Chapter 2

Theories of Infant Development

CHAPTER OUTLINE AND OVERVIEW

Learning Theories  *How do infants learn? What are the conditions most conducive to infant learning?*

Cognitive Theories  *What are the developmental origins of perceiving, remembering, thinking, and speaking? Are infants intelligent before they can speak?*

Systems Theories  *In what ways do fetuses differ? What are the major causes of these individual differences?*

Clinical Theories  *What has therapy with adults and children revealed about how infancy contributes to psychological development? What are the therapeutic effects when adults reexperience the feelings and movements of normal infant behavior and development?*
People acquire a personal theory about infants in the course of working with infants or raising one of their own. A scientific theory differs from personal theories in several ways. A **scientific theory** is a set of concepts that explains the observable world with structures, processes, or mechanisms that are presumed to exist but that cannot be observed directly.

1. A scientific theory helps to organize observations derived from systematic research, using accepted methods of observation and assessment.
2. A scientific theory is phrased in terms of general principles that can be applied to specific research findings and applications.
3. A scientific theory should accurately predict future observations in a majority of cases. A theory whose predictions are not confirmed should be changed or abandoned.

Scientific theories of human development focus on describing and predicting the ways in which children change over time and the origins of individual differences. Why does one child become adept at language skills from an early age, for example, while another is slow to pick up these abilities?

In this chapter, we shall examine a variety of theories of human development that have been applied to infancy: biological, learning, cognitive, systems, and clinical theories. The main principles and concepts of each theory are described, the historical trends within each are reviewed, and the contributions of the theory to contemporary research are outlined. Finally, the main limitations of the theory are discussed.

**BIOLOGICAL APPROACHES**

Biological approaches are based on the work of Charles Darwin, who theorized that differences between species and between individuals are shaped by whether or not the individual has the ability to survive long enough to reproduce. In a process called **natural selection**, the individuals who can successfully adapt to the environment will live long enough to reproduce and pass some of their characteristics down to the next generation. Thus, the environment influences which types of characteristics will survive and continue to evolve (Darwin, 1859).

Part of what gets passed down between generations is the genetic code. In sexually reproducing species, each parent passes half of his or her genetic code to the offspring (see Chapter 3). The genetic code is a set of chemical instructions for producing proteins in the nucleus of a living cell. This raw genetic code, made up of large molecules of deoxyribonucleic acid (DNA), is called the **genotype**. Every cell in a person’s body contains the same exact genotype. In order for different cells to take on different functions—such as the neural, skeletal, muscular, and other tissues that underlie mental and behavioral abilities—the environment of the cell and of the organism as a whole affects the actions of the genotype. This occurs via the **epigenome**, a set of biochemical markers that are responsive to the environment and that literally turn on or turn off the actions of particular genes within each cell (see Chapter 3).

The outcomes of the genotype-environment interactions—the resultant products—are called **phenotypes** and include not only tissues but also behaviors, intelligence, and temperament. Thus, it
is important to understand that the genotype does not directly determine the phenotype; rather, the genotype determines the opportunities by which the environment may have an influence on the phenotype (Gottlieb, 1991b). Natural selection, then, does not operate on the genetic code directly. Natural selection operates on the phenotypes, the characteristics of the individual in his or her environment. In this section, we will review two biological approaches: behavior ecology theory and behavior genetics.

Behavior Ecology Theory

Species-specific behavior. Behavior ecology theory is the study of behavior from an evolutionary perspective. Drawing upon Darwin’s ideas, behavior ecology theory suggests that all animals have species-specific behaviors that evolved through the process of natural selection. Species-specific behaviors are those that are seen in only one species, such as chimpanzee calls or human speech. Although these two behaviors are species-specific, both are examples of a more general function of communication. The selection of a specific form of communication in a species is presumably related to the survival of its members over many generations and the maintenance of a particular environment—including the interindividual social environment—in which that form of communication can flourish.

Another example of a general cross-species behavior related to survival is the attachment bond between parent and infant seen in most mammalian species, but each species shows this in different ways. Mother cats lick and nuzzle their infants, while mother monkeys groom and cuddle their babies and carry them around. All mammals nurse their young, but the styles of nursing differ between species. In dogs, the mother lies on her side while her puppies nurse. The mother does not look at her babies, but she may lick them and smell them.

Critical periods. Another aspect of behavior ecology theory is the prediction that species-specific behaviors are enhanced and modified in specific environments and at specific times during the life course. In many animal species, the young are biologically more susceptible to the acquisition of new behavior than older individuals. Often there is a limited period of time early in life during which environmental input can make a difference in later behavior. This period of maximum susceptibility is called a critical period and is a relatively short (compared to the individual’s life span) and clearly demarcated period of time in which learning can occur and during which whatever the animal learns has a permanent and irreversible effect.

In some species of birds, for example, attachment of the infant to an adult occurs only during a period of about two hours, several days after hatching. If a gosling follows its mother around during the critical period, it will develop a preference for the mother over other adults and will stay close to her after the critical period ends and for a long time afterward. This learning of preferences for particular adults is called imprinting.

Konrad Lorenz (1965) found that goslings could become imprinted on a number of different objects during this period. Lorenz made goslings imprint on flashlights, electric trains, and even himself. He would walk near the goslings during the critical period, squating and honking like a mother goose. In his description of these early studies, he wrote, “In the interest of science, I submitted myself literally for hours on end to this ordeal” (Lorenz, 1952, p. 42). For this and other work, Lorenz won a Nobel Prize in 1973. He is one of only three behavioral scientists to have received this honor. The other two—Niko Tinbergen and Karl von Frisch—were also behavior ecologists.

A large number of studies—mostly with mard ducklings—have been done on imprinting since Lorenz’s classic work. One of the main findings is that imprinting occurs only after the ducklings leave the nest and only if they can follow a moving adult duck that is calling to them (Bateson, 1966; Hess, 1959). One study (Dyer, Lickliter, & Gottlieb, 1989) suggests that before imprinting, ducklings may be more sensitive to the visual images of their walking siblings than to the mother duck. Ducklings may initially leave the
nest as they see other ducklings doing so. Once this happens, the ducklings will respond as a group to the mother duck’s call, follow her as a group, and thus become imprinted. Other environmental factors also affect the imprinting process. Ducklings need to hear their own call prior to hatching. In experiments in which duck embryos were made unable to vocalize, they did not recognize the mother’s call after hatching (Gottlieb, 1991a). If quail chicks are exposed to patterned light during the first days after birth, instead of seeing their mothers or siblings, they will not imprint even if they can hear the mother’s call (Lickliter & Hellewell, 1992).

In birds, critical periods occur in infancy that set down a behavioral pathway for the remainder of their lives. Cow bird males, for example, can either become aggressive and competitive in finding a single mate in their adult sexual behavior, or they can be egalitarian and choose among multiple mates with no competition. It all depends upon whether, as infants, they hear competitive versus egalitarian adult males singing in their environment, since there is a difference in the singing of these two types of adult male (White et al., 2007).

We shall see in Chapter 5 that gender stereotypical play in human children depends in part on the behavior of adults in their environment during the period between 2 and 4 years of age, particularly the behavior of the adult males (Hernández, Blasi & Bjorklund, 2003).

The picture of imprinting that emerges from these studies is that a series of related environmental events must be tied together. Imprinting involves age mates, locomotion, and auditory and visual perception and cannot be thought of as simple photographic images of the mother printed on the duckling’s brain. Imprinting does not occur in humans and other primate species because the infants are too immature to follow their parents around. Human parents, therefore, play a greater role in the mutual maintenance of proximity. The lasting emotional tie that promotes this proximity is called attachment (see Chapter 7). Also, the critical period for human attachment in humans, monkeys and apes is longer and the environmental conditions under which attachment may occur are more complex.

If there is severe deprivation of parental care, the critical period for attachment is easier to observe. Studies of infants reared with little adult interaction in orphanages in Eastern Europe and in the Middle East showed that these children developed severe symptoms of withdrawal and have life-long socioemotional impairments. Infant monkeys reared without adults tend to show similar symptoms: rocking, head banging, extreme fear in the presence of strangers, and an inability to form relationships with other individuals (Harlow & Harlow, 1965; Spitz, 1965).

Even with these clear deprivations, the situation is more complicated than it may seem. Some of the early orphanage studies have been criticized for confusing the symptoms of malnutrition—common in those institutions—with those predicted for maternal deprivation. Since research that deliberately deprives infants of their mothers is ethically forbidden with humans, researchers have used nonhuman primates for this research. Follow-up studies on monkeys deprived of their mothers early in life showed that some social experiences—in particular, interactions between the deprived monkeys and monkeys younger than themselves—provided when the deprived monkeys were juveniles had the effect of partially reversing the social withdrawal (Suomi & Harlow, 1972). Gorilla infants who are raised by humans develop more aggressive and antisocial behaviors than do gorillas raised with gorilla parents. After spending time in a group of gorilla peers, however, human-reared juvenile gorillas will act more like those who were reared by their own mothers (Meder, 1989). Like the duckling studies, attachment during the critical period of infancy depends upon multiple factors.

Another potential example of a human critical period is the development of language in the first three years of life. Again, severe deprivation is found in the case of a girl named Genie, who was found in 1970 at the age of thirteen after having been isolated in a small room since infancy. Her father, apparently a psychotic who hated children,
forced Genie to remain in a closet and refused to let anyone speak to her. Susan Curtiss, a developmentalist who spent many years trying to help Genie recover, reported that Genie learned some language (Curtiss, 1977) and after several years of practice could string up to three words together to make her intentions and thoughts known. But she never seemed to grasp the idea of grammar, and she never learned to ask questions.

The problem with this single case study is that we have no way of knowing whether Genie suffered from some form of brain damage or other impairment early in life. Such an organic deficit might be the real cause of Genie’s language retardation. Ethically, we cannot do language deprivation experiments on groups of healthy children.

In summary, critical periods exist for humans but they depend upon a complex network of environmental factors. The clearest example of a critical period in human development is the first six months of prenatal development. Environmental influences—such as maternal nutrition and environmental toxins—can have severe effects on the health, physiological and brain development, and behavior that last for a lifetime. These processes will be reviewed in detail in Chapter 9.

Behavior Genetic Theory

Behavior ecology approaches typically focus on species-wide patterns, but what accounts for differences between individuals? Behavior genetics is the study of possible environmental and genetic explanations for individual differences in behavior and personality characteristics. In doing research in behavior genetics, it is essential to know how individuals are genetically related to each other and whether the environments in which they are
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raised are similar or different. A typical research strategy is to observe behavior, such as intelligence or temperament (a word researchers use to talk about infant personality; see Chapter 7), in identical compared to fraternal twins. Identical twins have the same set of genes, while fraternal twins share only a portion of their genes. Thus, if identical twins reared at home are more similar to each other than are fraternal twins reared at home, it is possible to conclude that at least some portion of the observed behavior is explained by a genetic contribution, since identical twins have more genes in common than fraternal twins, who are no more related to each other than any two siblings in a family.

Another research approach is to study identical twins who are adopted at birth and raised in different families. They will have the same genes but be reared in different environments. Twins reared together will be more similar than twins reared apart, showing that some of the similarity between identical twins is due to the fact that they are raised in the same shared environment rather than to their genetic similarity. The shared environment of identical twins can be observed because twins look alike and are the same sex, so they are more likely to be treated alike by parents than fraternal twins. Identical twins may be dressed alike and encouraged to spend time together, creating opportunities for mutual imitation and similar experiences. Even in the same home, however, each twin may have somewhat different experiences, called the nonshared environment (Loehlin, 1989; Plomin, 1994).

The study of similarities in characteristics between family members is another approach to behavior genetic research (Lemery & Goldsmith, 1999). This kind of study is useful if a particular trait, such as a suspected genetically caused disease, occurs disproportionately within particular families. Identical twins share 100 percent of their genetic material, while other siblings from the same parents share 50 percent of their genetic material, the same amount shared by parents with their children. Uncles and nephews, aunts and nieces, grandparents and grandchildren, and half siblings share 25 percent of their genetic material. If genetics plays a role for a characteristic, there should be a decreased probability of the occurrence of that characteristic in family members who are more distantly related and an increased probability of occurrence among those who are more closely related.

The heritability of the observed behavior measures the extent to which individual differences in the behavior are due to genetic factors. Heritability is usually expressed in terms of a percentage, the percentage of variability between individuals that can be explained by genetic variability. It varies between 0 and 1.00. Research findings show modest heritability (about 30 percent, on average) for some measures of intelligence, temperamental inhibition, empathy, self-esteem, and the ways in which individuals select, modify, create, or avoid specific features of their environments (Plomin, 1994; Robinson et al., 1992; Scarr, 1993; Zahn-Waxler, Robinson, & Emde, 1992). This means that 30 percent of the differences between people in these characteristics can be explained by genetic variability.

