, and do other things for themselves. Parents who encourage and reinforce these efforts can foster a sense of autonomy and independence. In contrast, when parents are overprotective, or when they disapprove of a child's initiative, the child is likely to become doubtful, hesitant, and perhaps ashamed.

Stage 3: Initiative Versus Guilt

Between about ages three and six, children broaden their horizons by exploring new situations and meeting new people. During this stage, a conflict exists between children's taking the *initiative* to strike out on their own, and the potential *guilt* they will feel if this behavior offends their parents. Parents who encourage inquisitiveness make it easier for a child to express such healthy behaviors, whereas those who actively discourage such actions may contribute to their children's ambivalence or even guilt about striking out on their own.

Stage 4: Industry Versus Inferiority

The next stage extends from about ages six to twelve. At this point, children are much more involved in learning to master intellectual, social, and physical skills. The peer group becomes much more important during this time as children constantly evaluate their abilities and compare them to those of their peers. If their assessments are positive, they may contribute to a sense of *industry* or achievement. In contrast, a poor self-assessment is likely to induce feelings of *inferiority*. Parents and other adult caregivers can help a child develop a sense of industry by encouraging participation in a variety of tasks that are challenging without being too difficult, and by reinforcing a child for completing such tasks.

Table 10-4 Erickson's Eight Stages of Psychosocial Development

Stage	Outcome	Description
Infancy: Birth to 18 months	Trust vs. Mistrust	If the child's world is safe, needs are met, and caregiver is consistent, the child will develop a sense of trust.
Toddler: 18 months to 3 years	Autonomy vs. Shame and Doubt	Child begins to assert independence. If successful and supported by parents, the child will develop autonomy. Otherwise, they develop a sense of insecurity and self-doubt.
Preschool: 3 to 6 years	Initiative vs. Guilt	Child learns to initiate tasks and follow through with plans. Otherwise, they feel guilty about their attempts if overprotected and punished.
Elementary school: 6 to 12 years	Competence vs. Inferiority	If children are encouraged and supported for their initiative, they feel competent about their abilities. Otherwise, they begin to feel inferior.
Adolescence: 12 to 18 years	Identity vs. Role Confusion	As adolescents begin to transition into teenagers, they begin to test their sexual and occupational identities. Hindering these attempts can lead to confusion.
Early adulthood: 20 to 40 years	Intimacy vs. Isolation	Young adults begin to explore intimate relationships and develop a capacity for love. Avoiding intimacy can lead to isolation and loneliness.
Middle adulthood: 40 to 60 years	Generativity vs. Stagnation	During middle adulthood, careers and relationships are established. Adults contribute to society by raising families and being productive at work. Failing in these endeavors results in stagnation.
Older adulthood: 60 years and older	Ego Integrity vs. Despair	During this period adults begin to reflect back on their lives. Older adults feel a sense of satisfaction with their lives or despair from failure.

Stage 5: Identity Versus Role Confusion

The next conflict occurs during adolescence, from approximately ages twelve to eighteen. Now an individual's major task is to secure a stable identity. According to Erikson, this stage is when we must integrate all of our experiences in order to develop a sense of "who I am." Young people who are unable to reconcile all of their various roles (as a dependent child, independent initiator of industrious actions, and so forth) into one enduring stable identity, experience role confusion.

Stage 6: Intimacy Versus Isolation

As adolescents emerge into young adulthood, they now face the task of achieving intimacy. According to Erikson, an adult who has previously achieved a stable identity is often able to form close, meaningful relationships in which intimacy can be shared with significant others. Failure to achieve intimacy is likely to result in a sense of isolation in which the young adult may be reluctant to establish close ties with anyone else.

Stage 7: Generativity Versus Stagnation

The middle years of adulthood are characterized by still another conflict, this one between generativity and stagnation. Here, our central task is to determine our purpose or goal in life and to focus on achieving aims and contributing to the well-being of

others, particularly children. People who successfully resolve this conflict establish clear guidelines for their lives and are generally productive and happy within this directive framework. In contrast, individuals who fail to accomplish these goals by the middle years of life are likely to become self-centered and stagnated in personal growth.

Stage 8: Ego Integrity Versus Despair

Erikson's final stage extends into the older years of life. This phase of development is characterized by extensive reflection on our past accomplishments and failures. According to Erikson, individuals who can reflect on a lifetime of purpose, accomplishments, and warm, intimate relationships will find ego integrity in their final years. In contrast, people whose lives have been characterized by lack of purpose, disappointments, and failures are likely to develop a strong sense of despair.

Erikson's theory has been praised for recognizing the importance of sociocultural influences on development, and because it encompasses the entire life span. However, many of Erikson's assertions are so nebulous that they are virtually impossible to test.

10.8 Adolescence

My teenage years were the worst years of my life. It seemed to me that my life just couldn't work out. I didn't feel very smart, I wasn't attractive, and there was really nothing that distinguished me from my peers. At this time, my parents were going through a messy divorce that left me feeling both guilty for their unhappiness and mad at them for mine. My emotions were always on a roller coaster. I was either so in love that I couldn't concentrate on anything else, or I was depressed and couldn't care less. Thoughts of suicide were not uncommon, especially after breaking up with my girlfriend my junior year. At that time I couldn't imagine life getting any worse, and at that time, perhaps, it couldn't have.

Although the experiences expressed above are not common to all adolescents in our society (we see in this chapter that there is no such thing as a typical adolescence), it is probably fair to say that most of us have some painful memories of our teenage years. It is also a fair prediction that most of us will experience a certain degree of conflict at other transitions in our lives, for the ages of thirty, forty, sixty, and so on, are all milestones that may seem to us to mark the closing of one phase of our lives or the entrance into another.

Whether the transition is to the entrance of adulthood, middle age, or the older years, much of the conflict we experience has to do with our images or expectations for the new era we are entering. How accurate are these images? Certainly not all adolescents go through a period of storm and stress, nor do all young adults embark on a career and start a family. For that matter, not all older adults fit our society's characterizations of old age. As we explore adolescent and adult development in this chapter, we note the diversity with which individuals experience various ages and stages of their lives. Perhaps the most striking diversity occurs during adolescence, and we begin by examining this transitional period.

Adolescence is a time of dramatic physiological change and social-role development. In Western societies, it is the transition between childhood and adulthood that typically spans ages twelve to twenty. Although most major physical changes take place during the first few years of adolescence, important and often profound changes in behavior and expectations occur throughout the period.

By cross-cultural standards, the prolonged period of adolescence in America and other modern Western societies is unusual. In many nonindustrial societies, adolescence is considered to be either nonexistent or nothing more than a period of rapid physical changes leading to sexual maturity. In such societies, some sort of "rite of passage" often marks the transition from childhood to adulthood (Dunham, Kidwell, & Wilson, 1986). Even in our own society, adolescence is a relatively recent phenomenon. Early in this century, before schooling requirements were extended through high school, children were often expected to join the work force when they became teenagers.

Our society has no single initiation rite that signals passage into adulthood. Instead, a variety of signposts may herald this transition, including graduation from high school or college, moving away from home, securing a full-time job, or establishing an intimate, monogamous relationship.

Just as there is no one rite of passage into adulthood, in many ways there is no typical adolescence. Much has been written about the many conflicts and dilemmas faced by teenagers. However, the teenage years can also be a rewarding, relaxing, and exciting time of life, free from the stresses and responsibilities that come with adulthood. For most of us, adolescence probably varied between being a time of anxiety and stress and a time of freedom and optimism—depending on what day we were asked. Although we cannot describe a typical adolescence, we can describe some of the common physical, cognitive, and psychosocial changes that most teenagers experience.

10.8a Physical Development During Adolescence

Puberty (from the Latin *pubescere*, to be covered with hair) describes the approximately two-year period of rapid physical changes that culminate in sexual maturity. In our society, the onset of puberty in girls generally occurs sometime between ages seven and fourteen, with the average about age ten. Boys typically enter puberty two years later at about age twelve, with a normal range of nine to sixteen.

Puberty Approximately two-year period of rapid physical changes that occurs sometime between ages seven and sixteen in our society and culminates in sexual maturity

Adolescence A period of transition from childhood to adulthood beginning around puberty and extending to adulthood (typically the teenage years, from thirteen to twenty years of age)

Adolescent Growth Spurt Period of accelerated growth that usually occurs within about two years after the onset of puberty

Gonadotropins Hormones released by the pituitary gland that stimulate production of testosterone in men and estrogen in women

Secondary Sex Characteristics Physical characteristics typical of mature males or females (such as facial, body, and pubic hair) that develop during puberty as a result of the release of testosterone or estrogen

Physical Changes During Puberty

The first few years of life are marked by rapid growth. With **adolescence**, children enter a second period of accelerated growth, often called the **adolescent growth spurt**, which usually runs its course in the two years following the onset of puberty. Sexual maturity is reached soon after the growth spurt ends.

The physical changes that occur during puberty are quite dramatic and rapid. Suddenly the body a person has inhabited for years undergoes a mysterious transformation. What causes these changes? One important factor is a genetically determined timetable that causes the pituitary gland to release a growth hormone that triggers the rapid growth that takes place at the start of adolescence (Romeo, Richardson, & Sisk, 2002). The hypothalamus also increases production of chemicals that stimulate the pituitary to release larger amounts of **gonadotropins**—hormones that stimulate production of testosterone in men and estrogen in women. The resulting developments (breasts; deepened voice; and facial, body, and pubic hair) are called **secondary sex characteristics**. The timetable that governs these processes may also be influenced by environmental factors as well as by an individual's health.