Because heritability is expressed as a percentage, results from behavior genetic research are probabilistic. That is, if you possess a particular set of genes, you have a higher probability of developing a particular kind of behavioral characteristic than a person without those same genes. The action of the genes is not deterministic, since there are environments that might lessen the impact of those genes on the behavioral outcome (Scarr, 1993; Scarr & McCartney, 1983).

Some genetic predispositions, for example, may never appear in the phenotype because the genotype is never exposed to a “needed” environmental resource at a particular time in life (Turkheimer et al., 2003). Thus, a gosling will never manifest its species-typical attachment behaviors if it is not exposed to an adult goose during the critical period for imprinting. This is an example of a genetic predisposition that is easily influenced by the environment. In this case, environmental variability has a larger probability of predicting individual phenotypes than does genetic variability. In fact, genetic variability usually
accounts for only a small proportion of behavioral variability. Many genes, each with a small influence, rather than a single gene, are typically involved in influencing behavior (Plomin, 1990, 1994).

Other genotypes may be less susceptible to variations in the environment. If infants have a color blindness genotype, variability in the amount of exposure to visual stimuli will have little influence on the phenotype of color blindness. In this case, genetic variability between individuals (inheriting or not inheriting color blindness genes) has a larger probability of predicting individual phenotypes than does environmental variability.

No genes and no environments are 100 percent deterministic. Some genetic disorders can be eliminated in the phenotype through surgery, by drug treatments, or by avoiding certain environmental factors (e.g., controlling diabetes through diet). There is also hope that some will be “cured” by as yet undiscovered techniques (see Chapter 9). The increased used of molecular biological methods in behavior genetic research also provides hope for the discovery of particular gene-environment interaction processes that can be more easily regulated to prevent or treat serious physical, behavioral, and psychological disorders (Plomin et al., 2003).

In some cases, genetic variability may predict variability in phenotypes early in life but not later. A stable pattern of temperamental withdrawal tends to be correlated with eye color (withdrawn infants are more represented in the group of blue-eyed infants than would be expected by chance) during the first three years of life. During the preschool period and later, there is no correlation between eye color and temperament (Kagan, Reznick, & Snidman, 1987). These findings suggest that temperamental withdrawal may be genetically based, but after several years, the variability of that phenotype in the population is better predicted by environmental rather than genetic variability. The opposite could also be true: a genetically based skill in language might account for between-infant differences at age three, but not earlier in infancy (Fagard & Jacquet, 1989; Ramsay, 1980).

The relationship between genes and environments is made more complicated because they influence each other. People with a particular genetic predisposition—for temperamental withdrawal, for example—may prefer to be with one or two other people rather than in large groups. Their choice of environments, or preference for particular behaviors, then influences the kinds of skills they can later develop (Karmiloff-Smith, 2007; Scarr & McCartney, 1983).

It is generally assumed that the environment of the home is independent of the child’s genetic predispositions. Studies based on parents who are identical and fraternal twins, however, reveal that parental warmth and affection are partly heritable. If the child inherits similar genes from genetically more affectionate parents, the environment created by those parents is also to some extent genetically determined (Losoya et al., 1997). Behavior genetic research is still in its early stages, but it promises to provide important new ways of understanding the origins of differences between people.

What Are the Problems with Biological Approaches?

Behavior ecology theory assumes that all behavior evolved through natural selection. While this may seem clear for species-specific behaviors such as attachment and language, the evolutionary basis of the effects of television on infants or their preference for one storybook over another is a more difficult theoretical problem. Because televisions and books were not in the environment in which the current species-typical characteristics evolved, they are not easily understood from this perspective. It may be, however, that our inherited ability as humans to invent tools and technologies underlies the more specific abilities. This allows us to do things that did not evolve by natural selection, things that are nevertheless adaptive and enhance our ability to pass these characteristics to the next generation (Buss & Goldsmith, 1998).

One criticism of behavior genetics is that in most human situations, it is extremely difficult to sort out the relative effects of genetic and environmental variability. It is difficult to find cases of identical twins reared apart. Even when this
happens, the reasons for the twins’ separation at birth may make them unrepresentative of the rest of the population. Also, adoptions tend to occur within similar racial, ethnic, and social-class groupings, increasing the degree of shared environment, which may account for the twins’ similarity (Baumrind, 1993; Jackson, 1993).

Another problem with behavior genetic research is that while it gives some numerical estimate of genetic and environmental influences for groups of people, it does not tell us anything about a particular individual and his or her probability of inheriting the genetic potential or showing the characteristic in the phenotype (Gottlieb, 1995). Also, behavior genetic research tells us nothing at all about the ways in which the genes and environment act to produce a phenotype, so it gives no guidelines for intervention should a genetic problem be suspected, nor for how to enhance the development of a particular child (Baumrind, 1993). As the future brings more technological advances in the field of molecular biology, it may be possible to find the particular genes associated with those characteristics that have been shown to have a higher heritability (Plomin, 1994; Plomin & Rutter, 1998).

LEARNING THEORIES

Traditionally, learning theories have been contrasted with evolutionary theories as being on opposite sides in the nature-versus-nurture debate. Learning theories suggest that the environment is the most potent influence, while evolutionary theories dwell on genetic influences. As we saw in the section on behavior ecology theory, this simple characterization is not accurate. There is no clear separation between nature (the views of Rousseau and Gesell) and nurture (the views of Locke and Watson).

Evolutionary theory researchers believe that the genes regulate the kinds of learning possible in a species and the age at which it can take place (Richardson, 2008). Often, their research methods are nearly identical to those of learning theorists: both are studying the conditions under which learning takes place. On the other hand, learning theorists are cognizant of species differences in learning, since the vast majority of work based on learning theory has been done with nonhuman species.

Learning theory researchers have contributed to our understanding of development in several ways. First, they have discovered simple yet powerful ways to enhance learning. Second, they have shown that with the proper kinds of environmental supports, individuals and species can be trained to achieve considerably more than what might have been expected from evolutionary models of species-typical behavior. We might say that learning researchers work at the upper end of a species’s range of abilities as they search for more optimal strategies to enhance learning skills.

Classical Conditioning

The Russian physiologist Ivan Pavlov (1849–1936) published one of the first demonstrations of learning as a result of systematic environmental manipulation. Pavlov attempted to teach dogs to salivate on cue, not simply in the presence of food. He discovered that if a bell was rung every time a hungry dog was presented with food, the dog would later salivate at the sound of the bell without any food present. This process, called classical conditioning, or learning by association, is illustrated in Figure 2.1.

In classical conditioning, there must be an unconditioned stimulus that induces the unconditioned response. An example from human infancy is the fear (unconditioned response) induced by strangers in strange places (unconditioned stimulus). Learning occurs when the unconditioned stimulus occurs at the same time as some new conditioned stimulus. Following repeated exposure to this pairing of conditioned and unconditioned stimuli, the unconditioned response will occur in the presence of the conditioned stimulus. For example, if the infant’s doctor wears a white coat, the fear of the strangeness of the doctor’s office may become associated with white coats. Thus, the infant may later cry
at the sight of anyone—even a familiar person—wearing a white coat.

Operant Conditioning

In an experiment that led to a later development in learning theory, B. F. Skinner (1938) tried to condition birds. Since classical conditioning theory assumes that all unconditioned responses must be related to unconditioned stimuli, Skinner faced a problem. He could not discover the unconditioned stimuli for most of the animal’s actions: it seemed to emit behavior spontaneously without any obvious external stimulation. Skinner referred to these spontaneously emitted actions as *operants*. Pigeons, for example, peck (the operant) even when not eating. Skinner was not interested in what caused the operants, and he accepted the fact that each different species will have different types of operants. His goal was to change the way in which the animal emitted the operants.

Skinner discovered that the rate of emitted behavior could be controlled by the consequences of the behavior; that is, by what happened in the environment immediately following the operant’s occurrence. In one experiment, a pigeon was placed in a cage with no food tray. On the side of the cage was a colored disk. As the pigeon in the cage emitted the operant of pecking, it pecked at all the parts of the cage at random. When the bird happened to peck the colored disk, a small bit of food was dropped into the cage. Over time, the bird began to narrow down its pecking to the region of the cage containing the disk, and eventually it pecked exclusively at the disk: the animal discovered the contingency between its own operant, the disk, and the food. This is similar to our description of the response-contingent method of infant research (see Chapter 1). The process by which the frequency of an operant is controlled by its consequences is called **operant conditioning**.

Consequences that increase the frequency of the preceding operant are called **reinforcers**. A **positive reinforcer** is an action or reward that follows the operant and increases its frequency. In some cases, the frequency of an operant is increased following the removal of an aversive
stimulus. Thus, the absence of a consequence that increases the frequency of the operant is called a negative reinforcer.

Suppose an infant performs some action that the parents would like to encourage, such as drinking all his or her milk. Parents can increase the frequency with which this happens by praising the child after he or she has finished the milk (a positive reinforcer). On the other hand, the child may increase the frequency with which he or she finishes the milk to avoid being scolded for not finishing it. The absence of scolding becomes a negative reinforcer. A negative reinforcer is not negative in the sense of being bad or unrewarding, but rather in the sense of being absent. Not getting scolded is a rewarding consequence for the child.

Unrewarding consequences have the effect of decreasing rather than increasing the frequency of a particular behavior. An unrewarding consequence that decreases the frequency of an operant is called a punishment. In the above example, the scolding may act as a punishment to decrease the probability of the child’s not finishing the milk.

Another way to decrease the frequency of a behavior is by extinction. This is the process by which the frequency of an operant decreases when a reinforcing consequence is removed. In the first few months of life, it is important to respond promptly to an infant’s crying. This response, however, may increase the frequency with which the infant cries (although the intensity and duration of the crying episodes may decline over time). When the infant is several months older and is better able to tolerate distress, parents may want the infant to calm down on his or her own. Parents can extinguish crying by not responding to it as frequently or as promptly as before.

Both classical and operant conditioning are able to explain particular learning phenomena in infancy, especially in situations in which there are repeated opportunities for exposure to similar environmental consequences. There are, however, developmental differences in an infant’s susceptibility to conditioning and to the types of environmental stimuli and conditions that are most likely to serve as reinforcers or punishers. Unfortunately, learning theory cannot explain how these individual differences and development changes are caused.

Social Learning Theory

Researchers began to notice that simple conditioning was not enough to explain patterns of behavior seen in infants and children. Several theoretical developments led to social learning theory. First of all, researchers discovered that as infants change their behavior to adjust to the contingencies between their behavior and the environment, the infants seek to change the environment to preserve or enhance the same pattern of contingencies. Thus, infants come to control not only their behavior but also the behavior of other people around them (Bijou & Baer, 1965).

Suppose, for example, a parent reinforces the child every time the child asks for help and ignores the child whenever the child whines or cries to get help. The child is likely to increase the frequency of verbal requests for help, but in addition, the child will come to expect help whenever it is asked for in the appropriate way. On the parent’s side, when the child asks for help verbally and without whining, the parent is more likely to provide the assistance. Thus, the increase in the child’s verbal requests will condition the parent to increase the frequency with which he or she gives help. As a result of this complex social process, the child’s recognition of the contingency has ultimately changed that child’s social environment.

A second theoretical development was the discovery that infants could change their behavior in ways that had nothing to do with conditioning. Entirely new behaviors could be acquired almost immediately through observational learning (Bandura, 1977). Just by watching an adult or peer model, an infant could imitate the behavior and incorporate that imitated act into the infant’s own goals.

A final theoretical advance of social learning theory is the idea that infants are more likely to acquire new behaviors in some situations than in others. Both conditioning and observational learn-
ing are more likely to occur if infants are motivated to pay attention to the consequences of their action or to the model. Thus, an infant’s goals help to organize the way in which he or she picks up information from the environment. In a word, social learning theory introduced the self (including cognitions and motivations) as an intelligent actor and organizer of information. As Figure 2.2 shows, learning is an interaction between the behavior to be learned (is it easy or difficult to master?), the environment in which it is learned (does the environment support or inhibit the learning?), and the factors the person brings to the situation (is the person motivated to learn?).

If someone gives the infant a task to learn and models a behavior that is too difficult for the infant, if the infant is not interested at that moment in learning, or if consistent and positive help from others is not provided, this affects not only learning but the infant’s emotional experience as well. If the infant’s experiences are contingent upon his or her actions, and if those actions subsequently change the behavior of others in ways that accord with the infant’s goals, a feeling of self-efficacy emerges (Bandura, 1989). If, on the other hand, the infant’s goals are typically thwarted and the social environment behaves capriciously, feelings of helplessness and despair emerge (Seligman & Maier, 1967).

Social learning theory has been applied to a wide variety of issues in infant development. It suggests that environments can be structured in ways that are conducive to infant learning and to longer-term feelings of self-efficacy. The theory focuses on the immediate context of behavior and shows the importance of the environment’s being responsive to the infant’s current goals and needs and not merely a mechanical producer of reinforcers.

In the first few months, infants are largely dependent upon the pushes and pulls of their emotions. Later, they develop the ability to self-regulate their emotions through a process of social learning. Infants come to identify particular feelings with particular expressions and verbal labels. In this view, infants have feelings that they do not understand or recognize. Through a process of parental labeling of their feelings (e.g., saying things like “You must be angry” or “Why are you sad today?”), children learn to construct the social meaning of their emotions. Children also imitate adults’ use of emotion expressions in particular situations. If adults are smiling, the infant will also smile. In the process, the infant comes to associate the inner feelings of enjoyment with the expression of smiling in others and with the typical situations in which such feelings tend to occur. In addition, strong emotions become less frequent with age and are expressed in more socially appropriate forms, by saying, “I’m really angry,” as opposed to screaming and hitting (Izard & Malatesta, 1987; Lewis & Michalson, 1983).

![Figure 2.2 Diagram of Triadic Reciprocity](image_url)

The triadic relationship between behavior, cognition and personal factors, and environmental contexts determines social learning.

What Are the Problems with Learning Theory?

Although learning theory has had remarkable success in predicting infant behavior during controlled laboratory experiments, real-life environments are never so simple or so contingent. Many processes, including genetic contributions, may influence the way behavior is acquired. Because learning theory focuses on the immediate conditions of learning, it appears to suggest that an infant can acquire any behavior at any age if the environmental and motivational conditions are right. Since this is clearly not the case, learning theory cannot explain the sequence and timing of developmental stages in infancy. Although learning theorists deny that stages exist, insisting instead that behavior is acquired gradually and cumulatively, the existence of universal developmental sequences cannot be denied. Learning theory also cannot explain the spontaneous emergence of new behaviors, such as stranger anxiety even when children have no prior experience with a stranger, or smiling in blind infants. Cognitive-constructivist theory, to be reviewed next, provides one explanation for the developmental stages of infancy.

COGNITIVE THEORIES

Cognitive developmental theories focus on the mental experience of the person. The goal is to understand intelligence: how people of different ages know about, perceive, plan, and remember their experiences. In cognitive theory, behavior is considered to be a form of intelligence because most of what people do is goal directed and depends upon their knowing what to do under particular circumstances. In this book, I focus on cognitive theories that have been applied to the study of developmental change in infancy.

Constructivist Theory

One of the central theories of infant cognitive development is that of Jean Piaget (1896–1980), who was trained as an invertebrate biologist before he became interested in the study of human development. Biologists used evolutionary theory to study development from the point of view of each individual’s adaptation to the environment. Adaptation is a change in an individual’s functioning that makes the individual better suited to survive in a particular environment. Piaget’s contribution to cognitive development was to conceptualize human intelligence as a form of adaptation to the environment. In his view, even small infants can act in intelligent ways, not by thinking but by acting physically on the environment in order to meet their own goals (Piaget, 1952).

For Piaget, an infant who is touching an object is developing an intelligent way of “knowing” that object. Knowledge is conceived of not as a static library of information but as an active process of co-construction between the knower and what is to be known. Co-construction means that what one knows depends upon how one acts on the environment and how the environment responds to those actions. Imagine what you would know about an object if all you could do were grasp it and bring it to your mouth, like a four-month-old. You don’t have the skill to shake or bang the object, and you do not have sufficient fine motor coordination to inspect its details with your fingers. But you can sense texture, hardness, shape, and the different feelings that come from touching the object with your mouth compared to your hand. All complex forms of knowing develop out of simpler actions found in infants, such as sucking, chewing, touching, seeing, and hearing.

Piaget brought two principles of biological adaptation into his study of the development of intelligent action: assimilation and accommodation. Assimilation refers to the process by which individuals use their existing abilities in response to challenges from the environment. It is the application of what one already knows or does to the current situation. Accommodation is the alteration of existing abilities to better fit the requirements of the task or situation. Accommodation is more likely to occur if assimilation does not result in an effective adaptation to the environment.
Typically, most actions involve both assimilation and accommodation. Between the ages of six and twelve months, human infants must learn to eat solid foods. This is not an easy task, because the infant’s tongue is not yet coordinated enough to keep food in the mouth. While sucking on a breast or a bottle, the baby’s tongue moves in and out like a piston. When a baby is first given solid food on a spoon, the baby’s response is to move the tongue as if he or she were sucking, which has the effect of expelling food from the mouth. Thus, the infant assimilates the tongue and mouth actions of sucking to the eating of solids. Since this simple assimilation leaves the infant hungry, the child must accommodate mouth and tongue movements so they are better adapted to the shape of the spoon and the consistency of the solid foods. The infant’s knowledge about food, therefore, is a co-construction between assimilation and accommodation, as each process influences the other to create the resulting action.

Piaget’s main goal was to apply his theory to the development of human intelligence, and he looked for the origins of intelligence in human infancy. He referred to the first two years of life as the sensorimotor substage because at that age infants were primarily involved in explorations involving their movements and senses. The main feature of sensorimotor development is the growth of infants’ understanding of their bodies and how their bodies relate to other things in the environment (Piaget & Inhelder, 1969). Piaget divided the sensorimotor stage into six substages. We will discuss substages 1 to 6 in Chapter 5. These are described in Table 2.1. Although they will not be discussed in this book, Piaget’s discoveries of stages beyond the infancy period are summarized in Table 2.2. The sensorimotor stage was thought to contain the seeds for the post-infancy development of thought, language, social skills, and morality.

Three basic principles about human infants characterize Piaget’s theory:

Individuals play an active role in their own development. The major motivation for develop-
mental change comes from the individual’s failure to reach an adaptation to the environment. This experience of failure, when accommodation and assimilation fall short of adaptation, is called **disequilibrium**. Since disequilibrium is defined in relation to what each individual wants to accomplish, it cannot be imposed from the outside: babies seek knowledge about those things that they most want to figure out or accomplish.

Infants develop knowledge by means of their own actions on the environment. The accommodation process literally changes the infant’s view of the world, since, by altering his or her own actions, the child comes to “know” new uses for the same objects. Through action, individuals create knowledge. Since knowledge is an active process of creation, this is often referred to as **constructivist theory**, according to which knowledge is built up—constructed—by the child’s own action rather than imposed on the child from the outside.

Infants will learn better from experiences if those experiences can be assimilated to their current developmental level. The currently available set of skills and knowledge is known as the infant’s schemes. Schemes can be sensorimotor, that is, involving physical actions such as reaching and chewing. Schemes can also be conceptual, involving ideas, concepts, or thoughts. In order for accommodation to occur, the infant has to assimilate the existing set of schemes to the environment. For
this to happen, the environment should present challenges that are moderate, not overly difficult or beyond the infant’s grasp. Thus, the first solid foods have to be soft in consistency (the infant does not have teeth yet) and given on a spoon that is small enough to fit in the infant’s mouth. Adults have to hold the spoon at just the right angle and move it in and out of the infant’s mouth at the appropriate time.

Piaget’s original work on infancy was based on observations of his own three children, Jacqueline, Laurent, and Lucienne, and he is known to have been empathically attuned to young children. His qualitative observations are unrivaled in their clarity, accuracy, detail, and theoretical import (see Qualitative Research, Chapter 1). Piaget’s work is clearly distinguished from learning theories and from evolutionary theories. Piaget believed that development is not imposed on the infant from the outside, nor is it guided solely by genetically based maturational change. Adaptation suggests a more active, infant-centered perspective.

Piaget referred to emotional processes only very briefly, but he believed that emotional development was parallel to the development of intelligence and should therefore follow his sequence of sensorimotor substages. The emotions of shame and pride, for example, do not appear in children until they have the cognitive ability to separate self from other and to recognize the existence of standards of behavior. Shame is the feeling of being exposed, and that means exposed in front of some other person. To be able to feel shame, we must realize that other people can see us as we see them. Similarly, pride is a sense of meeting or achieving some standard in the eyes of another person (see Chapter 7).

What Are the Problems with Piaget’s Theory?

One problem with Piaget’s theory is related to how Piaget decided to divide development into stages. As we discussed in the previous chapter, there is a certain arbitrariness in choosing a particular behavioral milestone to mark the beginning or end of a stage of development. Once you pick an indicator of a stage transition, then you do not expect to see that behavior appearing earlier or later in development. Unfortunately for stage theories, this often happens.

<table>
<thead>
<tr>
<th>Approximate Age (Months)</th>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>Sensorimotor</td>
<td>Infants learn through direct experience of the senses and by handling objects and moving them around. They do not understand that things exist outside their own actions.</td>
</tr>
<tr>
<td>3–7</td>
<td>Pre-operational</td>
<td>Ability to form mental representations, language, thinking as internalized action but centered on the self’s perspective; inability to think logically.</td>
</tr>
<tr>
<td>7–11</td>
<td>Concrete operational</td>
<td>Thinking takes the perspective of others and is logical with respect to concrete actions and objects such as the rules of a game; inability to think about abstract things.</td>
</tr>
<tr>
<td>12–adult</td>
<td>Formal operational</td>
<td>Thinking about non-concrete, abstract things; ability to solve word problems, form a coherent system of thought relating many ideas, and think about future possibility.</td>
</tr>
</tbody>
</table>

Research has shown, for example, that certain behaviors may appear earlier than Piaget’s stages suggest that they should. A good example is imitation. Piaget (1962) claimed that infants younger than nine months could not imitate movements such as a facial expression that they could not see themselves make. Yet current evidence indicates that such imitation may be possible at birth (see Chapter 5).

Perhaps a more critical problem for Piaget’s theory is that he failed to take account of the effects of adults on infants. Although he is given credit for helping us understand that infants are active learners, he did not attend to the facilitating and supportive environment that parents often provide and in which infants may exercise their curiosity. In order for infants to assimilate their eating to spoon feeding, for example, it requires an adult who can choose the right kind of food and spoon, an adult who is actively and constructively engaged with the infant. The role of adults is more explicit in systems theories, which offer the possibility for adult-infant co-construction, to be discussed later in this chapter.

INFORMATION-PROCESSING THEORIES OF COGNITIVE DEVELOPMENT

Imagine a toddler about two years old playing with her peers in a day care center. The toddler playroom is enclosed by glass windows that separate it from the entrance foyer of the day care building. Out of the corner of her eye, the toddler sees her mother come into the foyer. Her mother stops to speak with someone. The little girl gets up, walks to the door that opens onto the hall, walks down the hall, turns left, enters the foyer, and runs up to Mommy with arms outstretched. The child has solved a difficult problem in communication.

Piaget’s explanation of this behavior, assuming this is not the first time it happened, would be simply “assimilation.” Piaget might also place our toddler in the fifth or sixth sensorimotor substage, since she was able to see her mother as a separate person, stop what she was doing, and walk around a barrier to reach her mother. A younger baby might recognize her mother but try to walk directly to her by going toward the glass wall.

Many developmentalists are dissatisfied with Piaget’s explanation because it leaves unspecified the mental processes that may be involved. Let us think about what they might be. First of all, the child must be able to focus her attention on the person who walks in. Next, the jumble of colors, lines, and moving images must be organized into a coherent picture that has a meaning for the child; this is known as the perceptual process. The particular perception is organized according to specific categories using the processes of recognition and recall memory. The child interprets this perception as one that she has seen before, and she remembers what this perception means to her (Mommy!). At this point she can invoke thought processes to make some decisions. Should I go to see Mommy? How can I get there? Should I go through the door or wave at her through the window?

Information-processing theories attempt to specify the way in which the mind handles the information presented to it by the environment (see Figure 2.3). This type of cognitive theory does not run counter to Piagetian theory; it simply tries to provide a more specific picture of mental processes and their changes in the course of development. Research in information processing generally requires sophisticated technology to measure such things as visual fixation time, eye movement patterns, auditory sensitivities, and the like (see Chapter 1).

During the past thirty years, information-processing research has become the primary tool for studying infant cognition. Most of the research on perception and cognition reported in this book is based on an information-processing theory rather than on Piaget’s theory of development. Piaget’s work mapped the basic features of infant cognitive development. Information-processing research is now filling in the details.

Information-processing theory can be applied to the study of emotions. Changes in different
components of the information-processing system may change the way emotions are expressed and experienced during infancy. Emotions become more complicated as different ones are combined (e.g., joy and anger mixed will become mischief). Emotional expressions can be modulated by cognitive processes such as remembering, thinking, and planning. These lead to emotion regulation and coping (e.g., biting the lower lip to hold back crying, finding appropriate versus inappropriate ways to express anger). Finally, emotional states become detached from direct emotional experience and associated with cognitive beliefs and expectations (e.g., trying to smile in a social situation even though one is feeling sad). This latter achievement, however, does not begin until after the infancy period.