There is considerable variation in the rates of growth and development in different societies around the world. We cannot be certain about what causes these changes in human physical growth patterns (including height, weight, and rates of maturation)

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During adolescence, children's bodies experience a growth spurt, which usually runs its course in two years. The onset of puberty can be dramatic; some may gain muscle tone, or experience changes in metabolism and body type. Sometimes these changes can be desirable, but not always.

measured in sample populations throughout the world. However, the most likely cause is the improved standard of living in societies where these changes have been observed.

10.8b Cognitive Development During Adolescence

Although the most obvious changes of adolescence are physical, significant changes also take place in the way we think. With adolescence, individuals acquire the ability to think abstractly. Teenagers can engage in hypothetical reasoning, imagining all kinds of possibilities in a given situation. They also begin to approach problems more systematically and logically, rather than relying on trial-and-error strategies.

Piaget's Formal Operations Stage

Piaget maintained that most people enter the formal operations stage sometime around age twelve. This stage of cognitive development is marked by the emergence of the capacity to manipulate representations of objects, even when they are not physically present, and by the ability to engage in deductive reasoning. Advanced subjects such as mathematics and physics can be understood at this time. These cognitive abilities have important implications for the way adolescents perceive their world. With their increased ability to think logically and abstractly, teenagers often detect what they consider to be logical inconsistencies in other people's thinking, and they may be impatient with the thought processes and decisions of others. Adolescents also may question their own judgments, and the result is often confusion.

Adolescence is also a time when individuals begin to ponder and debate such complex issues as social justice, the meaning of life, the validity of religious dogma, and the value of material wealth. No longer constrained by personal experiences and concrete reality, teenagers can explore all kinds of "what if" possibilities. They may feel compelled to contribute to ending human misery, poverty, social injustice, and war. As adolescents grow older, however, much of their idealism is replaced with a more pragmatic or practical view.

Critique of Formal Operations Stage

We have explored some criticisms of Piaget's theory, but we did not specifically discuss criticisms of his formal operations stage. A number of developmental psychologists have challenged Piaget's ideas about the timing of this stage. Researchers have found that the transition to formal operations does not necessarily occur abruptly at the onset of adolescence, for even relatively young children often demonstrate rudiments of logical thinking (Commons & Grotzer, 1990; Ennis, 1975; Keating, 1988). In addition, adolescents (and even adults) often revert to illogical thinking as they deal with issues and problems. Thus, unlike the sudden and dramatic physical changes of adolescence, the shift to formal operations is often gradual, spanning late childhood and adolescence, and perhaps even extending into the adult years.

Some critics have also argued that many adolescents and adults never attain the level of formal operations logic. A number of studies in the United States have shown that only about 50 percent of college students attain the formal operations stage of cognitive development (Moshman, 2009) In addition, college students who had attained formal operations outperformed those who had not (Mwamwenda, 1993, 1999). Piaget noted that even though adolescents may attain the level of brain maturation necessary for abstract reasoning and logical thinking, they may never achieve the formal operations stage unless they are provided with adult models of formal reasoning and are schooled in the principles of logic. Thus, both neurological maturation and specific training may be necessary for higher cognitive development. As we see in the following section, whether we reach formal operations or not may have a profound influence on another area: moral development.

10.8c Moral Development During Adolescence

When we begin life, we are all *amoral*. We do not yet have even the rudiments of moral judgment. By the time we become adults, however, most of us possess a complex notion of *morality*. Morality is a system of personal values and judgments about the fundamental rightness or wrongness of acts, and of our obligations to behave in just ways that do not interfere with the rights of others. How do we evolve from amoral to moral, from a total lack of understanding our responsibilities to a complex perception of right and wrong?

Kohlberg's Theory of Moral Development

The question of how moral development occurs has occupied the attention of a number of developmental theorists, most notably Lawrence Kohlberg (1964, 1968, 1969; Puka, 1994). Kohlberg was more interested in the ways in which thinking about right and wrong change with age than the specific things that children might consider to be right or wrong. For example, whether we are eight, sixteen, or thirty-two, most of us would say that it is wrong to break our society's laws. However, our reasons for not breaking the law, as well as our views about whether we might be justified in breaking the law under some circumstances, might change drastically as we develop.

To learn how this change takes place, Kohlberg devised a series of moral dilemmas that typically involved a choice between two alternatives, both of which would be considered generally unacceptable by society's standards. "Heinz's" dilemma is an example.

> In Europe a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together $1,000, which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug, and I am going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife. (Kohlberg 1969, p. 379)

What is your reaction to this story? Kohlberg would not be interested in whether you thought Heinz was right or wrong. (In fact, either answer could demonstrate the same level of moral development.) Instead, Kohlberg was interested in the process you

used to reach your judgment, for your reasoning would indicate how advanced your moral thinking is.

Kohlberg asked his subjects a series of questions about each moral dilemma and then used a complex scoring system to assign a subject to a particular category or stage of moral reasoning. This approach led him to formulate a theory of moral development in which he proposed that we move through as many as six stages of moral reasoning that traverse three basic levels: preconventional, conventional, and postconventional.

According to Kohlberg, most children between ages four and ten have a **preconventional morality**, a kind of self-serving approach to right and wrong. In *stage 1* of preconventional morality, children behave in certain ways in order to avoid being punished; during *stage 2*, they behave in certain ways to obtain rewards. At this lowest level of moral development, children have not internalized a personal code of morality. Rather, they are molded by the standards of adult caregivers and the consequences of adhering to or rejecting these rules.

By late childhood or early adolescence, a person's sense of right and wrong typically matures to the level of **conventional morality**. Here, the motivating force behind behaving in a just or moral fashion is the desire either to help others and gain their approval *(stage 3)* or to help maintain the social order *(stage 4)*. As children and young adolescents progress through these stages, they begin to internalize the moral standards of valued adult role models.

A few individuals, particularly those who become adept at the abstract reasoning of formal operational thought, may progress to the final level of **postconventional morality**. *Stage 5* of postconventional morality affirms values agreed on by society, including individual rights and the need for democratically determined rules; in *stage 6*, individuals are guided by universal ethical principles in which they do what they think is right as a matter of conscience, even if their acts conflict with society's rules. Table 10-5 summarizes Kohlberg's six stages of moral reasoning and illustrates how an individual at each stage might respond to Heinz's dilemma.

A person may progress from conventional to postconventional morality any time during adolescence. However, Kohlberg maintained that only about 25 percent of adults in our society progress beyond *stage 4*, and that most of these individuals do so sometime during their adult years.

Preconventional Morality Lowest level of moral development in Lawrence Kohlberg's theory, comprising stage 1 and stage 2, in which individuals have not internalized a personal code of morality

Conventional Morality Second level in Lawrence Kohlberg's theory of moral development, consisting of stages 3 and 4, in which the motivating force for moral behavior is the desire either to help others or to gain approval

Postconventional Morality Third and highest level in Lawrence Kohlberg's theory of moral development, in which individuals are guided by values agreed upon by society (stage 5) or by universal ethical principles (stage 6)

Evaluating Kohlberg's Theory

Kohlberg's theory is an impressive attempt to account systematically for the development of moral reasoning. His writings have also provided some guidelines for implementing moral education for children and adolescents. He suggests that people are often encouraged to advance to higher, more mature levels of moral reasoning through exposure to the more advanced moral reasoning of others. In addition, moral reasoning may develop at a faster rate and achieve a higher pinnacle if children have frequent opportunities to confront moral challenges. Parents and educators might take a cue from these suggestions by arranging for frequent moral consciousness-raising experiences during the developmental years of childhood and adolescence.

John Snarey (1985) reported his evaluation of data obtained from forty-five studies conducted in twenty-seven diverse world cultures that provide striking support for the universality of Kohlberg's first four stages. More recent reviews of seventy-five cross-cultural research studies conducted in twenty-three countries also supports Kohlberg's notion of universality of common moral values and moral judgment (Gibbs, Basinger, Grime, & Snarey, 2007).

Table 10-5 Kohlberg's Levels and Stages of Moral Development with Stage-Graded Answers to the Story of Heinz

Stage Description	Examples of Moral Reasoning Favoring Heinz's Actions	Examples of Moral Reasoning Opposing Heinz's Actions
Level One—Preconventional Morality		
Stage 1: Punishment and Obedience Orientation (The consequences of acts determine if they are good or bad.)	He should steal the drug because he offered to pay for it and because it is only worth $200 and not the $2,000 the druggist was charging.	He shouldn't steal the drug because it is a big crime.
	He should steal it because if he lets his wife die he would get in trouble.	He shouldn't steal the drug because he would get caught and sent to jail.
Stage 2: Instrumental Orientation (An act is moral if it satisfies one's needs.)	It is all right to steal the drug because his wife needs it to live and he needs her companionship.	He shouldn't steal the drug because he might get caught and his wife would probably die before he gets out of prison, so it wouldn't do much.
	He should steal the drug because his wife needs it and he isn't doing any harm to the druggist because he can pay him back later.	He shouldn't steal it because the druggist was not doing a bad thing by wanting to make a profit.
Level Two—Conventional Morality		
Stage 3: Good Person Orientation (An action is moral if it pleases or helps others and leads to approval.)	He should steal the drug because society expects a loving husband to help his wife regardless of the consequences.	He shouldn't steal the drug because he will bring dishonor on his family and they will be ashamed of him.
	He should steal the drug because if he didn't his family and others would think he was an inhuman, uncaring husband.	He shouldn't steal the drug because no one would blame him for doing everything that he could legally. The druggist, and not Heinz, will be considered to be the heartless one.
Stage 4: Maintaining the Social Order Orientation (Moral people are those who do their duty in order to maintain the social order.)	He should steal the drug because if he did nothing he would be responsible for his wife's death. He should take it with the idea of paying the druggist back.	He should not steal the drug because if people are allowed to take the law into their own hands, regardless of how justified such an act might be, the social order would soon break down.
	He should steal the drug because if people like the druggist are allowed to get away with being greedy and selfish, society would eventually break down.	He shouldn't steal the drug because it's still always wrong to steal and his breaking the law would cause him to feel guilty.
Level Three—Postconventional Morality		
Stage 5: Social Contract and Individual Rights Orientation (A moral person carefully weighs individual rights against society's needs for consensus rules.)	The theft is justified because the law is not set up to deal with circumstances in which obeying it would cost a human life.	You could not really blame him for stealing the drug, but even such extreme circumstances do not justify a person taking the law into his own hands. The ends do not always justify the means.
	It is not reasonable to say the stealing is wrong because the law should not allow the druggist to deny someone's access to a life-saving treatment. In this case, it is more reasonable for him to steal the drug than to obey the law.	He shouldn't steal the drug because eventually he would pay the price of loss of self-respect for disregarding society's rules.