One advantage of information-processing theory is that it can be applied to problems in early education and in the treatment of handicapped infants. In Piaget’s view, infants pass through major stages in which all of their capacities are integrated and centered around a single stage. Information-processing views predict that infants may get off their cognitive developmental track if only one of their component processes is faulty. For example, an infant with poor perceptual skills may show signs of retardation even if everything else about the infant is intact and healthy. Without perception, however, nothing else can operate well. Simple interventions to improve hearing or eyesight, for example, may be all that is necessary to dramatically improve the developmental prognosis for some infants.

**What Are the Problems with Information-Processing Theory?**

One problem with information-processing theory is that it offers few clues about how each of the informational processing components develops. Each component—such as memory and perception—is presumed to change gradually, leading to overall improvements in cognition. Information processing is more a theory of how infants act and think than a theory of how action and thought develop.

Another problem is that there are many different approaches to information-processing theory and research and many thousands of research studies. Making sense of these different approaches is sometimes difficult, especially since there is no broader theoretical framework to use in interpreting the findings. So please beware. You should not expect the current knowledge on infant cognition to come neatly wrapped in nicely understandable packages.

**SYSTEMS THEORIES**

Systems theories share the view that all facets of the child and the environment are important, and that development is a complex process in which outcomes are determined through the active interaction of these facets. Rather than focusing on one element—emotion, cognition, or learning—systems theories attempt to understand developmental change in its entirety: the whole child in the whole environment.

A system is a set of interdependent components, each of which affects the others in reciprocal fashion. Systems theories recognize the mutual dependencies between the infant and the environment. The process by which systems components affect each other in a bidirectional and reciprocal way is known as transaction (Sameroff & MacKenzie, 2003). In the parent-infant interaction system, for example, the behavior of a parent is likely...
to depend on the sociability of the infant. Infants who smile more and cry less are likely to have parents who are more relaxed and socially attentive to the infant. This parental social attentiveness, in turn, will affect the infant’s continued sociability.

Consider this parent-infant system during a transactional process. The infant’s sociability affects the parents, which makes the parents more relaxed and which then affects the infant in ways that promote sociability. Feedback is a process by which components of a system have an effect on their own behavior during their transactions with other components. The behavior of the infant is fed back to the infant in terms of how the infant’s behavior affected the parent’s behavior.

Feedback transactions show how systems have the property of self-organization: the emergence of organized patterns due to the mutual influences of each component of the system on the others. Nothing from outside the system is required to maintain the transaction that enhances the infant’s sociability; it is a product only of the system’s transactions. The infant sociability transaction is an example of feedback that maintains the system over time. If the parent or infant has a bad day and is not so relaxed or socially attentive, it is likely that the sociability of one partner will help the other to calm down. Feedback that maintains a system’s characteristics over time in spite of small deviations is called deviation-correcting feedback (or negative feedback).

In other cases, however, the deviation from the normal state of affairs is larger than the system can tolerate and still maintain itself. Suppose, for example, the infant becomes ill and fussy. Under normal conditions, the parent would remain cheerful and attentive. If the parent too is under stress, however, the infant’s fussiness could lead to an increase in the parent’s level of stress, which then leads to the infant’s feeling even more distress and crying more, which leads to parental despair or anger. Feedback that drastically changes a system as a result of a small deviation is called deviation-amplifying feedback (or positive feedback).

Deviation-amplifying feedback generally works to change a system, while deviation-correcting feedback works to maintain it. Deviation amplification could also change a system for the better. The infant’s sociability may, with the support of the parent’s attentiveness, lead to the enhancement of the infant’s social skills with peers and other partners and to the growth of a wider range of shared communication between parent and infant.

Another facet of systems is that they have multiple levels. A parent-child relationship system, for example, is embedded within a larger family system. In addition to the feedback between parent and child, a parent’s relationship to the infant may also be affected by the parent’s marital satisfaction, his or her relationship with other family members, the financial well-being of the family, his or her own job satisfaction, and even society’s attitudes about the parenting role. Conversely, the successful functioning of society depends on the patterns of interaction and socialization within the family, where infants and children are initially prepared for their roles in that society.

**Ecological Systems Theory**

One of the first applications of systems theory to developmental psychology was the work of Urie Bronfenbrenner. He developed a conceptual framework for understanding the complex relationships between the infant, the family, and society. The ecology of human development is “the study of the progressive, mutual accommodation, throughout the life span, between a growing human organism and the changing immediate environments in which it lives, as the process is affected by relations obtaining within and between those immediate settings, as well as the larger social contexts … in which the settings are embedded” (Bronfenbrenner, 1979). Bronfenbrenner defined four levels of system functioning between persons:

- **Microsystem.** The microsystem is made up of all the relationships between the person and his or her environment in a particular setting. For example, all of the transactions that take place between the child and the physical and social environment of the
family form a microsystem. Other settings in which children are typically found are schools, camps, hospitals, play groups, and places of worship. Children are affected by many aspects of their immediate microsystem environment, including social interactions, housing, and nutrition (Melson, 1980). We shall deal with a number of these aspects in the course of this book.

Mesosystem. The mesosystem includes the relationships between the major settings in which children are found. An example would be the interaction between the family and the day care center. A child who is experiencing many difficulties in day care is likely to force the family to have more interactions with the center’s teachers and administrators, and those family-school interactions should, in turn, have an effect on the child’s functioning.

Exosystem. The exosystem extends the mesosystem to include other social systems that do not contain the developing child but have some effect on him or her. The world of work, neighborhood institutions, the media, the government, the economy, and transportation affect the functioning of the family, school, and other social settings in which children are found.

Macrosystem. The macrosystem contains all of the various subsystems that we have been discussing. It contains all of the general tenets, beliefs, and values of the culture or subculture and is made up of the written and unwritten principles that regulate everyone’s behavior. These principles—whether legal, economic, political, religious, or educational—endow individual life with meaning and value and control the nature and scope of the interactions between the various levels of the total social system.

The idea of the macrosystem suggests that cultural values and practices have an effect on child-rearing practices and on the development of children. Throughout this book, we shall cite examples of cross-cultural studies showing how culture affects children’s development. The relationships among these various subsystems are shown in Figure 2.4.

An example of ecological systems theory as applied to the family system suggests that infants may be influenced by and influence others either by direct transactions or by mediated transactions. A direct transaction occurs as part of a social relationship in which the child is an active participant: the infant-parent, infant-peer, or infant-sibling relationship. A mediated transaction occurs when the infant affects or is affected by people with whom the infant does not share an active relationship.

An example of a mediated transaction concerns the child’s relationship with grandparents. Though children in North American society often spend little time with their grandparents, visiting perhaps only once or twice a year, they nevertheless seem to develop special relationships with them. This can be accounted for by parental mediation. Since the parent’s relationship to his or her own parents is so important, this importance is transmitted to the child, who then comes to think of Grandma and Grandpa as special people (Lewis & Feiring, 1978; Lewis, 2005).

One model of the family system that incorporates these ideas is depicted in Figure 2.5 (Belsky, 1981). With mediated effects, the acts of one individual affect another, who then affects a third person. This model includes the effects of one individual (for example, the infant) on the relationship between the parents and, conversely, the effects of the marital relationship on the infant directly and indirectly as it affects each spouse’s ability to parent. One other notable aspect of this model is that it includes feedback transactions. For example, the marriage may affect a spouse’s ability to parent, which may affect the infant, whose subsequent behavior may affect the marital relationship. Each component is capable of affecting every other component in a mutually influential manner.

Ecological systems theory has contributed to research and applied work with infants. Since this theory’s conception, a growing number of stud-
ies have examined the infant in the context of the family or day care. In addition, we are becoming more aware of the effects of the larger social and cultural ecosystem on infants. Nuclear radiation and environmental toxins affect prenatal development and mother’s milk. The effect of having two parents working outside the home—on both the infant and the parents—is a complex family and social issue. We are becoming aware that child abuse and neglect are social ills related to poverty, discrimination, drug use, and stress.

What Are the Problems with Ecological Systems Theory?

A problem with ecological systems theory is that it does not specify the processes by which these effects might occur. For example, a disturbed parent-infant interaction may depend in part on the mother’s drug use or the father’s absence from the family. The precise transactional process by which the parent-infant interaction mediates these ecological factors is not explained by the theory. In addition, the theory does not provide any guidance concerning which of the many ecological factors are most likely to affect a family and under what circumstances the family is or is not affected. In other words, the richness of the conceptualization of multiple interacting effects is not supported by enough detail to guide research or practice. For that reason, most research based on ecological systems theory is descriptive of the processes that occur under a variety of social conditions.
Another problem with ecological systems theory is that it is not developmental. Although the theory points to factors that might affect infants of different ages, it is not a theory about how infants develop from one age to the next. Because adults are the primary mediators of ecological factors on infants, other versions of systems theory, which will be discussed next, focus on the infant-adult interaction in order to explain infant development. These theories deal with the process by which cultural skills, such as language, are transferred from parent to infant during social interaction.

Interactive Systems Theory

Up until the 1960s, the parent-infant relationship was viewed as a one-way process: parental behavior affects infant behavior. This was due to the general acceptance of learning theories, which view the parent as the primary socializer. In these theories, parents got all the credit for child-rearing success and all the blame for child-rearing failure. Cognitive theories had little to say about the role of the parent, assuming that cognitive development was the result of the individual’s transactions with the physical environment.

In the early 1960s, an infant psychiatrist, Louis Sander, developed a theory of the early mother-infant relationship in which he explicitly recognized the reciprocal mutual transactions and feedback processes between mother and child (Sander, 1962). Sander’s stages of development in the mother-infant interaction are given in Table 2.3. The importance of this theory is that it recognized that both parent and infant develop as a system in relationship to each other over time.

A large body of research since then has confirmed the transactional nature of the parent-infant interaction. The evidence is so persuasive that most developmentalists today accept the idea of transaction in the parent-infant system as fact. This change in theoretical orientation toward the parent-infant relationship contributed in part to a revival in the 1970s and 1980s of the nearly forgotten work of Lev Semanovich Vygotsky (1896–1934), a Soviet educator who worked with parents and founded a number of schools.

Vygotsky did most of his work in the early years after the Russian revolution. Following from the political theory of Marxism-Leninism, which viewed society as a complex system of mutual and cooperative influences, Vygotsky suggested that all individuals are defined by the social
group, and that their knowledge is an active social construction. Vygotsky suggested that adults do not directly socialize the child into the culture but rather follow the child’s own motivations to learn. By careful observation of what the infant wants to understand, adults can introduce forms of guidance that allow the infant to realize his or her goals.

The timing of parental guidance is crucial. According to Vygotsky, parents should wait for times when the infant appears to be trying to learn some new skill but has not yet mastered it (see Figure 2.6). Vygotsky referred to this phase of skill development as the **zone of proximal development**; that is, the time during which the proximal (next) achievement in skill is about to occur but has not occurred yet (Wertsch & Tulviste, 1992). Adults who tailor their guidance to fit the child’s needs for support and information in the zone of proximal development will have the most lasting impact on learning.

Suppose, for example, the child is trying to express his or her desire for an object using grunts. If the adult suggests more culturally appropriate ways of requesting (speech, pointing, etc.), the child will pick up the cultural skills because those skills best serve the child’s motivation at that particular moment. If the adult models appropriate forms of requesting when the child is not interested in requesting, the adult’s model will not have an impact on the child.

The concept of the zone of proximal development, therefore, suggests that children will acquire culturally acceptable practices only if parents can adjust the timing and level of their actions to the ongoing motivational state of the children. Mutual, cooperative transaction is at the heart of Vygotsky’s theory, which is why it is sometimes called **sociocultural theory**. Because Vygotsky became ill and died at the young age of thirty-eight, he was not able to elaborate his theory. Developmentalists today are taking over where he left off.

One of the theories derived from Vygotsky’s work is that of Jerome Bruner (1983). Bruner suggested that language development arises out of earlier social-communicative routines between parents and infants. These routines must be ones in which the infant is an active participant. Bruner focused on simple parent-infant social games, such as peekaboo. The infant’s participation in the game is part of his or her zone of proximal development because parents not only help to create the game’s structure, they also make sure the game is a challenge for the infant that goes slightly beyond what

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**TABLE 2.3 Louis Sanders’ Stages of the Development of Mother-Infant Reciprocity**

<table>
<thead>
<tr>
<th>Approximate Age (Months)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–3</td>
<td>The parent is concerned with helping the infant cope with the biological function and the establishment of regular patterns of sleeping, feeding, arousal and quieting. The infant begins to show differential responsiveness to the caregiver.</td>
</tr>
<tr>
<td>4–6</td>
<td>The beginnings of mutual play and reciprocal interactions can be seen. The parent and infant learn to anticipate signals from each other to coordinate feeding, playing, and caretaking activities.</td>
</tr>
<tr>
<td>7–9</td>
<td>The infant begins to take the initiative in social exchanges and shows preferences for certain kinds of social activities over others. The infant experiences feelings of success or frustration in meeting goals.</td>
</tr>
<tr>
<td>10–13</td>
<td>The infant makes directed demands on the mother and tries to test her availability. The parent is used as a secure base for exploration.</td>
</tr>
<tr>
<td>14–20</td>
<td>Infants take their own initiatives in a wider variety of settings. Infants learn to achieve success and pleasure autonomously (apart from the mother).</td>
</tr>
</tbody>
</table>

the infant is capable of doing. Because the infant wants to play, he or she is more attuned to learning about the rules of the game and the behavior necessary to play. In Bruner's examples, the necessary behaviors are turn taking and language, which the child learns as part of enjoyable play routines in the company of an adult.

In many interactions, adult and infant are working on something together, but each has a different purpose. The adult is perhaps intent on instructing the child in the culturally appropriate uses of words and objects. The child may be more motivated by being a direct participant in the social world. The concept of **guided participation**, which is also based on Vygotsky’s theory, reflects the active role that children play while observing and participating in the organized activities of the family and society in the company of adults (Rogoff, 1990). Although, from the adult’s perspective, the child is merely “playing games” or “playing at” cooking or taking care of a doll, from the child’s perspective, it feels like actually doing the task as an active participant.

Typically, in adult-child interactions, the children set the agenda for what they want to do and for how much they want to be involved. The more skilled partner collaborates in the child’s goals by giving the child responsibility for certain actions that are part of the larger task but within the range of the **zone of proximal development**; that is, so the child can assimilate the task. The adult must also constrain the child’s participation for the sake of the child’s, or of others’, safety or rights. Eventually, the adult transfers responsibility for larger segments of the task to the child, in relation to the growth of the child’s competence as assessed by the adult (Bruner, 1983; Heckhausen, 1988; Kaye, 1982; Lock, 1980; Rogoff, 1990). These points are summarized in Table 2.4.

There are cultural differences in styles of guided participation. In one study (Rogoff et al., 1989), mothers from the United States were compared with Mayan Indian mothers from Guatemala on how they helped their twenty-month-old children to use a set of nesting dolls. The U.S. mothers acted more like peers, wanting to take turns in combining dolls and commenting on the process. The Mayan mothers retained more of an adult-child status difference. They assumed the children would eventually learn the task. They
monitored the children’s progress and gave verbal instructions, but they did not get very involved in the task.

One U.S. mother tried to play games with the dolls, then offered them to the child for “his turn.” She gave instructions (“Put the lid on”) and then cheered when the child did this (“Yeah! You’re so smaaart!”). This mother tried to change the agenda when she judged that the baby’s attention waned. She commented on all the child’s actions and made requests for actions throughout the task.

A typical Mayan mother demonstrated how the dolls come apart and go back together, using a few words to encourage the child to look. The baby wanted to handle the doll, but soon after, the mother took it back and again demonstrated how to do the task. She pointed out the features of the task verbally as she performed the action. After that, she let the infant try for some time on his own while she watched but did not intervene. When he ran into trouble, the mother would say something to help (“Do this one first”). When the child made a successful move, the mother would simply say “Okay” or “I see” in a quiet tone. This study shows that the principles of guided participation work even in very different cultural situations and with different parental styles.

Interactive systems theories have had a major impact on research and on practice. Even during Vygotsky’s era, these ideas influenced early childhood education. Teachers in day care centers and nursery schools have known for generations that education begins with the child’s motivation, and that it is the teacher’s job to adapt to the skill level of the infants. Many parents do this intuitively, and most current child-rearing advice books encourage this behavior. Teaching young parents how to pay attention to the inclinations of their babies is a major component of parent-education classes for parents who are having difficulty with their babies, such as teenage parents, single parents living in poverty, parents with clinical depression, and parents who have a handicapped infant (see Chapters 8 and 9).

Simple, one-directional parent-to-child socialization theories would not be acceptable in developmental research journals today. Research based on interactive systems theories has given detailed descriptive accounts of the ways in which parents and infants play games, come to understand each other, and develop over time.

What Are the Problems with Interactive Systems Theory?

One problem with interactive systems theory is that it focuses primarily on short-term developmental changes such as acquiring a new skill during guided participation with an adult. It does not provide a framework for understanding how these short-term changes contribute to the changes that move infants from one developmental stage to the next.

Another criticism of interactive systems theory is that it focuses on parent-infant relationships or small groups of co-participants, without taking account of the broader issues, such as those raised in ecological systems theories. Many interaction theorists study primarily the mother-infant interaction and fail to consider the family systems processes described earlier, including the roles of the father and siblings. Research inspired by

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**TABLE 2.4 Components of Guided Participation Between Adults and Young Children**

<table>
<thead>
<tr>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child sets the agenda according to interest and skill level</td>
</tr>
<tr>
<td>Adult adjusts level of child’s participation according to child’s skill</td>
</tr>
<tr>
<td>Adult constrains child’s participation for the safety and rights of others</td>
</tr>
<tr>
<td>Adult transfers responsibility to child according to on-going assessment of child’s abilities</td>
</tr>
</tbody>
</table>

Vygotsky’s work, on the other hand, does take explicit account of cultural factors and cultural differences in the developmental process.

**Dynamic Systems Theory**

Some of the pioneers in the study of human development—Darwin, Vygotsky, and Piaget—were interested in the problem of how new forms arise during development. At different times in evolutionary history, for example, new species emerge that have never been seen before. Similarly, during the life span of a person, new abilities, emotions, and experiences arise as stages unfold in time. The story of all living systems, in fact, is about the generation of novelty, the creation of something new that was not there before.

Until recently, however, the emergence of novelty could not be explained. Many developmentalists turned their attention to other topics, such as the age at which children acquired particular skills and the environmental conditions that facilitated the infant’s development. The introduction of dynamic systems theory into developmental research, however, has given scientists the conceptual and methodological tools to return to the fundamental question that motivated Darwin, Vygotsky, and Piaget: the emergence of novelty in development (van Geert, 1998).

Dynamic systems theory takes its current form from the work of the physicist Ilya Prigogine (Prigogine & Stengers, 1984). Most of the matter in the universe slowly expends its energy and then burns out. But Prigogine was interested in phenomena that make their own energy, preserve themselves across time, and become increasingly complex by generating novel forms. This is the process that characterizes all living systems, from single-celled organisms to human beings. The ability of systems to maintain themselves and to develop new forms is called *self-organization*. The “self” in self-organization means that the maintenance and development of the system arises from the mutual transactions and feedback processes between the components of the system, rather than being imposed on the system by some preexisting plan.

Prigogine began his research by studying some nonliving physical systems that had the capacity to create their own energy and become more complex in form. One example is the weather, in which the forms—such as seasons or hurricanes—develop and maintain themselves over time. In spite of its dynamic complexity, the weather has patterns that repeat. Every year you can expect it to be cold in the winter and warm in the summer. Every winter is different from every previous winter in particular ways, however, and it is not possible to predict in advance what each new winter will be like.

Many dynamic systems display the following two properties:

1. They form predictable and stable patterns in their macroscopic behavior. The seasons in the weather system are one example; the stages of human development are another. All infants go through the same Piagetian substages in the same sequence, just as each year the earth goes through the same four seasons.

2. They are relatively unpredictable in their microscopic behavior. One may be able to predict the weather over the coming week or two within a range of possibilities depending upon the season, but the complexity of the weather system always leaves room for something novel to emerge. Similarly, we can describe what ten-month-old infants are likely to do in general, but their precise behavior on a given day and how they develop within the range of their possibilities cannot be predicted. Something novel happens every day that cannot be anticipated.

This microscopic unpredictability in the context of macroscopic stability is known as *chaos*. Chaos is a mathematical concept that expresses the property of complex systems to have some general structure that repeats over time but never in exactly the same way. The drawing in Figure 2.7 represents chaos. It is the trajectory of a mathematical equation that traces a path in three-dimensional space that is similar on each cycle, but is never exactly the same as any previous cycle. Each
person’s life course is similar in the transitions between developmental stages, but no two lives are exactly the same. The concept of chaos suggests that dynamic systems are partially determinate and partially indeterminate.

The concepts of chaos and indeterminism suggest how the application of dynamic systems theory to human development is different from all other developmental theories. All scientists will admit that with something as complex as human development, there is no way to predict precisely how a person will turn out. Most scientists believe, however, that if we could somehow measure all the relevant variables in the system, it would in fact be possible to predict a person’s future. This idea of determinism suggests that all events have a cause, and the cause can be found with enough scientific work. In this view, we are unable to predict events in a person’s life because we simply do not have sufficient data.

On the other hand, dynamic systems theory allows for the possibility of indeterminism. Indeterminism expresses the idea that not everything a person does, and not every turn in that person’s development, can be predicted from known laws or principles. Indeterminism suggests that even if we could measure all the relevant variables in a system, we still could not completely predict its future behavior. This is because self-organization spontaneously creates novelty, something that did not exist prior to its creation and that could not have been predicted. Most living systems display a certain degree of indeterminism in their growth (Fogel, Lyra, & Valsiner, 1997; Prigogine & Stengers, 1984).

Scientists use the following example. Imagine a butterfly is flapping its wings somewhere in Asia. This movement is just enough to change the flow of a tiny bit of warm air. This tiny change in airflow may happen at just the right moment to

![Figure 2.7 A Trajectory of Chaos](image)

A mathematical equation generates a curve that repeats a similar shape in three-dimensional space. Each time the curve repeats the shape, however, it is in a slightly different place from where it has passed through before.

trigger a much larger change in airflow because of deviation-amplifying feedback, which then causes a change in the temperature distribution at higher elevations. At some point and without a specific cause, the conditions are created for a thunderstorm to emerge in the United States. Because of complex feedback processes and emergent novelty, it is impossible to trace the cause of the thunderstorm back to a single source (even the flight path of the butterfly depends in part on wind and weather conditions in that very moment!).

A butterfly effect occurs when a very small perturbation creates unpredictable novelty in a system, which then results in macroscopic developmental change in the system. Self-organization, chaos, and the butterfly effect have been used to explain why all snowflakes are similar but no two are exactly alike, the unpredictability of heart rhythms during a heart attack, and the development of differences and similarities between living cells (Capra, 1996; Hopkins & Butterworth, 1997).

Esther Thelen and I were among the first to apply dynamic systems theory to developmental psychology. We used it to explain infant locomotor development and infant socioemotional development (Fogel & Thelen, 1987; Thelen & Fogel, 1989). We proposed that infant development is not fixed to a genetic or maturational timetable, nor is it entirely predictable from adult guidance or infant learning. While these factors provide the context for development, new abilities emerge through the dynamic indeterminacy of self-organization.

Infants have all the necessary locomotor skills for walking as early as six months, but they do not walk until ten or twelve months. By six months, most infants can move their legs in a walking pattern, can support their own weight on their legs, and can take steps if held by an adult. They seem to have all the abilities but one: balancing themselves while upright. This balancing ability develops between six and ten months through a variety of experiences alone and with an adult. When the ability develops—and the exact age is unpredictable—infant walking self-organizes spontaneously. In just a few days from the first independent steps, the infant can walk across the room (Thelen, 1989; Thelen & Smith 1994). This spontaneous and sudden developmental transition is one of the behavioral markers of a self-organizing process (Prigogine & Stengers, 1984): something novel emerges that was not present earlier.

Dynamic systems theory has the advantage of trying to explain development from the perspective of multiple possible causes and connections. Unlike most theories, dynamic systems gives credit to indeterministic factors in development, suggesting that there is a creativity and spontaneity in human development that goes beyond the inputs to produce unique effects: the special qualities of particular infant personalities and infants’ remarkably inventive actions. Human development has many examples of butterfly effects; small and unexpected events that can change the course of a life (Fogel, 1990a; Thelen, 1990).

I have applied dynamic systems theory to the parent-infant communication system (Fogel, 1993; Fogel & Branco, 1997; Fogel, Garvey, Hsu & West-Stroming, 2006; Fogel & Lyra, 1997). Many forms of interpersonal communication are transactional, that is, they work by means of feedback between the participants. In my research, I discovered that this transaction has two important features:

- The continuous mutual adjustment of action
- Creativity

Unlike adults, whose conversations are in the form of speaking turns in which one person waits while the other talks, parents and infants communicate nonverbally in such a way that both participants are continuously active at all times. As a baby makes cooing vocalizations, for example, the parent is smiling at the infant, holding him, and moving him in rhythm with the vocal sounds. You can see this continuous mutual adjustment of actions in adult conversation if you take note of the facial expressions and body movements of the adults and not just their vocalizations. This continuous mutual adjustment also appears in all adult communication, including ordinary conversation, dancing, group singing, and team athletics.