Continued

Table 10-5 *Continued*

Stage Description	Examples of Moral Reasoning Favoring Heinz's Actions	Examples of Moral Reasoning Opposing Heinz's Actions
Level Three—Postconventional Morality		
Stage 6: Universal Ethical Principles Orientation (The ultimate judge of what is moral is a person's own conscience operating in accordance with certain universal principles. Society's rules are arbitrary, and they may be broken when they conflict with universal moral principles.)	He must steal the drug because when a choice must be made between disobeying a law and saving a life, one must act in accordance with the higher principle of preserving and respecting life.	Heinz must consider the other people who need the drug just as much as his wife. By stealing the drug he would be acting in accordance with his own particular feelings with utter disregard for the value of all the lives involved.
	Heinz is justified in stealing the drug because if he had failed to act in this fashion to save his wife, he would not have lived up to his own standards of conscience.	He should not steal the drug because, though he would probably not be blamed by others, he would have to deal with his own self-condemnation because he did not live up to his own conscience and standards.

Kohlberg's theory has been criticized for a number of reasons. Some critics argue that a high level of moral reasoning does not necessarily go hand-in-hand with moral actions, especially if a person is under strong social pressure.

Other critics take issue with Kohlberg's assertion that postconventional morality is somehow preferable to conventional morality. Since most adults in our society never reach these stages, critics argue that widespread moral education programs designed to take people to the sixth stage of moral development could have disastrous results. They ask, where we would be if most people chose to act according to individual moral principles with little regard for society's rules? Finally, some argue that morality plays a relatively minor role in the judgments and decisions people make each day (Krebs & Denton, 2005, 2006).

Finally, we should mention that researcher Carol Gilligan argues that Kohlberg paid little attention to the significant difference between boys and girls, and men and women. Gilligan argues that Kohlberg's stage theory ignores critical differences between the sexes in social and moral understanding. For example, in a research study she compared men and women's thinking about real-life dilemmas, such as abortion. Men tended to focus on issues about justice while women tended to focus on issues about care (Gilligan & Attanucci, 1988). Many psychologists agree that sex differences in moral reasoning should be considered in a complete theory of moral development (Levenson, 2009).

10.8d Psychological Development During Adolescence

In addition to the physical, cognitive, and moral development of adolescence, there are also significant social and behavioral changes. During this period, relationships with

parents may be under stress, the peer group may become of paramount importance in influencing behavior, and there is an increased interest in sexual behavior. Perhaps the most important task an adolescent faces is to answer the question, "Who am I?"

Identity Formation

Considering the tremendous diversity of possible answers to questions such as, "Who am I?" and "Where am I headed?", it is understandable that a great deal of experimentation takes place during adolescence. This experimentation often takes the form of trying out different roles or "selves"—which explains the unpredictability of many teenagers who behave in different ways from one day to the next.

By experimenting with different roles, many adolescents eventually forge a functional and comfortable sense of self. For some, this process takes place with little conflict or confusion. Parents of these young people may wonder why such a fuss is made over the supposedly rebellious teenage years. Other parents may feel like tearing out their hair as their adolescent children blaze their own trails in unexpected directions.

The rapid social changes in contemporary society have greatly complicated the task of achieving a sense of identity. Not only traditional gender roles but also values associated with religion, marriage, and patriotism are being challenged in society today. Perhaps as a result, psychologists have found that contemporary adolescents continue to struggle with their identity crises well into their college years. In fact, as we see in this chapter, our sense of identity is likely to be modified and recast throughout our lives. However, it is during the glorious and confusing years of our adolescence that most of us first acquire a genuine appreciation of who we are and what we might become.

The Role of Parents and the Peer Group

An important part of establishing an identity is gaining independence from parents. Although this process begins long before adolescence, it is accelerated during the teenage years. As parental influence diminishes, the peer group's influence grows, but relationships between parents and their teenage children do not necessarily take a nosedive. The popular image of the teenage years as a time of rebellion and intergenerational warfare is more myth than fact, and most teenagers and parents resolve their conflicts with a minimum of fireworks.

The process of becoming a separate, unique individual is a natural part of the transition from child to adult. Certainly most parents would be distressed if their grown children still depended on them for their sense of self and direction in life. However, the process of separation may give rise to difficulties. Parents may feel that their values are being rejected, and adolescents may be torn between the need to be dependent and the need to be independent.

When conflicts increase, family tension often rises. Culturally defined adult behaviors—such as driving, drinking, and smoking—are sometimes used by adolescents as symbols of maturity or as a form of rebellion. Adolescents may reason that they are not children anymore as they seek to become increasingly independent of their parents' authority. However, they still need support from others. This need may be greater now than ever before, considering the profound physical and behavioral changes they are experiencing. In a sense it is paradoxical that adolescents' driving needs for independence force them to retreat from the very people who are likely to be the most supportive and nurturing. To satisfy their needs for both support and independence

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The process of establishing an identity by gaining independence from parents is accelerated during the teenage years. Teens pursue their interests, and begin trying out new ideas and behaviors. This is all part of the process of becoming a separate, unique individual.

from their family, teenagers typically turn to other people who are in the same boat—namely, their peers.

Adolescent friendships are typically much closer and more intense than at any previous time in development. American teenagers spend more than half their waking hours talking to and doing things with friends of the same age group. They tend to identify more with their peers than with adults, and most rate themselves as happiest when they are with their friends. Adolescents are also more inclined to share intimate information with peers than with parents or other adults (Berndt, 1982; Csikzentmihalyi & Larson, 1984). The important role of peers in adolescent development appears to be a worldwide phenomenon.

Young people may find it reassuring to be with friends who are experiencing the same kinds of awkward physical changes. Having friends the same age to go to for advice allows teenagers to get support and counsel without short-circuiting their independence from their parents. The peer group also provides a sounding board for trying out new ideas and behaviors. Finally, it is comforting for teenagers to feel they belong to a world of their own rather than being minor players in the adult world.

It is not surprising, then, that adolescents are strongly inclined to conform to the standards of their peer group in order to gain approval. This conformity may sometimes be taken to extremes in which they radically change their manner of dress, hairstyle, and behaviors—including risky sexual and drug-use behaviors. If they identify with a group whose values and behavioral styles are dramatically different from those of their parents, considerable strife and stress may result. Of course, teenagers often welcome parents' horrified responses as evidence that their rebellion has succeeded!

Despite the increased influence of peers and occasionally extreme acts of independence, however, the so-called generation gap between parents and teens is rather small. Parents continue to exert a strong influence on their teenagers' attitudes and values, and, in fact, adolescents are often more inclined to accept their parents' values and opinions than those of their peers. Peer influence is strong in matters of dress and hairstyles, problems related to school and dating, and drug and alcohol use, while teenagers appear to be more influenced by their parents in issues of politics, religion, and major decisions such as career choices (Abrahamson, Baker, & Caspi, 2002).

Sexual Development and Behavior

It is impossible to explore the psychosocial development of adolescents without taking notice of the changes that take place in sexual development and behavior. During adolescence, boys and girls go through rapid developmental changes and often begin engaging in sexual activities. Peer pressure, self-perceptions of popularity, and the emergence of powerful sexual motivation—all contribute to a variety of sexual behaviors that normally emerge in adolescence.

BVT Lab

Flashcards are available for this chapter at www.BVTLab.com.

The Double Standard During Adolescence

Although children have been exposed to gender-role socialization since infancy, the emphasis on gender-role differentiation often increases during adolescence. Thus, in our society, teenagers receive the full brunt of the double standard. For males, the focus of sexuality may be sexual conquest, to the point that young men who are not exploitative or are inexperienced may be labeled with highly negative terms like "sissy." For females, the message and the expectations are often very different. Many girls learn to appear "sexy" to attract males, yet they often experience ambivalence about overt sexual behavior. If they do not have sexual relations, they worry that a boyfriend will lose interest. On the other hand, having sex might make a boy think they are too "easy."

Despite the double standard, contemporary adolescents are as likely to engage in sexual behavior with casual friends or acquaintances as with someone to whom they feel emotionally attached. Girls are also more inclined than boys to perceive themselves as more popular if they engage in sexual behaviors (Mayeux, Sandstrom, & Cillessen, 2008).

Peer Pressure and Sexual Behavior

While different social pressures may affect adolescent boys and girls, both males and females today are also affected by societal influence—the increasingly permissive attitudes toward sex.

A significant number of adolescents experience premarital sex by the age of fifteen. The results of numerous nationwide surveys of adolescent sexual behaviors reveal a strong upward trend beginning in the 1950s through the 1980s, a decreasing trend through the 1990s, and a steady trend of about 50 percent being sexually active from 2000 to 2009 (see Table 10-6). Sexual surveys conducted annually at the authors' institution between 1989 and 2009 show a much higher rate, with about 80 percent of students becoming sexually active by age nineteen. There is also accumulating evidence that young adolescents, under age fifteen, are engaging in intercourse and other sexual activities in increasing proportions. Results from a national survey conducted in 2002 revealed that approximately 55 percent of boys and 54 percent of girls had engaged in noncoital (oral) sex by age fifteen (Lindberg, Jones, & Santelli, 2008).

Table 10-6 Percentage of Adolescents Who Reported Having Premarital Intercourse by Age Nineteen

	Females	Males
Kinsey et al. (1953)	20%	45%
Sorensen (1973)	45%	59%
Zelnik & Kantner (1977)	55%	No males in study
Zelnik & Kantner (1980)	69%	77%
Mott & Haurin (1988)	68%	78%
Ku et al. (1998)	43%	68%
Centers for Disease Control (2016c)	46%	47%

In broad terms, we can briefly summarize the major changes in adolescent sexual activities in the last five decades. First, there was a rapid increase in premarital sex through the 1980s, followed by a decline to about 50 percent, which has remained stable for the past decade. Second, the large differences in male and female sexual activity rates decades ago appear to have completely disappeared. Perhaps we should conclude with a warning when interpreting these numbers by saying that the data presented in Table 10-6 report premarital intercourse and do not include other sexual activities. There is some evidence that while sexual intercourse rates may be stable, the rates of other sexual activities are not (Martinez & Abma, 2015).

10.9 Adulthood

If you have recently entered adulthood or are presently making this important transition, you may be wondering what lies ahead in the remaining 70 percent of your life. Will you continue to grow and change, or has the die already been cast? Will you be the same person at age forty or age seventy that you are now at age nineteen or twenty?

It is now widely acknowledged that development continues throughout life and that this growth is not limited merely to physical changes. Contemporary developmental psychologists have been amazed at the extent of psychosocial change, and to a lesser degree cognitive development, that continues during the adult years. In all, we can say with some confidence that you will not be the same person at age forty that you are at nineteen or twenty.

Most psychologists divide the adult years into three periods: early adulthood (roughly twenty to forty), middle adulthood (forty to about sixty-five), and late adulthood (after sixty-five). Although these categories are convenient, they are somewhat arbitrary and carry the danger of promoting the notion of age-based expectations (the tendency to associate certain developmental tasks or appropriate behaviors with each phase of adult life). Young adults may be expected to marry and start families and careers, and people in the middle adult years are often expected to reach the top of their careers. However, as we noted at the beginning of this chapter, not all of us experience the phases of our lives in the same orderly fashion.

In fact, many age-based expectations in our society have begun to break. People often postpone marriage or decide not to marry at all; in addition, many people are becoming first-time parents in middle adulthood, and gray-haired retirees are now a common sight in many college classrooms. In all, we seem to be moving in the direction of what might be called an age-irrelevant society, and it can be argued that age, like race or sex, is diminishing in importance as a regulator of behavior.

One reason for this shift is that age, per se, is not the cause of changes in our lives. A thirty-year-old advertising executive is not more mature than she was as a college student simply because she is older. Rather, her increased maturity reflects the experiences she has encountered in her personal and professional life. Thus, instead of measuring development only by age categories, many of us find it useful to define our phase of adult development in terms of *perceived age*—how old we feel.

In keeping with this reduced emphasis on age, the following sections describe physical, cognitive, and social development in fairly general terms during the years between the twenties and the sixties. We begin with the physical changes that take place during adulthood.

10.9a Physical Development in Early and Middle Adulthood

During early adulthood—the twenties and thirties—people reach the peak of their biological efficiency. These are typically years of good health and high energy, which is fortunate considering that this is the time of life when most of us are busy establishing careers, adjusting to marriage, and perhaps responding to the boundless needs of small children.

Physical Capacities

A number of physical attributes are likely to reach their high point during early adulthood. During this period most of us reach the peak of our reproductive capacities and enjoy the best health of any time of our lives. The speed with which we can react to complex stimuli is fastest at around age twenty and then gradually declines from the midtwenties on. However, simple reflex time (such as the knee-jerk when tapped with a mallet) remains relatively constant from age twenty to eighty. Vision and hearing are at their best at around age twenty; as we move into our middle adult years, we can expect to become gradually more farsighted and to lose our ability to hear higher notes. Sensitivity to taste and smell also decline with age. Sweet and salty taste decrease most rapidly while the tastes of bitter and sour are actually heightened. There is about a tenfold increase in smell thresholds from age twenty to age eighty, with most of this increase occurring after age sixty (Wysocki & Preti, 2004).

Physical strength also tends to peak sometime in the mid- to late twenties. It then declines gradually, dropping about 10 percent between ages thirty and sixty (Bassey, 1998). Unless you happen to compete in swimming, cycling, running, or some other athletic endeavor requiring peak performance, you may hardly notice the barely perceptible decline in physical strength, stamina, and cardiac output over the third and fourth decades of your life. In fact, a number of world-class endurance athletes remain quite competitive throughout their forties and fifties. Among endurance athletes, the decrease in VO_2max (a measure of oxygen utilization) between twenty-four and fifty years of age is only about 4 percent. In addition, individuals who maintain fitness can expect to have VO_2max values far higher than younger, less athletic individuals. In fact, maintaining physical activity can slow the rate of decline in VO_2max by as much as 50 percent (Fox, 2011). Maintaining a level of physical fitness may also contribute to fewer health problems and a reduction in the brain cell loss that normally occurs during aging. Numerous studies have revealed that physical fitness and continuing education protect against normal brain cell losses that occurs during aging (Gordon et al., 2008).

Over time, however, middle adulthood brings a gradual decline in physical functioning and perhaps a corresponding increase in health problems. We may begin to notice that it is not so easy to rebound the morning after a late party, or that the body protests more after a hard workout on the tennis courts. Some of the most notable changes, particularly for women, have to do with changing hormonal patterns that, among other things, alter reproductive capacity.

Hormonal Changes and the Climacteric

The term **climacteric** refers to the physiological changes that occur during a woman's transition from fertility to infertility. **Menopause**, one of the events of the female climacteric, refers to the cessation of menstruation. Menopause results from certain

Climacteric Physiological changes, including menopause, that occur during a woman's transition from fertility to infertility

Menopause Cessation of menstruation that takes place during the climacteric

physiological changes, most notably a reduction in estrogen levels. It can take place anytime between forty and sixty, but most commonly occurs between forty-five and fifty (Crooks & Baur, 2014). Many women consider the cessation of menstruation and fertility to be the most significant biological change related to aging.

Do men also undergo a climacteric? Not in the same sense as women. For one thing, men often retain their reproductive capacity well into the older years (although with declining fertility). The hormonal changes, called **andropause**, men undergo are much more gradual. Male testosterone levels usually reach their peak sometime between the ages of seventeen and twenty, and then steadily, but slowly, decline at a rate of about 1 to 2 percent per year until around age sixty, when they level off. In recent years, there has been increasing interest in hormone replacement therapy for men. Evidence suggests that testosterone supplements in older men increase lean body mass, bone density, and libido. In addition, testosterone replacement may improve mood and cognitive functioning by altering neural activity essential for learning and memory (Janowsky, 2006; Lu et al., 2006)

The Double Standard of Aging

In a society that places a premium on youth, it can be difficult for both men and women to grow older. This process is usually more difficult for women than for men because of another double standard of our society—this one related to aging. Although a woman's erotic and orgasmic capabilities continue after menopause, it is not uncommon for her to be considered past her sexual prime relatively early in the aging process. The cultural image of an erotically appealing woman is commonly one of youth. As a woman grows away from this image, she is usually considered less and less attractive. Cosmetics, Botox® injections, and plastic surgery are often used to maintain a youthful appearance for as long as possible.

In contrast, men's physical and sexual attractiveness is often considered to be enhanced by age. Gray hairs and wrinkles may be thought to look "distinguished" on men, signs of accumulated life experience and wisdom. Likewise, while the professional achievements of women may be perceived as threatening to some males, a man's sexual attractiveness is often closely associated with his achievements and social status, both of which may increase with age (Buss, 1989; Shackelford, Schmitt, & Buss, 2005).

10.9b Cognitive Development in Early and Middle Adulthood

Intelligence

At one time, intellectual ability was believed to peak in young adulthood just as do most aspects of physical functioning. This view was supported by an early large-scale study that administered standardized intelligence tests to large samples of adults of varying ages. Young adults were found to score higher than middle-aged adults, who in turn outperformed older adults (Jones & Conrad, 1933). More recent longitudinal studies all suggest that there is an age-associated decline in intelligence, but all do not agree on just when this decline occurs and whether some aspects of intelligence are less susceptible to age-related change.

Andropause A condition of low testosterone often attributed to the natural loss of testosterone production in older men (also referred to as male menopause)

Crystallized Versus Fluid Intelligence

Some changes in specific kinds of intelligence do appear to be age-related, however. Psychologists distinguish between crystallized and fluid intelligence. **Crystallized intelligence** results from accumulated knowledge, including knowledge of how to reason, language skills, and understanding of technology; it is linked closely to education, experience, and cultural background. Crystallized intelligence is measured by tests of general information. Research indicates that crystallized intelligence increases with age and that people tend to continue improving their performance on tests of this form of intelligence until near the ends of their lives.

Fluid intelligence allows us to perceive and draw inferences about relationships among patterns of stimuli, to conceptualize abstract information, and to solve problems. It is measured by various kinds of test problems to which people are unlikely to have been exposed previously, such as grouping numbers and symbols according to some abstract principle. Fluid intelligence seems to be relatively independent of education and cultural influences. It peaks sometime between ages twenty and thirty and declines steadily thereafter (Kaufman, 2001).