The other feature of communication is creativity. During conversation, for example, people form
their sentences and stories to express something they have in mind. There is never a perfect match between what someone wants to express and the way in which it is actually said. People have to make up their sentences as they speak, and no two sentences are ever exactly alike. In addition, as we hear the responses of others to our words, that feedback sometimes makes us work to clarify our meaning or even to change it according to the other’s perspective. In this sense, communication is creatively self-organized because it emerges in the process of transaction. A participant’s words and actions can have a butterfly effect, changing the direction of an interaction toward new topics and introducing a certain amount of indeterminism. We can call this type of communication “alive” (Fogel & Garvey, 2007).

Co-regulation is the continuous mutual adjustment and co-creativity that appears in spontaneous communication (Fogel, 1993; Fogel & Garvey, 2007). Co-regulation is a synonym for self-organization as applied to interpersonal communication. It accounts for why communication systems maintain repeating patterns of co-activity such as greetings, parent-infant games like peekaboo, or particular topics of conversation between a couple. Repeating patterns in a communication system, such as a topic of conversation, are called frames. Co-regulation also provides a way for novelty to enter into the system. Because communication is inherently creative, it contains the sources for its own change over time (Fogel, 1993).

Dynamic systems theory has been applied by an increasing number of infant researchers. The applications are in areas such as gene-environment interactions (Lickliter, 2008; Richardson, 2008), prenatal development (Messinger & Lester, 2008), motor development (Goldfield, 1993; Clark, Truly, & Phillips, 1993; Thelen & Smith, 1994), cognitive development (van Geert, 1993; Thelen & Smith, 1994), perceptual development (Bertenthal & Pinto, 1993; Butterworth, 1993), personality and temperament (Lewis, 1995, 2008), emotions (Camras, 1993; Fogel et al., 1992; Wolff, 1993), parent-infant mental health (Beebe & Jaffee, 2008; Downing, 2008; Greenspan, 2008), family-child relationships (Fogel, 2008; Kerr, 2008), and peer play (Eckerman, 1993).

Consider the development of infant emotions. Infant self-soothing, to take one example, emerges quite suddenly when infants develop the ability to put their hands in their mouths, usually around the age of five months. This achievement reduces the intensity of crying and allows infants immediate control over the direction of their attention and action. Hand-mouth coordination would not normally be considered part of emotional development. When we look at the whole system, however, we can see that each component of the system may be affecting the others. In addition, a simple butterfly effect of the change of one small component can have big effects on the self-organization of the whole system. In addition to self-calming, infant laughter and sustained engagement in social and object play also occur around five months of age (Fogel, 1985; Fogel, Nwokah, & Karns, 1993; see also Chapter 7).

At each developmental period, dynamic systems theory suggests an important role for creativity in everyday action. When babies begin to acquire language, for example, they can create novel sentences never spoken before. These experiments with playful creativity provide the opportunities for novelty to enter the system and to enhance growth and development.

What Are the Problems with Dynamic Systems Theory?

Because dynamic systems theory is relatively new, its description of infant development is still rather general. Dynamic systems theory points to the inclusion of all the components of the system and the search for butterfly effects, but it does not have any specific guidelines for where to look for such things. It will take a great deal more research to fill in the blanks of the theory (as it took thirty years for information-processing theory to fill in the blanks of Piaget’s more general theory of cognitive development). Research can be a slow process.

Because it came from physics, dynamic systems theory sometimes uses complicated mathematical
models. Applying such models directly to human development is difficult because it is not easily reduced to measurable quantities such as velocity and acceleration. The mathematics of the theory has been most successfully applied in the study of motor development, because moving limbs can be measured according to displacement, velocity, and acceleration. We do not know whether socio-emotional development fits the same mathematical principles as the physical systems on which the theory was originally based, or whether a very different mathematical approach will be needed to understand the more qualitative aspects of human experience. It is possible that there is a form of mathematics for the human psyche, but it has not been invented.

CLINICAL THEORIES

The infant’s psychological experience of the world—what the infant knows, perceives, and feels—is not observable. Theories function to go beyond what is observed in order to explain what cannot be observed. Virtually all scientific theories of infant experience, such as Piaget’s, are based upon direct observations of infants, creating a picture of infancy known as the observed infant (Stern, 1985).

An alternative source of evidence about infants’ psychological experience comes from clinical work with older children and adults. During psychotherapy, for example, people sometimes appear to remember their experiences during childhood. Memories of particular incidents and events are called conceptual memories. Conceptual memories are composed of specific categories for type of event (“I was left alone”), time (“when I was five years old”), and place (“at the preschool”). Conceptual memory is recall about an event that is communicated in the form of a verbal narrative or story.

Memories of early infancy, however, are very different from conceptual memories of particular incidents. Memories of infancy are participatory memories. Participatory memories are non-conceptual. They are not about a past experience; rather, they are felt as a being with or a reliving of past experiences. They are composed of emotions, desires, and a sense of familiarity, without any specific time or place (Bråten, 1998, 2003; Fogel, 2004; Heshusuis, 1994; Stern, 1985). A participatory memory, for example, is the re-creation of a feeling of what it was like to be cuddled and comforted, rather than a specific situation of being cuddled. An adult’s participatory memory of feeling cuddled may include the adult’s body curling into a fetal posture and the feeling of being very tiny and held by a much bigger person.

The clinical infant is the participatory memory of infancy in children and adults. The observed infant is constructed primarily from quantitative research methods. The clinical infant is based primarily on qualitative research methods and participant observations. Participatory memories of infancy and early childhood may occur during psychotherapy. Clinicians and their clients are participant observers and they typically report their “data”—clients’ reexperiencing their own infancy during therapy—in terms of narrative descriptions of individual cases. The quantitative researcher relies primarily on conceptual analyses, describing and narrating about what has been observed. The qualitative researcher, on the other hand, uses a participatory method. The goal is being with the subject of the study, being a participant observer in the sense of reliving experiences, rather than standing outside those experiences (Heshusius, 1994).

Theory and qualitative research based on the clinical infant are often not accepted within the scientific community because of the belief that they cannot be proven. In part, this is due to a negative bias attached to qualitative and case study research methods by people who favor quantitative research as the only true scientific method. Also, it is very difficult to ascertain, for example, if an adult’s participatory memory of his or her infant experience during psychotherapy is the “truth.”

Because participatory memories are general rather than specific, focusing on feelings rather
than events, they can never be located in particular events. If, for example, in a psychotherapy session, a client has a participatory memory of trauma to her pelvic area, it may or may not be related to a history of sexual abuse. It could just as easily be related to toilet training difficulties or a forgotten injury. There is, in other words, no way to trace a participatory memory back to a specific source. Yet, as we shall see, children and adults can have very “realistic” feelings that have a sense of familiarity; that is, of a being a personal memory.

It is important to realize, on the other hand, that even scientific theories based on the observed infant cannot be proven. No matter what research method is used, infants’ psychological experience will always be unobservable by adults. Adult scientists cannot get inside the skin of the infants being observed; they must use theory to fill the gap between what can be observed and what cannot.

Scientific theories are not “truth” but reasonable conclusions based on a systematic application of the assumptions of the theory and the methods of research. There are many instances in the history of psychology in which theoretical conclusions about the infant’s psychological experience have changed; witness the historical changes and controversies regarding ideas about infants during the twentieth century (Chapter 1) and the different views of infant experience that emerge from each of the scientific theories reviewed earlier in this chapter.

Each theory, then, is just one perspective on nature. No single theory can ever deal with the entire range of human developmental phenomena. Researchers, clinicians, parents, and educators can examine each of these theories and take what is most meaningful for any given application. These theories should be seen not as mutually exclusive but rather as complementary.

The purpose of this section on clinical theories is to describe several theories of infancy that are based on the clinical infant. In addition, I briefly explore the possible therapeutic effects on children and adults of the participatory remembering of infant experiences during clinical work.

Can Children and Adults Remember Their Infancy Experiences?

The clinical theories reviewed in this chapter assume that children and adults are shaped by their experiences during early infancy and the prenatal period. Is there any evidence that this is so? With regard to conceptual memory, people typically can recall only one or two specific incidents from early childhood, and not usually before the age of two or three years. Adults can have more detailed conceptual memories of events and situations beginning from when they were five or six years old. This is why it is commonly believed that we cannot remember our infancy, a phenomenon known as infantile amnesia.

As mentioned earlier, however, during therapeutic and other emotionally salient situations, people have participatory experiences that appear to them to be memories of the prenatal and infancy periods that had been previously forgotten. Some therapeutic situations appear to allow people to recover the “unconscious,” that part of the self that is not verbally remembered during ordinary waking states (Wade, 1996). Participatory memories are likely to be nonverbal ones because they occurred at a time when we did not have words to describe them or because they were in some way traumatic. We know this from research on three-year-olds remembering traumatic injuries that occurred when they were one or two years old (Peterson, 1999; Peterson & Bell, 1996; Peterson & Rideout, 1998).

While conceptual memories are primarily mental, participatory memories often involve the whole body. When particular patterns of movement, posture, and/or emotions occur repeatedly in particular situations, they are more likely to be remembered by the neuromotor system (Shore, 1994; Thelen & Smith, 1994). This is true, for example, in learning any skilled activity, such as music or athletics. Musicians may have conceptual memories of written music, but it is the participatory memory of moving their bodies that allows them to actually play or sing. Research on adults who experienced traumas as adults (such as assault,
emotional trauma, war, or an automobile accident) also shows that their memories of the trauma are fragmentary (they do not have a particular time or place) and relived in the body. They may shake or break out in a cold sweat and experience a feeling of intense fear (Smyth & Pennebaker, 1999; Terr, 1994).

If an infant’s needs are repeatedly ignored, for example, the infant develops feelings of distress and hopelessness. As the infant grows older, as a child or adult, similar situations will evoke similar participatory memories. If that person feels ignored, it is likely to lead to the experience of hopelessness (Gaensbauer, 2004). If that experience occurs repeatedly in life, it can lead to depression. The depression, therefore, may have its origins in a participatory memory from early infancy. There are also many ordinary, nontraumatic participatory memories. Movement patterns learned in infancy, such as kicking, reaching, crawling, and rolling over, underlie all later complex movements of older children and adults (Thelen & Smith, 1994). Patterns of emotional responses in infancy form the basis for many later adult emotions (Fogel, 2003; Stern, 1985).

Participatory memories are often transformed over time. The memory of being ignored in infancy, in the above example, may be changed into feelings of depression in the adult. The adult has a long developmental history, which may include other experiences of being ignored or of being recognized and loved. The early participatory memories, therefore, are filtered through this history of related experiences. These early memories may remain, or they may become lost or transformed.

Participatory memories are not verbal. For this reason, therapeutic methods that evoke these memories succeed by taking people away from their ordinary patterns of conceptual thinking and reasoning. The most common example of participatory memories in adults is dreams, which cannot be completely comprehended by verbal or logical means. Dreams are often used in therapeutic situations as a way to bring these participatory memories into conscious awareness. Although the idea of participatory memories of infancy is theoretical, there is some evidence that they exist and can be reexperienced. This evidence comes from dreams and from experiences during therapeutic encounters (see Chapters 2 and 9).

In the remainder of this section, we review two different types of approach to the clinical infant: psychotherapeutic approaches and somatic awareness approaches. Psychotherapeutic theories use talking between client and therapist as the principal tool for enhancing awareness of participatory memory and how it affects the adults’ psyche. Somatic refers to the individual’s conscious awareness of the experiences of their bodies. Somatic awareness approaches use some combination of talk, movement, touch, and somatic awareness in order to access participatory memory. It is not the purpose of this section to review all types of clinical methods. We focus only on a few that have explicitly recognized the role of infant and other developmental experiences in the therapeutic process.

Psychotherapeutic Approaches

Sigmund Freud was a physician who noticed that his patients often came to him with physical symptoms that had no apparent medical cause. Freud saw that in some cases, people exhibited behavior that was thematically related to their physical symptom. A person with constipation, for example, might tend to be overly concerned with behavioral cleanliness, order, and punctuality. The mode of retention in the body organ corresponded with retaining tight behavioral control over one’s life.