It is possible that these age-related differences may somehow be an artifact of the research strategy used, since much of the basic research on crystallized and fluid intelligence has relied on the cross-sectional approach. However, since fluid intelligence depends more on optimal frontal lobe functioning than does crystallized intelligence, it seems likely that it is more adversely influenced by age-associated neurological declines. Recent research confirms that declines in fluid intelligence are strongly correlated with age-related decreases in functioning of the frontal lobes (Rabbitt et al., 2008).

A Fifth Stage of Cognitive Development

Recall that Piaget saw formal operations as the highest level of cognitive functioning. Some critics disagree, maintaining that many adults progress beyond formal operations to what might be called a fifth stage of intellectual development. One theorist, Patricia Arlin (1989), believes that adults develop cognitively to the level of problem finding. Someone at the problem-finding stage is concerned with posing new questions about the world and trying to discover novel solutions to old problems. Arlin believes that problem finding allows intellectually maturing adults to progress beyond Piaget's formal operations to the level of creative thinking.

Crystallized Intelligence
Intelligence that results from accumulated knowledge, including knowledge of how to reason, language skills, and understanding of technology

Fluid Intelligence
Ability to perceive and draw inferences about relationships among patterns of stimuli, to conceptualize abstract information, and to solve problems

10.9c Psychosocial Development in Early and Middle Adulthood

Erik Erikson described two primary developmental tasks in early and middle adulthood: first the establishment of intimacy, and then the achievement of generativity through commitments to family, work, and future generations. The two major topics in this section, "Single and Married Lifestyles" and "Commitments to Parenting and Work," explore some of the ways in which people respond to these challenges.

Single and Married Lifestyles

As we make the transition from adolescent to young adult, the central focus of our psychosocial adjustment is likely to shift from wanting to be liked by people to needing a loving relationship with someone special. Establishing an intimate relationship requires courage, and a certain amount of self-abandon and willingness to compromise personal preferences. In Erikson's view, two people who achieve true intimacy are able to fuse their identities while at the same time retaining a sense of self. Too much independence may prevent the establishment of intimacy and result in a state of isolation.

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According to Erikson, two people, who achieve true intimacy, are able to fuse their identities while at the same time retaining a sense of self.

Erikson emphasized traditional marriage as a vehicle for fulfilling intimacy needs, but there is plenty of statistical evidence that the commitment to marriage is changing in our society. Can the decision to remain single or cohabit also provide a satisfactory adjustment? The following discussions explore the evidence.

Single Living

Increasing numbers of young and middle-aged adults in our society live alone, many out of choice. This increase is most pronounced among people in their twenties and early thirties. For example, a comparison of census figures between 1965 and 2010 reveals that the percentage of young adults who are married has decreased from about 80 percent in 1965 to about 50 percent in 2010 (Centers for Disease Control and Prevention, 2013).

Although single life is still often seen as the period before, in between, or after marriage, these societal attitudes may be changing. Until recently in the United States, a stigma was often attached to remaining single, especially for women. Today it seems quite possible that more and more people will remain single, either as an option to marriage or following a divorce. There may also be a reduction in the number of people who marry primarily for convention's sake.

Various conditions contribute to the increasing numbers of single adults. These factors include people marrying at a later age, more women placing career objectives ahead of marriage, an increase in the number of cohabiting couples, high divorce rates, a greater emphasis on advanced education, and an increase in the number of women who need not depend on marriage to ensure economic stability.

Although single living is common in our society, most adults still choose to enter into a long-term relationship with a partner, even though it may not be a lifelong bond. There are several kinds of long-term intimate relationships. We will look at the most common: cohabitation and marriage.

Cohabitation

The past few decades have seen a significant increase in the number of couples choosing to **cohabitate** (living together in a sexual relationship without being married). Between 1974 and 2010, the percentage of marriages preceded by cohabitation increased from 10 percent to about 57 percent—rates higher than marriage. This dramatic increase in cohabitation has been attributed to a growing inclination to question traditional mores, particularly those pertaining to marriage as well as to our recessed economy. Today many people believe that sexuality is an important part of life, and that marriage is not the only lifestyle that legitimizes sexual relations.

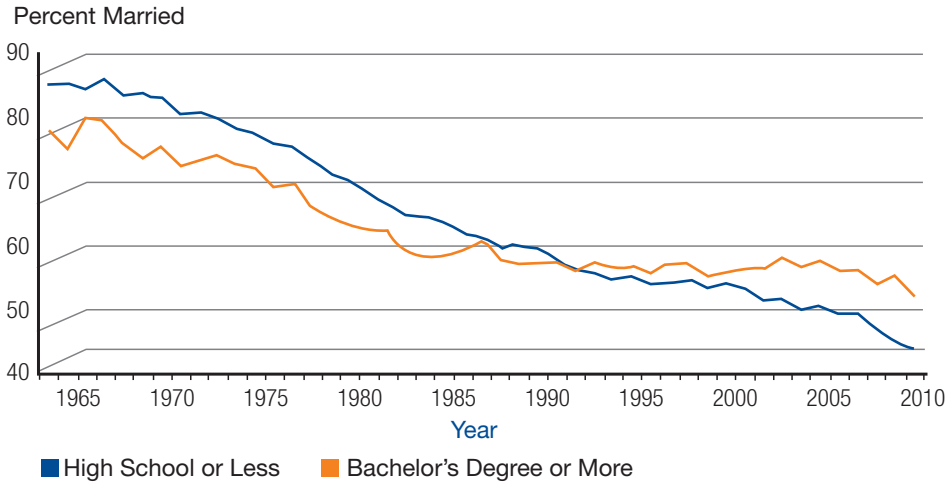
Cohabitate Living together in a sexual relationship without being married

Marriage

In spite of rapidly changing mores, people do not seem to be permanently substituting single living, cohabitation, or other alternative lifestyles for traditional marriage. As discussed above, statistics show that the percentage of young people

Figure 10-8 Marriage Rates

Percentage of young adults (twenty-five to thirty-five years) who are married has declined over the past forty-five years from approximately 80 percent to fewer than 50 percent.



Data from Statistical Abstracts, 2012

married has begun to decline over the forty-five-year period from 1965 to 2010, (see Table 10-7). Divorce rates during this period have also decreased, but they still represent about one in two marriages.

There are good reasons why the institution of marriage is found in virtually every society; it serves several personal and social functions. It provides societies with stable family units that help to perpetuate social norms, as children learn society's rules and expectations from parents or kinship groups. It also structures an economic partnership that ties child support and subsistence tasks into one family unit. Marriage regulates sexual behavior and also provides a framework for fulfilling people's needs for social and emotional support.

Table 10-7 Number of Marriages and Divorces per 1,000 People

While both marriage and divorce rates appear to be declining over the last few years, the percentage of marriages that end in divorce remains about 50 percent.

	1970	1975	1980	1985	1990	2004	2006	2012	2014
Marriages	10.6	10.0	10.6	10.1	9.8	7.4	7.3	6.8	6.9
Divorces	3.5	4.8	5.2	5.0	4.7	3.7	3.6	3.3	3.2

Centers for Disease Control, 2014

While people's expectations for marriage have increased, our society's supportive network for marriage has decreased. In a mobile, urban society in which a couple often settles down far from their extended families—many married couples are isolated from their families and neighbors. This geographical distance puts further demands on the marriage, for there is often no place else to turn for such things as child-care assistance, emotional support, and financial or household help.

Another development influencing marital patterns is increased longevity. "Till death do us part" now means many more years than it did in the past, raising the question of how long even the best marriage can be expected to fulfill so many functions.

10.10 The Older Years

What kinds of associations or images come to your mind when you hear the words *old people* or *old age*? If you are like most Americans, young and old alike, you are likely to think of old people as forgetful, cranky, touchy, depressed, frail, unhealthy, poorly coordinated, and not as smart as when they were younger. You are also likely to view the older years as a time when people become more dependent on others, less interested in sex, obsessed with physical complaints, more isolated from friends and family, unreliable, and likely to be institutionalized in nursing homes. Are these stereotypes more myth than fact? In the remaining pages of this chapter we explore the evidence about the physical, cognitive, and psychosocial developments that accompany older adulthood.

10.10a The Graying of America

People today are living longer and retaining their health and vigor longer than previous generations. In fact, the proportion of older people in the American population has increased quite dramatically in recent years. Whereas in 1900 the average life expectancy was slightly less than fifty years, by the 2000s it had increased to approximately age seventy-seven. Only 4 percent of the American populace was over sixty-five in 1900, but in 2008 this figure had increased to 13 percent (more than 6.8 million people). Over the last few decades, the proportion of American people sixty-five and older has grown at twice the rate of the rest of our population. By the year 2020, it is estimated that more than 16 percent of the American population will be sixty-five and older (Administration on Aging, 2014).

(Shutterstock)

As of the year 2000, the average life expectancy had increased to approximately age seventy-seven.

The so-called graying of America may be attributed to a number of factors. To some extent, it is a function of an increased birthrate that commenced around the turn of the twentieth century, combined with higher immigration rates early in this century. However, much of this trend is caused by technological changes since 1900 that have resulted in longer life spans and lower mortality rates for the elderly. Improved medications and medical procedures prolong the lives of many older people.

The graying of America has significant implications for changing family patterns, employment trends, social policies, and political trends, but our concern is with the individuals who are experiencing longer life spans. Does a longer life mean a welcome prolonging of life's so-called "golden years," or has technology merely expanded the pain and travail of life on a downward slide?

10.10b Physical Development in the Older Years

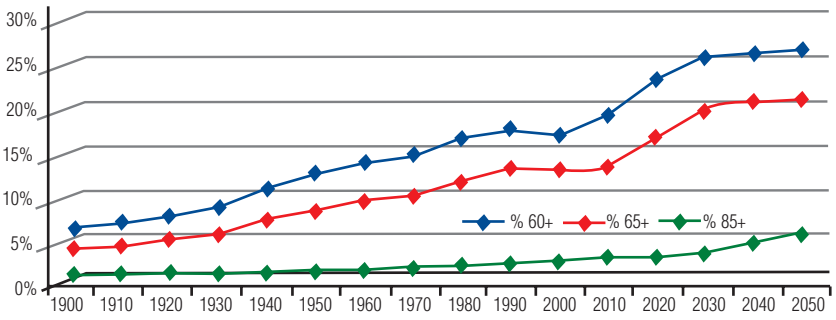
Organ Reserve Potential ability of organs such as the heart, lungs, and kidneys to increase their output to a level several times greater than normal under emergency conditions

We noted earlier that physical decline in such things as muscle strength, vision, and hearing begins in early to middle adulthood. While many of these changes are barely noticeable in the middle years, they often are disturbingly obvious as we grow older. One area in which there are often sharp declines is vision. Older people may become more farsighted; they may also have trouble perceiving color and depth and adapting to changes in lighting. (Night vision commonly declines with age.) The changes in vision are largely caused by a reduction in the elasticity of the lens. This makes it more difficult for the ciliary muscles to change the shape of the lens. As a result, older people often need to hold reading material farther away to keep it in focus.

Hearing loss is also common. Many older people have difficulty following a conversation, particularly when there is competing noise from television, radio, or other background sound. This decline can increase a sense of isolation and perhaps even contribute to mild paranoia if older people assume that others are trying to hide something from them by whispering. Other frequent accompaniments to aging are reduction in taste and smell sensitivity (which explains why food often does not taste as good to older people). About 25 percent of people between sixty-five and sixty-eight have no sense of smell, and by age eighty, this increases to more than 50 percent. There is also a diminution of the body senses and equilibrium (see Chapter 3), which may be one reason why older people are more likely to lose their balance and fall.

The organ systems also show a decline in functional efficiency with age. When we are young, our hearts, lungs, kidneys, and other organs have the potential to increase their outputs to a level several times greater than normal under emergency conditions, a capacity that is known as **organ reserve**. For example, strenuous physical activity can cause a young heart to work six times harder than normal. As we grow older, organ reserve is reduced. The heart's ability to pump blood declines by about 1 percent per year from the early twenties on, and by age sixty blood flow from the arms to the legs is slower than at age twenty-five. By age seventy-five, there has been an average decline in lung capacity of approximately 50 percent in men and 30 percent in women. Furthermore, muscle fibers decrease in number at an average rate of 3 to 5 percent per decade after age thirty (Fleg, Morrell, Bos, Brant, & Talbot, 2005).

Figure 10-9 Older Population by Age Group 1900–2050



Data from Administration on Aging, 2012

Although the statistics we have just cited may seem to paint a rather depressing picture, there is a brighter side to the story. Glasses, hearing aids, and other medical procedures can adequately compensate for many of the visual and hearing difficulties of older people. There is also evidence that regular exercise can significantly reduce deterioration of many bodily functions that accompany aging. It has been estimated that disuse accounts for about half of the functional decline that occurs between ages thirty and seventy. It would appear that the advice "use it or lose it" has some validity. Despite the declines associated with the older years, widespread evidence indicates that older people enjoy reasonably good health, some virtually to the ends of their lives.

Neuronal Changes During Aging

In the previous section we reviewed a number of sensory and structural changes that occur during later years. What about the brain? Does it change too? Normally, the effects of aging on the brain are not noticeable until we reach about fifty to sixty years of age. At this time, the brain begins to decrease in size as a result of both neuron and glial cell loss. Just how much neuronal degeneration occurs during normal aging is difficult to determine because of wide variations in cell numbers between individuals and the difficulty in diagnosing cognitive diseases such as Alzheimer's disease in some individuals. For instance, early research suggested that between the ages of eighteen and ninety-five years there might be a 50 percent loss in cell numbers in the frontal and temporal lobes. More recent estimates from healthy individuals suggest that it may be closer to only 10 percent (Ances, Ortega, Vaida, Heaps, & Paul, 2012)

As with other bodily functions, the normal deterioration in the brain can be significantly reduced by both physical exercise, which increases blood flow to the brain, and by using your brain. Experiments with aging rats have demonstrated new cell growth and synapse formation after exposure to a stimulating environment (Greenough, McDonald, Parnisari, & Camel, 1986). It is believed that people who continually engage in stimulating aerobic activities such as walking can greatly reduce the rate of normal cell deterioration by increasing the production of essential nerve growth hormones (Erickson, Miller, & Roecklein, 2012).

10.10c Cognitive Changes in the Older Years

It is often said that old people have poor memories, and that intelligence declines sharply in the later years. How accurate is this picture? For most people, the ability to learn and retain meaningful information declines only slightly in the later years. The characterization of old age as a time of cognitive decline may be related to a few conditions. One of these is a decline of fluid intelligence that usually does accompany aging; another is the highly visible condition of senility that affects a relatively small percentage of older people. Let us look at both of these factors.

Memory, Intelligence, and Aging

As we saw earlier in this chapter, there seem to be two types of intelligence. Crystallized intelligence tends to hold steady or perhaps even improve somewhat in the later years—a finding that is consistent with our tendency to continue to add to our storehouse of knowledge, as we grow older, often up to the end of our lives. In contrast, fluid intelligence declines with age, a process that may be related to a reduced efficiency

of neurological functioning, particularly in the frontal lobes (Rabbitt, 2005; Aine, Sanfratello, Adair, Knoefel, Caprihan, & Stephen, 2011).

There is another possible explanation for the discrepancy between crystallized and fluid intelligence in the later years. People may be more likely to maintain crystallized abilities because they are exercised or used on a regular basis, whereas older people may be less frequently challenged to use their fluid abilities. This suggestion presents another version of the "use it or lose it" concept mentioned earlier.

Memory, particularly short-term, or working memory, does decline with aging. While diseases such as Alzheimer disease contribute significantly to memory impairments in older individuals, a gradual decline in memory even occurs in healthy aging. There are several factors that contribute to this decline, including decreased blood flow to the brain as well as a normal decline in the production of several essential nerve growth hormones. Both of these declines can be delayed significantly by increasing both physical and cognitive activity (Miller et al., 2012).

Senile Dementia Collective term describing a variety of conditions sometimes associated with aging, including memory deficits, forgetfulness, disorientation of time and place, declining ability to think, and so forth

Alzheimer's Disease An incurable disease that destroys neural tissue resulting in an impaired capacity to remember, think, relate to others, and care for oneself

Senile Dementia

For a small number of people, old age brings a nightmare of deteriorating cognitive functions known commonly as senility or more technically as **senile dementia** (a collective term that describes a variety of conditions characterized by memory deficits, forgetfulness, disorientation of time and place, decline in the ability to think, impaired attention, altered personality, and difficulties in relating to others). Approximately ten million Americans are afflicted with senile dementia, including 50 percent of people over seventy-five. Dementia has many causes, some treatable and some that cannot be remedied at the present time. Occasionally the confusion characteristic of dementia can be attributed to improper use of medications, hormonal abnormalities, infectious diseases, or metabolic disorders. (Dementia resulting from these causes may often be remedied by medical treatment.) More commonly, it is associated with a series of small strokes, brain tumors, neurological disorders, or chronic alcoholism—all of which can result in irreversible loss of brain neurons.

(iStock)

Dementia is most often associated with a series of small strokes, brain tumors, neurological disorders, or chronic alcoholism.

The most common form of senile dementia is **Alzheimer's disease**, a currently incurable condition that robs individuals of the capacity to remember, think, relate to others, care for themselves, and even to be aware of their own existence. In the mid-1980s, the National Alzheimer's Disease and Related Disorders Association estimated that roughly 2.5 million Americans, most of whom are over sixty, had this dreadful illness. Current estimates suggest that approximately 5 percent of people between sixty-five and seventy-four have Alzheimer's disease and that this rate increases to about 50 percent of those over eighty-five years old (Centers for Disease Control and Prevention, 2016a). Alzheimer's disease alone accounts for 60 percent of all cases of senile dementia in people over age sixty-five. This represents about 5.3 million people and is projected to increase to 14.0 million Americans by 2050.

A tremendous amount of research is currently underway to determine the cause(s) of this disease, and some clues have been uncovered. The most promising line of evidence suggests

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that victims of Alzheimer's disease produce an abnormal protein called beta amyloid protein, which deposits amyloid plaques in the brain. Amyloid proteins duplicate themselves to such an excessive extent in people with Alzheimer's disease that they create tangled webs, known as neurofibrillary tangles, which produce massive neurological damage and ultimately choke the life out of affected brain cells (Blennow, de Leon, & Zetterberg, 2006; Pastorino & Lu, 2006). Promising new lines of research are aimed at developing drugs that target amyloid proteins and develop antibodies against it (Cardinale & Biocca, 2008; Vasilevko & Cribbs, 2006).

10.10d Psychological Development in the Older Years

We have seen that the popular stereotype of old age as a time of rapidly deteriorating physical and cognitive functioning is much more myth than fact, but what about the mental health of older people? Is aging associated with depression, despair, dissatisfaction, unhappiness, and a breakdown of interpersonal relationships? Fortunately, this generalization is true of only a small proportion of aging people.

In reality, the older years do tend to be the golden years for a large number of individuals. Several major national surveys have found that satisfaction with life in general, feelings of well-being and marital satisfaction actually tend to be higher among the aged than among younger adults. Despite the common misconception that many older people end up in institutions for the aged, only about 5 percent of America's aged population live in institutions. For most, old age is a time of continued independence, with the additional freedom from the burdens of job and family obligations.

This situation is not always the case, however. Some older people—who are widowed, isolated from friends, in poor health, economically disadvantaged, or resentful of being forced to retire—may find the older years to be far from golden. Admittedly, some of these factors are beyond most individuals' control, but in many ways our satisfaction in old age is the product of our own attitudes and behaviors.