Freud speculated that these patterns of behavior might have their origins early in a person’s life, around the time when infants are being toilet trained and becoming aware of the process of holding onto and letting go of the contents of their bowels. This occurs in children in Western cultures around the age of two years. Freud wanted to explore whether such people had any memory of a trauma that might have occurred around that age. He experimented with an early form of hypnosis
and then later discovered a method that he called **free association**. He asked his clients to lie down and encouraged them to relax by providing a comfortable couch and a safe environment in which they could say anything without fear of retribution or judgment. As they talked about whatever came to mind, Freud helped them become aware of the possible participatory memories that were behind the behavioral symptoms, memories of which the client's conscious mind was unaware. The use of free association along with interpretation in psychotherapy is called **psychoanalysis**.

During free association, people who are over-controlled in their daily life may express participatory memories of fear, such as the fear of punishment or the fear of being controlled. This participatory memory is not of any specific toilet-training situation. These memories may be connected with nonverbal desires to lose control, to be uninhibited in their behavior, to let go of what they are carrying, and to release their pent-up feelings of frustration. This type of uninhibited behavior is what Freud (1903) referred to as the **id**. The id can be thought of as all of the person's needs and desires, but especially those desires that are irrational, overwhelmingly compelling, and not tolerant of any delay.

According to Freud, infants are dominated by the id and gradually learn to control some of these impulses. Their crying becomes less insistent, for example, and they develop the capacity to wait for gratification and to regulate their own needs. The **ego** is the ability to tolerate discomfort and frustration and to moderate the pursuit of pleasure. The ego, in psychoanalytic theory, refers to the regulatory functions of the person.

As the infant grows older, the ego relies increasingly on thought processes, mental representation, problem solving, and rational approaches to the world. Freud realized that thinking and reasoning about oneself are important for self-control and appropriate social behavior. These tools of the ego, however, are not useful in accessing the mostly nonverbal id memories, because the ego was developed specifically to repress the id. This is why Freud turned to free association: in order to get people temporarily out of the rational conceptual way in which they regulated their everyday life.

Based on what his adult clients revealed during free association, Freud theorized that the development from id to ego recurs during the life course, as new sources of id experiences mature. Id experiences relate to pleasurable or unpleasurable feelings of the body, and the location in the body of these feelings changes as the person grows older. He distinguished two major phases of id development during the first three years of life: the oral stage and the anal stage.

During the first year of life, the infant is particularly aware of sensations of pleasure and displeasure in the mouth region through activities such as sucking, chewing, biting, sound making, touching with the lips, and swallowing. This period is called the **oral stage**. During this stage, according to Freud's theory, the infant views the world from the point of view of consuming it. Freud felt that infants at this stage of development believe that they can incorporate everything and everyone—that the world is centered upon their own gratification—and trust in the inevitability of satisfaction.

The **anal stage** begins some time in the second year of life, when the primary sensitive zone becomes the anal region of the body. Freud recognized that children find pleasure in the distension of the bowel, the withholding of feces, and the elimination of feces. Gaining self-control over the bladder and bowel muscles is a major personal achievement, and the feelings associated with producing, owning, holding onto, and voluntarily giving up one's feces are thought to relate to the child's growing sense of self and personal autonomy.

The person with constipation, for example, may be holding onto things, according to Freud, because his anal id desires to let go and be messy either were not recognized or were punished by his family. He retains a participatory memory of his anal desires (to be messy), but that memory that have not been verbalized because the behavior was not tolerated or discussed when he was two years old.
These two stages and later developmental stages postulated by Freud are included in Table 2.5. A more detailed description of the later stages is beyond the scope of this book.

Erik Erikson (1950) accepted Freud’s basic premise that changes in body sensitivity from oral to anal awareness form the core of the developing infant. He viewed each stage of development (eight stages in all across the entire life span) as a potential crisis of the personality leading to a new sense of individual identity. Individuals might continue their forward progress in development, or they might become sidetracked at any point. Erikson’s developmental stages are also given in Table 2.5. Parents and parental behavior are a topic of this book as well, and parents are typically in Erikson’s stage of generativity versus stagnation, the period of young adulthood and parental responsibility that follows the stage of identity versus role confusion shown in Table 2.5. Generativity means to create and to nurture.

Instead of emphasizing participatory memory of the body, as Freud did, Erikson focused on the way in which the infant’s body related to the family and to society. The first conflict of the life cycle was related to the development of a sense of basic trust in the environment. This trust developed if the parent was able to recognize and gratify the infant’s id needs in such a way that the baby came to expect the environment to be friendly and supportive. Mistrust occurred when the parent did not allow the infant to experience id feelings (mistrust in self) or when the infant came to expect that needs would not be met adequately (mistrust in others). In an adult, participatory memories of this period may be related to feelings of being ignored or supported by others.

In the second stage, the infant could develop either a sense of purpose and autonomy or else a sense of shame and doubt. This again depended upon the parent’s ability to support the infant’s desire to feel his or her own experiences of control and letting go, and to reward and to share in the infant’s personal achievements. If the parent chastises the infant for being assertive or fails to delight in the infant’s accomplishments, the infant may feel ashamed and develop a sense of doubt about his or her ability to be independent. In adults, participatory memories of this period may be felt as a fear of failure or a lack of self-confidence.

Both Freud and Erikson relied on observations of the clinical infant, the infant as experi-

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**TABLE 2.5 Psychoanalytic Stages of Development**

<table>
<thead>
<tr>
<th>Approximate Age (Years)</th>
<th>According to Freud</th>
<th>According to Erickson</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1½</td>
<td>Oral: Focus on experiences of the mouth such as sucking, eating, crying, biting</td>
<td>Trust vs. Mistrust: Development of expectancy for either gratification or frustration</td>
</tr>
<tr>
<td>1½–3</td>
<td>Anal: Focus on experience in anal region such as elimination and retention</td>
<td>Autonomy vs. Shame/doubt: Self-assertiveness and self-control or uncertainty and shame</td>
</tr>
<tr>
<td>3–6</td>
<td>Phallic or oedipal: Focus on genitals and desire to possess opposite-sex parent</td>
<td>Initiative vs. Guilt: Independent activity is approached with either a sense of purpose (initiative) or questioning (guilt)</td>
</tr>
<tr>
<td>6–11</td>
<td>Latency: Interest in learning new skills but no overt sexual desires</td>
<td>Industry vs. Inferiority: Interest in learning and skill development or a sense of inadequacy and loss of motivation</td>
</tr>
<tr>
<td>11–20</td>
<td>Genital: Adult sexual desires and the establishment of sexual relationships</td>
<td>Identity vs. Role confusion: Perception of self as a unique individual: development of personal values or confusion about identity and role in life</td>
</tr>
</tbody>
</table>

enced by adults during free association. Somewhat later, psychoanalysts began to rely on data from the observed infant. The issue of the growth of personal autonomy, for example, was studied by Margaret Mahler (1975). Mahler was a practicing psychoanalyst who devoted her clinical work to helping young children and their families. She believed that many psychopathologies could be prevented by intervention with families in the early years of the child’s life.

Mahler’s work and that of others led to the refinement of the field of infant psychiatry, the application of clinical psychology work directly to infants and their families (see the section on infant mental health in Chapter 9). Because of the psychoanalytic emphasis on the parent-infant bond, most clinical interventions in infancy involve a large component of parent education and enrichment. When infants have severe feeding, toilet-training, emotional regulation, or autonomy problems, clinicians will most often work with the mother-infant dyad.

Daniel Stern (1985) followed Mahler’s approach of using data from both clinical and observed infants. Stern’s theoretical emphasis is on self-awareness, and his theory is one of the most detailed regarding the types of infant experiences that correspond to later participatory memories of adults. He theorized that even from birth, infants have a sense of self. The early senses of self during the first three years of life remain with the person, even as new ways of knowing the self emerge in development.

Stern postulated that during the first two months, infants have a sense of an emergent self (see Chapter 5). They are aware of how the different movements, sensations, and feelings cohere into recognizable states. Between two and eight months, infants develop a sense of a core self (also called the ecological self; see Chapter 5). This is the experience of being an active agent that does things in the world, has feelings, and has a history of prior experiences. Between eight and fifteen months, infants discover that they have inner experiences that are different from others around them. This subjective self (see Chapter 5) can choose to share feelings and experiences with others and is aware of its dependence upon and attachment to others. After fifteen months, the verbal self (which this book divides into the categorical self [Chapter 5] and the conceptual self [Chapter 5]) comes to use language to talk about inner states and to construct a coherent identity in the company of other people. The verbal self is the beginning of the individual’s conceptual memory.

According to Stern, the ability to fully experience each of these senses of the infant self is fostered when parents recognize and support the infant in his or her endeavors to explore the self, its possibilities and boundaries. These senses of self are very vulnerable to being overwhelmed when parental action is not attuned to the infant’s process of self-discovery. If parents are too controlling, infants may lose their sense of an emergent, core, or subjective self. They cannot feel any of their own control over their feelings and actions. Although this happens regularly to all babies and is part of the process of growing up, in some cases infants are chronically deprived of any ability to sense themselves.

Stern’s theory suggests that adults may have both positive and negative participatory memories of the emergent, core, and subjective selves. In adults, the participatory memory of the emergent self is the feeling that things are “coming together,” or, in contrast, that the events in one’s life are chaotic or confusing. In adults, the participatory memory of the core self is the sense of having a lasting identity and the person’s willingness to fully feel one’s emotions. Alternatively, core self memories may be experienced as identity confusion, avoidance of emotions, loss of direction, and helplessness. In adults, the participatory memory of the subjective self is the presence or lack of sharing, security, and trust with which we relate our inner feelings to other people.

The work of Mahler and Stern led to a developmental approach to the treatment of children and adults who have lost touch with their infant selves. A developmental approach allows people to reexperience the core self—in a therapeutic context, for example—and then to use those experiences
to recreate a more optimal sequence of self-development than they had in their own families.

The treatment method is similar to Freud’s. Work with clients who may be suffering from a mistrust of others occurs in a setting that is conducive to relaxation and total acceptance of their feelings. Relaxation and acceptance are universally part of all therapeutic efforts—both psychotherapeutic and somatic awareness approaches—to relive one’s infancy and to recreate a better developmental process. These are the basic conditions under which people can be made aware of their participatory memories of infancy.

The psychoanalytically oriented therapist also helps the client to focus attention on the threads of his or her early experience in order to explore the consequences for the self. This allows the client the freedom to weave these threads into a coherent pattern that promotes renewed developmental change. The basic elements of developmental therapeutic processes are given in Table 2.6. Working with young children, these goals can be accomplished using play therapy (Ryan & Wilson, 1995).

Somatic Awareness Approaches

The other branch of developmental clinical theory and practice that will be discussed here is grouped under the heading of somatic awareness approaches. In psychotherapeutic methods, therapists usually talk with their clients while they are seated or lying down. Somatic awareness approaches may also use talk, but they typically use body movement and touch as a way to access the participatory memories of early childhood. Since infants experience their world via movement and touch, for many somatic awareness practitioners, this seems to be a more direct route to an adult’s infant experience than merely talking.

Somatic awareness approaches also use the three aspects of developmental therapy shown in Table 2.6: safety, exploration, and awareness. Safety is created in part by the physical environment. Some methods use soft music and low lighting. Safety is also created by an attitude on the part of the practitioner that permits openness and allows people to relax. If touch is used, clients are reassured that it will be for therapeutic and strictly nonsexual purposes. Exploration is created by letting the client direct the flow of the session. Awareness is enhanced as the practitioner helps clients to pay attention not only to their words, but to their body movements, emotions, and sensations. Because it is difficult for most adults to do this, access to participatory memory is aided by the creation of a deep state of relaxation that facilitates attention to the inner self.

One somatic awareness method that explicitly attempts to recreate an optimal infant experience is Watsu. In this technique, the practitioner floats the client in a pool of warm water. It was created by Harold Dull, who studied a Japanese massage method called zen shiatsu, in which the body is gently stretched in order to release tension. Dull found that the effects of zen shiatsu were enhanced in the water.

During a session, clients are moved freely in the water, stretched gently, and cradled in the practitioner’s arms. In their parent’s arms, fussy infants are comforted and touched, their tensions are eased, and they can return to focusing their relaxed attention on what they are doing and feeling. In this safe environment, they can really explore their bodies and continue to grow. A similar effect occurs in Watsu. “By being moved so freely through the water, by being stretched and repeatedly returned to a fetal position, the adult has the opportunity to heal in himself whatever pain or loss he may still carry from that time” (Dull, 1995, p. 65).

With the head and body in water, sound is muted, and clients can hear the rush of the water and the sound of their own heartbeat. They can also hear the practitioner’s heartbeat and feel the contact of skin against skin. This is believed to evoke a preverbal experience, possibly even a prenatal experience, that provides a sense of wholeness (Brooke, 2001a; Sawyer, 1999). The method has been used to help adults recover from prenatal, birth, and early childhood trauma. It is also one of the more relaxing treatments for pregnant women, soothing both mother and fetus. Watsu
is also believed to help both mothers and fathers connect with their fetus and infant.