Successful Aging

Many Americans see continued active involvement in life as the best road to successful aging. Older people are encouraged to remain active and not to retire from their lives when they retire from their jobs. However, might there not also be advantages to cutting back, relaxing, and gracefully withdrawing from the bustle of life?

These descriptions summarize two popular theories of successful aging that have generated considerable discussion and research. It is clear that the more involved and active older people remain, the more happy and fulfilled they will be. Thus, older people should pursue hobbies, travel, do volunteer work, engage in active grandparenting, or involve themselves in other endeavors that help to sustain a relatively high level of activity. As people age, however, they may no longer find the results of these activities as rewarding as they once were. Aging not only makes many activities more difficult because of the changes in sensory abilities (like vision, audition, and taste), it makes the consequences more aversive. For instance, playing tennis or going on long walks may result in fatigue and sore muscles; engaging in intellectual activities may result in embarrassment from a failing memory. For these reasons many people may abandon activities they enjoyed earlier. B. F. Skinner offers some particularly useful advice on how the aging intellectual can compensate for some of these changes (Skinner, 1987). It

is perhaps this advice that kept him intellectually active through the last months of his long and productive life. Recall that Erik Erikson viewed successful aging as conditional upon achieving integrity. He believed that people who are able to view their lives retrospectively with a sense of satisfaction and accomplishment are likely to achieve a sense of unity or integrity. In contrast, people who view their lives as a series of disappointments and failures are likely to experience unhappiness and despair. Recall Ebenezer Scrooge in Charles Dickens's *A Christmas Carol* whose forced life review produced a dramatically more optimistic focus to his life in his remaining years.

Maintaining close personal relationships has been shown to be especially important for maintaining health and recovering from illness in the elderly. A number of studies have demonstrated the health benefits of **social support** from family, friends, and health-care providers in reducing risks of disease and prolonging life. For instance, in a large longitudinal study of nearly 1,300 participants between the ages of sixty-five and ninety-five, morbidity increased from about 41 percent in those with close social ties to over 68 percent in those without social support (Mazzella et al., 2010).

How does social support facilitate recovery from surgery and disease as well as prolong life? How might **social isolation** increase an individual's risk of disease? Think about these questions before reading on.

There are several possible ways that social support might influence health. First, it has been suggested that people who live in isolation live in physically different circumstances, and it is these circumstances that influence health. These conditions might include the type and location of housing, diet, and opportunities for physical exercise. Another possibility is that social support acts as a buffer to life stressors. This buffering hypothesis argues that people with social contacts are protected (or buffered) from the harmful effects of stress. In addition, people with social contacts are more likely to receive advice about good health practices, receive encouragement, be physically active, and have a greater sense of personal control (Brannon et al., 2014).

In this chapter we reviewed the developmental changes that occur during adulthood. Physical, cognitive, and psychosocial changes continue throughout our lives. During these later years, there is considerable variability between individuals in how quickly these changes occur. It appears that maintaining a physically active and cognitively stimulating lifestyle can greatly reduce the rate of detrimental changes in late adulthood. In addition, maintaining close social contacts throughout our lives may contribute to health and longevity.

Social Support An environment in which a person has close relatives or personal friends

Social Isolation An environment lacking social interaction, such as one in which an elderly person lives alone

(Shutterstock)

Many Americans believe remaining active is the key to successful aging. Older people are encouraged to remain active and not to retire from their lives when they retire from their jobs.

CHAPTER REVIEW

Developmental Issues

1. Contemporary developmental psychologists believe that humans are the products of both nature and nurture, and they are interested in how genetics and experience interact to shape development and the expression of human behavior.
2. Psychologists who emphasize the role of learning have tended to view development as a gradual, continuous process in which individuals undergo qualitative changes over the life span as they accumulate experiences. In contrast, psychologists who emphasize maturation (the orderly unfolding of certain genetically determined behaviors) view development as a discontinuous process that occurs in a series of stages.
3. Most contemporary psychologists agree that the concept of critical periods in infant development, at least when applied to emotional, intellectual, and behavioral traits, lacks supporting evidence.
4. Three research designs have been widely used in the study of development: the cross-sectional, longitudinal, and cross-sequential methods.

The Beginning of Life

5. Life begins when the germ cells (sperm and ovum) unite to produce a zygote. The zygote contains a complement of forty-six chromosomes arranged in twenty-three pairs, one chromosome in each pair from the sperm and one from the egg.
6. Chromosomes are composed of thousands of genes, the chemical blueprints that determine physical characteristics and influence behavioral traits.
7. The assortment of genes we inherit at conception is known as our genotype; the characteristics that result from expression of various genotypes are known as phenotypes.
8. A dominant gene is one that is always expressed in the phenotype; a recessive gene is one that may be expressed only in the absence of a dominant gene or when it is paired with a similar recessive gene.
9. Many sex-linked diseases are more common in males than females because only a single dose of the defect-causing gene on the X chromosome is necessary to cause the disease. (The gene-deficient Y chromosome does not carry a gene that may counteract this adverse factor.)
10. About 3 percent of babies born each year in the United States have some gene defect or chromosomal abnormality that produces a physical and/or mental handicap.
11. Huntington's disease, carried by a dominant gene, does not cause symptoms until a person is thirty-five to forty-five years old.

12. Phenylketonuria (PKU) is a potentially devastating genetic disease, characterized by mental retardation and other disruptive symptoms, that is caused by a recessive gene.
13. Down syndrome, the most common chromosomal disorder, is an autosomal chromosome disorder in which the twenty-first chromosome pair has an additional chromosome attached to it.

Prenatal Development

14. The approximately nine months of prenatal development takes place in three stages: germinal (the first two weeks after fertilization), embryonic (beginning of the third week to the end of the eighth), and fetal (from the beginning of the third month to birth).
15. Addictive drugs, alcohol, tobacco, and a multitude of medications can cross through the placenta and damage the developing fetus. No drugs should be used during pregnancy unless absolutely necessary and taken under close medical supervision.

Physical Development

16. Brain growth is very rapid in the early years of life. At age six months, the brain is 50 percent of its adult size; by age five it has reached 90 percent of its adult size.
17. Research has revealed anatomical and biochemical brain changes associated with improved cortical functioning in animals exposed to environmental enrichment.
18. Both physical growth and motor development follow two basic patterns: cephalocaudal (from head to foot) and proximodistal (inner to outer).
19. Motor development follows a pattern of progression from the simple to the more complex.
20. Within a normal range of experiences, the role of environmental influences on motor development is quite limited.

Cognitive Development

21. Piaget formulated the concepts of schemas, assimilation, and accommodation to explain how we organize incoming information (schemas), interpret it in accordance with existing schemas (assimilation), and restructure it to fit better with already existing schemas (accommodation).
22. Piaget viewed cognitive growth as a four-stage process with qualitatively different kinds of thinking occurring in each of these four stages: sensorimotor, preoperational, concrete operations, and formal operations.

CHAPTER REVIEW

23. During the sensorimotor stage (birth to about twenty-four months), infants learn about their worlds primarily through their senses and actions.
24. The preoperational stage (ages two to seven) is characterized by an increasing use of symbolic thought, language, and imaginative play. However, children at this stage have yet to master logical reasoning processes based on rules and concepts and have difficulty taking into account more than one perceptual factor at the same time.
25. Between ages seven and twelve, children in the concrete operations stage again make a qualitative leap as they begin to use logical mental operations or rules. However, children in this stage are not yet able to deal with completely hypothetical problems.
26. In the formal operations stage (age twelve and older) individuals acquire the ability to think abstractly and to make complex deductions and solve problems by systematically testing hypothetical solutions.

Psychosocial Development

27. Attachment is the term applied to the intense emotional tie that develops between infants and their parents or other consistent caregivers. The most intense attachment relationship that typically occurs in the early stages of development is between mother and child.
28. Research suggests that satisfaction of contact comfort is more important in establishing attachment than is gratification of being fed.
29. Infants deprived of early attachment with nurturing caregivers may suffer serious development difficulties. However, there is evidence that damage associated with deprivation in early infancy can be overcome by ample loving nurturance during childhood.
30. In general, children who are securely attached to their mothers or other caregivers demonstrate a healthier picture of psychosocial adjustment than children who are insecurely attached.
31. Research has shown that most infants form specific attachments to their fathers at about the same time as they establish these relationships with their mothers.
32. The authoritative style of parenting is much more conducive to the development of social and emotional competence in children than either the permissive or authoritarian parenting style.
33. Erik Erikson's theory of psychosocial development outlines eight stages that people pass through during their journey through life: trust versus mistrust (birth to eighteen months); autonomy versus shame and doubt (eighteen months to three years); initiative versus guilt (ages three to six); industry versus inferiority (ages six to eleven); identity versus role confusion (ages twelve to eighteen); intimacy versus isolation (early adulthood); generativity versus stagnation (midlife); and ego integrity versus despair (older years).

CHAPTER REVIEW

Adolescence

34. In the United States and other modern Western societies, the period of adolescence is prolonged. Unlike many nonindustrial societies, our society has no single initiation rite that signals passage into adulthood.

35. Puberty is the approximately two-year period of rapid physical changes that culminates in sexual maturity. The adolescent growth spurt usually runs its course in the two years following the onset of puberty.

36. In general, research has shown that early maturation holds some advantages for boys and some disadvantages for girls.

37. The onset of adolescence is marked by the emergence of the capacity to manipulate objects mentally that are not physically present and by the ability to engage in deductive reasoning, both traits Piaget associated with the formal operations stage of cognitive development.

38. According to Lawrence Kohlberg's theory of moral development, most children between the ages four and ten exhibit a preconventional morality in which they behave in certain ways to avoid being punished or to obtain rewards. By late childhood or early adolescence, we achieve the level of conventional morality exemplified by the desire either to help others or to help maintain the social order. Some adults progress to the final level of postconventional morality, in which they affirm individual rights and perhaps are guided by universal moral principles that may conflict with society's rules.

39. Adolescent sexuality in America is influenced by considerable pressure to be sexually active, perceived popularity, and increased sexual motivation.

40. Since the latter half of the twentieth century, there has been a strong upward trend in the numbers of adolescents who engage in sexual behaviors. The levels of sexual activity are now essentially the same for female and male adolescents.

Adulthood

41. Many age-based expectations (the tendency to associate certain developmental tasks or appropriate behaviors with each phase of adult life) have begun to break down in contemporary society. We appear to be moving in the direction of an age-irrelevant society in which such attributes as age, race, and sex are diminishing in importance as regulators of behavior.

42. During early adulthood (the twenties and thirties), people reach the peak of their biological efficiency. During this time, most of us enjoy the best health of any time in our lives.

43. Middle adulthood (the forties and fifties) brings a gradual decline in physical functioning and perhaps a corresponding increase in health problems.

44. Our society has a double standard of aging that tends to regard postmenopausal women as past their sexual prime, whereas men's physical and sexual attractiveness is often considered to be enhanced by the aging process.

CHAPTER REVIEW

45. Research has shown that people retain their intellectual abilities well into middle age and beyond. Some changes in specific kinds of intelligence do appear to be age-related. Crystallized intelligence, which results from accumulated knowledge, tends to increase with age. In contrast, fluid intelligence, or the ability to conceptualize abstract information and to solve problems, tends to decline after age thirty.
46. Erik Erikson identified traditional marriage as the avenue for fulfilling intimacy needs. Today, however, an increasing number of people remain unmarried, and many are able to fulfill their intimacy needs through close friendships and/or cohabitation relationships.
47. Studies have linked marital happiness to positive communication, high levels of physical intimacy, mutual empathy, spending focused time together, sharing values, and flexibility.
48. Having children may be associated with both positive and negative consequences. On the positive side, parenthood may enhance a couple's love and intimacy and provide them with a sense of accomplishment and a chance to discover untapped personal dimensions and resources. On the debit side, children often sap energy, reduce time for each other, and place a drain on emotional and financial resources.

The Older Years

49. Over the last few decades, the number of Americans sixty-five and older has grown at twice the rate of the rest of our population.
50. In the older years, people experience a decline in all sensory functions together with a reduction in organ reserve (the capacity of organs like the heart and lungs to increase their outputs under emergency conditions).
51. There is ample evidence that regular exercise can significantly reduce the deterioration of both physical and cognitive functions that accompany aging.
52. For most people, the ability to learn and retain meaningful information declines only slightly in the later years.
53. Many older men are using testosterone replacement to preserve muscle mass, bone density, and cognitive functioning as they age.
54. The most common form of senile dementia is Alzheimer's disease, which has been linked with the beta amyloid protein that creates neurofibrillary tangles that destroy brain cells. Research is focusing on drugs and antibodies that target amyloid.

55. Studies have shown that satisfaction with life in general and feelings of well-being tend to be higher among the aged than among younger adults, particularly in those who remain both physically and cognitively active.

56. Happiness in the later years does not appear to be correlated with a particular lifestyle. Some older people are happiest when they are busy and socially involved; others may enjoy indulging in plenty of relaxation. Older people tend to select a lifestyle that reflects their personality and the kinds of activities they engaged in while they were younger.

57. Maintaining a network of social support seems especially important for the health of older adults. Social isolation is associated with a greater risk of disease and prolonged recovery from illness.

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POP QUIZ

True or False

___ 1. A major drawback of the cross-sectional design is that it takes an extended period of time to collect all the necessary information.

___ 2. Huntington's disease is a genetic condition that newborn infants are routinely screened for; if the condition is present, dietary changes can prevent the symptoms of the disease.

___ 3. Results of experiments with rats suggest that early experience affects the development of the brain.

___ 4. Children are first able to understand the principle of conservation in the preoperational stage of cognitive development.

___ 5. Assimilation refers to the process whereby society conveys behavioral expectations to the individual.

___ 6. Adolescence refers to the approximately two-year period of rapid physical change that culminates in sexual maturity.

___ 7. Typically by late childhood or early adolescence, an individual would be functioning at the level of conventional morality.

___ 8. The term climacteric refers to physiological changes associated with the transition from fertility to infertility for both men and women.

___ 9. The brain begins to decrease in size as a result of neuron loss by about age forty.

___ 10. The activity theory proposes that the aging process is a consequence of wear and tear on one's body.

Multiple Choice

11. Unlike psychologists who emphasize the role of learning, psychologists who emphasize maturation view development as a _____ process that results in _____ changes.
    a. continuous / qualitative
    b. continuous / quantitative
    c. discontinuous / qualitative
    d. discontinuous / quantitative

12. The research design used in developmental research that attempts to overcome some of the drawbacks associated with the other two designs is the _____ design.
    a. cross-longitudinal
    b. cross-sequential
    c. cross-sectional
    d. longitudinal

POP QUIZ

13. A person who is heterozygous for a sex-linked recessive trait (e.g., red-green color blindness) _____.
    a. will not exhibit the recessive trait in their phenotype
    b. is female
    c. may have offspring who exhibit the recessive trait regardless of the genetic makeup of the other parent
    d. All of the above.
14. A newborn's brain has what percentage of neurons?
    a. Only 25 percent of the neurons of an adult
    b. 75 percent of all the neurons it will ever have
    c. 50 percent of all the neurons it will ever have
    d. Most—if not all—of the neurons it will ever have
15. What is a mental structure that guides future behavior while providing a framework for making sense out of new information called?
    a. An operation
    b. A schema
    c. Accommodation
    d. Assimilation
16. What is the correct order of Piaget's stages of cognitive development?
    a. Sensorimotor, concrete operations, preoperational, formal operations
    b. Preoperational, sensorimotor, concrete operations, formal operations
    c. Concrete operations, preoperational, sensorimotor, formal operations
    d. Sensorimotor, preoperational, concrete operations, formal operations
17. A child begins to use logic to solve problems during the _____ stage of cognitive development, and can first think abstractly in the _____ stage of cognitive development.
    a. formal operations / concrete operations
    b. preoperational / concrete operation
    c. concrete operations / formal operations
    d. preoperational / formal operations
18. The "strange situation" is used to evaluate which of the following?
    a. A child's stage of cognitive development
    b. Infant–mother attachment
    c. Mother–infant attachment
    d. A child's stage of psychosocial development

19. The stage of Erikson's theory of psychosocial development that is characterized by an extensive reflection concerning past accomplishments and failures concerns the _____ crisis.
    a. ego integrity versus despair
    b. initiative versus guilt
    c. generativity versus stagnation
    d. industry versus inferiority

20. If an adolescent developed breasts but, even after several years, did not begin menstruation, and all other causes had been ruled out, a medical doctor would most likely suspect which of the following?
    a. The presence of two Y chromosomes
    b. Androgen insensitivity syndrome
    c. DHT deficient male syndrome
    d. Fetally androgenized female syndrome

21. What does the adolescent growth spurt indicate?
    a. It occurs at a younger age in boys than in girls.
    b. It refers to a four-year time span of rapid physical growth in early adolescence.
    c. It is completed before a child reaches sexual maturity.
    d. It occurs after a child reaches sexual maturity.

22. When people have cognitively matured to the point at which they can explore hypothetical or "what if" possibilities, Piaget would say that they are in the _____ stage.
    a. sensorimotor
    b. preoperational
    c. concrete-operations
    d. formal-operations

23. Kohlberg was more interested in a person's _____ rather than in his or her _____.
    a. moral behavior / moral reasoning
    b. yes-or-no answer to a moral dilemma / moral behavior
    c. yes-or-no answer to a moral dilemma / moral reasoning
    d. moral reasoning / yes or no answer to a moral dilemma

24. The popular image of the teenage years as a time of rebellion, storm, and stress is considered which of the following?
    a. Substantiated by studies
    b. Applicable only to early adolescent years
    c. More myth than fact
    d. True only in the United States

POP QUIZ

25. When do most people reach the peak of their reproductive capacities and enjoy the best health of any time in their lives?
    a. Middle adulthood
    b. Early adulthood
    c. Later adulthood
    d. Late adolescence

26. What is one problem with cross-sectional studies on intelligence?
    a. Older groups experienced less formal education.
    b. Older groups have less experience with standardized tests.
    c. Groups have experienced varied cultural conditions.
    d. All of the above reasons are valid.

27. Approximately what percent of young adults (25–35) are married today?
    a. 60
    b. 50
    c. 80
    d. 25

28. Which of the following vision problems is ***not*** increasingly common in the older years?
    a. Night vision problems
    b. Perceiving color
    c. Farsightedness
    d. Nearsightedness

29. Current evidence links the cause of Alzheimer's disease to which of the following?
    a. An excess of the beta amyloid protein
    b. A defective gene on chromosome 21
    c. Environmental factors
    d. Gene mutations on several chromosomes

30. Erikson's developmental theory of the older years—ego integrity versus despair—is consistent with the idea that older people _____.
    a. select a lifestyle that reflects their personality
    b. are concerned with problem finding
    c. conduct a life review
    d. demonstrate postconventional thought

Answer Key: 1. F 2. F 3. T 4. F 5. F 6. F 7. T 8. F 9. F 10. F 11. c 12. b 13. d 14. d 15. b 16. d 17. c 18. b 19. a 20. b 21. c 22. d 23. d 24. c 25. b 26. d 27. b 28. d 29. a 30. c