In the Rosen method, clients lie on a padded table while the practitioner’s open and relaxed hands make gentle contact with areas of the body that appear to hold muscular tension and restrict free breathing. By listening to the client’s body with gentle touch and to the words they use to describe their experience, the practitioner can help the client to relax, relieve pain, and breathe easier. The Rosen method was developed by Marion Rosen, who began her studies of the body as a young woman in Germany in the 1930s. After working many years as a physical therapist, she began incorporating her own observations into her treatments. Following the client’s natural breathing pattern with gentle touch resulted in deep relaxation. She listened as clients sometimes talked about how their injuries had occurred. Often the client would connect with the felt sense of an earlier experience that related to the injury. When this happened, the client’s breath would deepen, relaxation would occur, and pain would often disappear (Rosen, 2003).

Rosen began to understand that the body tells its own story, shaped by our early life experiences, many of them forgotten and nonverbal. If we are born healthy, we come into the world breathing fully, with the full swing of our diaphragm moving every muscle in our body. We expect to have all our needs met and to be loved. But these expectations cannot be fully met even under the best of circumstances. As a result of either ordinary or traumatic events, we shape ourselves through muscular tension in whatever way that helps us to survive.

These situations are believed to be registered deeply in our bodies as participatory memories, which contribute to our characteristic patterns of muscular tensions, emotions, and postures. These emotions are held in abeyance by muscular tension until we feel big enough, strong enough, and safe enough to finally allow ourselves a felt sense of the old experience. Through the gentle touch of the Rosen method, as we deeply relax and breathe more easily, we begin to remember the experiences that we had learned to suppress and contain and through that knowledge we regain fuller movement, ease, and well-being (Wooten, 1995). You can experience the quality of Rosen Method “listening touch” by following the exercise based on Rosen Method in the Experiential Exercises section of Chapter 6.

Moshe Feldenkrais (1904–1984), originally a physicist and judo instructor, invented a system
of body movement education—**the Feldenkrais method**—that reawakens, develops, and organizes capacities for kinesthetic (sensorimotor) learning. Whereas children before the age of three learn movements by relying on their sensorimotor experience, older children and adults in technological cultures often behave according to social expectations, distancing themselves from their bodily feelings. Feldenkrais also observed that very young children use all their senses and every part of their bodies, a process he called **organic learning**. Adults appear to involve less of themselves, unless they are fully absorbed in what they are doing.

Feldenkrais believed that such alienation from the body contributes to habitual, usually patterns of muscular tension and psychosomatic illnesses. Because the Feldenkrais method involves the emulation of how young children learn, its therapeutic value hinges on releasing capacities for learning that had been left behind in childhood (Reese, 1985).

To teach his methods, Feldenkrais invented thousands of “Awareness through Movement” lessons, many of which are based on the movements performed by babies as they first learn to roll, sit, crawl, walk, and explore their bodies in the environment. Students are asked to make small, slow movements, reduce their efforts, and sense how even simple movements are connected with every part of the body. This book contains some Awareness through Movement lessons, those written by Feldenkrais practitioner Mark Reese and found in the Experiential Exercises sections of Chapter 4. Doing these may help you enhance your self-awareness and possibly access your own participatory memories of infancy. Feldenkrais practitioners also use hands-on techniques called functional integration. In this work, students lie on a padded table as a practitioner gently touches and moves them, often in babylike ways, in order to promote deep relaxation, kinesthetic awareness, and openness to learning new ways to move.

Feldenkrais methods are used to increase physical coordination and integration and to bring greater enjoyment and satisfaction in life. They are also used for adults and children with muscular problems, cerebral palsy, Down’s syndrome, and other developmental disabilities (Baniel, www.anatbanielmethod.com), and other developmental problems, and with adults who suffer from neurological or orthopedic problems.

**Bodymind centering** (BMC) is a method of body and movement awareness in which adults perform exercises based on the normal stages of infant sensorimotor development (Hartley, 1995). Bodymind centering was created by a dance teacher and physical therapist, Bonnie Bainbridge Cohen, during the 1960s and 1970s. Cohen discovered that she could help many of her clients by taking them step by step through the sensorimotor stages of prenatal and infant development. This is done by giving verbal directions and using touch to guide movement when necessary. In this way, clients can reconnect with a sense of self and self-discovery that may have been lost as they grew up.

Clients are first guided through the prenatal experience of feeling the pull of gravity, the movement of their breathing, and their heartbeat. Then they do exercises focused on feeling the sensations around the mouth, just as a newborn baby explores with mouth and sucking movements. The infant’s first movements are generated through the torso and spine, and these are explored before movements that entail pushing and pulling with the arms and legs. “First we simply feel the new sensations, perceptions, and mobility in a very direct and immediate way, as does an infant or child. Conscious recognition of change may occur in the adult only after the movement has been fully experienced” (Hartley, 1995, p. 99). BMC has been used in the treatment of parent-infant relationships at risk (Frank, 2001) and working directly with infants who experience sensorimotor difficulties (Brook, 2001b). An Experiential Exercise, naval radiation, based on BMC can be found in Chapter 3.

Related to BMC is **Dance Movement Psychotherapy**, in which infants and children can be engaged using expressive dance-like movements to foster a more integrated sense of self in relation to other people. It has been successful for infants and children with autism, communication delays, sensory integration difficulties, hyperactivity, and trauma (Tortora, 2006). Infants and chil-
Children learn to sequence their movements in space and time in order to connect with others and achieve personal goals. One of the key concepts of this work is kinesthetic empathy, the ability to feel another person’s feelings by moving like that other person. Dance movement psychotherapists use **kinesthetic empathy** with their clients, and children learn this by engaging with the therapist. You can better understand this approach by doing the Experiential Exercises in Chapter 7. Another related field is **somatic psychotherapy**, which focuses on felt sensations in the body, breathing, and movement on the pathway to psychological well-being (Aposhyan, 2003; Totten, 2005).

**What Are the Problems with Clinical Theories?**

Clinical theories have offered an alternative perspective for understanding infant development, the perspective of children and adults who are taught how to become aware of their participatory memories of being a baby. Although no theory can be proven, clinical theories have not been subjected to quantitative research tests of their predictions in the same way as the other theories reviewed in this chapter.

Clinical research is rooted in qualitative methods, which is a strength because they help us...
to understand how particular individuals have been shaped by their infant experience. On the other hand, more could be learned from clinical approaches by the systematic introduction of qualitative research and also by the complementary use of quantitative methods. Claims about increased relaxation and a renewed sense of well-being could be measured in treatment and no-treatment contrast groups.

It is difficult to substantiate whether the participatory memory of infancy revealed during a therapy session is the same as what that adult actually experienced as a baby. First of all, memories of early infancy are typically about feelings and body states, not about particular incidents. Second, the adult clients’ middle-aged or elderly parents would find it difficult to remember whether a particular event happened, and even if they did, their experience of it as a parent would not be the same as the infant’s experience. It may be that the acceptance of particular body feelings as belonging to a person’s past, regardless of how they actually occurred, is of such significant therapeutic value that an exact verification is not necessary.

A problem with psychoanalytically oriented psychotherapeutic theories is that like learning theories, they tend to focus reward or blame for the child’s behavior on the parents. Our earlier review of systems theories suggested, on the contrary, that children contribute to their own development by influencing parental behavior. It is easier to be sensitive and calm with a relaxed and happy baby than with one who cries much of the time.

All clinical approaches are limited in the effectiveness of their treatment. Most approaches work best for a particular range of child or adult concerns and problems. No one approach can treat all behavioral and psychological issues of children and adults. Clients should be informed about both the possibilities and the limitations of each approach. Newer approaches to parent-infant mental health will be reviewed in Chapter 9.

**EXPERIENTIAL EXERCISE**

**Exploring the Clinical Infant**

Because the infant’s psychological experience is unobservable, one might conclude that understanding an infant is no different from understanding the psychological experience of a nonhuman animal. Adult humans, however, have all been human infants, and we have all had infant experiences. On scientific grounds, it would be pointless to ignore such a rich source of potential data on infancy as the clinical infant, the re-experiencing of infant-like movements, sensations, and states of being.

Many of the chapters in this book will have a section like this one, called Experiential Exercises. These sections will include simple exercises that allow an opportunity to experience the clinical infant for yourself. It is important to do these exercises in a quiet room where you can feel what is happening in your body. Many students feel self-conscious when first doing this. It is, after all, unusual for adults to act like babies! Almost all students, however, change their minds after actually doing the exercises for a while.

You can also enhance your learning about the clinical infant by finding opportunities to interact with infants (see the Co-Regulating with Baby sections in most chapters for ideas about this). You might want to keep a journal of your reactions to each of these exercises and encounters with babies. It is best to write in your journal immediately following the exercise. As a participant observer, note your physical and emotional reactions.

Doing these exercises, many students become aware of their own body in new ways, such as noticing unnecessary tension and effort in their movements. Students often report a sense of relaxation, peace, calm, and enhanced well-being, and they can see the similarities of doing these exercises to other kinds of movement and somatic awareness education in which they have participated, such as dance,
yoga, massage, meditation, and athletics. When students do the exercises and observe babies, they say things like, “Being an infant is not as easy as I used to think it was.” As a result of this, students often change their approach from being an observer of infants to being someone who can really share the infant’s feelings and experiences. This is a shift from a conceptual stance of learning about infants to a participatory stance of being with infants.

Another way to enhance your understanding of the clinical infant is to investigate your own infancy. Talk to your parents or guardians about what they remember about your infancy. Were you a healthy baby? Were you born prematurely? Did you experience trauma as an infant, or was your infancy reasonably happy? What was that time like for your mother and father? Was their relationship supportive or difficult, intact or separated? Did either of your parents have a physical or mental illness? Did either of them leave or die when you were a baby? Did one or both of them work, and was that work satisfying or stressful? Was your family rich or poor? Did you spend a significant amount of time with someone other than your parents? What was life like for those individuals?

Try to match your spontaneous experiences of participation in the exercises with what you can find out from others about you, the family, and the environment that you lived in as a fetus and as an infant. Review the principles of qualitative research from Chapter 1 as well as the research on the observed infant presented in this book, and ask yourself: Does trying to re-create the clinical infant help me understand my own infancy? Does it help me understand infants in general? Try the finger painting experiential exercise that follows and see what you think.

Finger Painting (by Alan Fogel)

Finger painting is a wonderful and enjoyable way to begin to re-connect with participatory memories of your early childhood experience. It can be done individually or in groups. Just get the materials at any crafts or toy store, clear a space and time, and start painting. Notice the concrete feelings in yourself, such as emotions or sensations of color, temperature, texture. Notice if any memories come back to you. Are they pleasant or unpleasant? What does this experience tell you about yourself today? About yourself as a child?

SUMMARY

Biological Approaches

• Species and individual phenotypes evolve by natural selection.
• Behavior ecology theory is the study of a species’ evolved behavior characteristics.
• Although certain survival functions are present across species, each species has a unique species-specific behavioral pattern.
• Critical periods are times in early development when the fetus or infant is particularly susceptible to environmental influence, and on which all later learning and development depend.
• Behavior genetics studies the probabilities of predicting individual differences between phenotypes using differences between either environments, genotypes, or both.

Learning Theories

• Classical conditioning is learning by association that occurs when unconditioned and conditioned stimuli are paired during training.
• Operant conditioning occurs when the frequency of behavior is controlled by its consequences: reinforcement, punishment, and extinction.
• Social learning theory suggests that learning occurs when the individual is motivated to attend to the consequences. Infants can also learn by observation and imitation.

Cognitive Theories

• Piagetian constructivist approaches suggest that infants develop intelligence by means of their own explorations in the world. Infant intelligence is of a sensorimotor rather than a verbal-symbolic form.
Information processing theories break cognition down into a series of component processes, each of which can function independently of the others. Breakdowns in the cognitive system may occur if any of the components are not properly functioning.

**Systems Theories**

- A *system* is a set of interdependent components, each of which affects the others in reciprocal fashion. The process by which systems components affect each other is known as *transaction*.
- Ecological systems theory suggests that infant development is related in direct and indirect ways to the family and to society, and vice versa.
- Interactive systems theory focuses on the process of communication between parents and infants and the ways in which that communication leads to developmental change in the infant.
- Dynamic systems theory introduces elements of self-organization and indeterminacy into the process of development. Individual differences are not always predictable as a direct result of particular causes, but rather emerge creatively as part of the complex dynamics of action.

**Clinical Theories**

- Clinical theories use evidence from children and adults during therapeutic transactions to construct a view of infant experience and its meaning in later development.
- Children and adults remember their infancy in participatory ways via forms of body movement, muscular tension, and emotions.
- Psychoanalysis uses talking in the form of free association to evoke nonverbal participatory memories. It uses these memories to help adults understand sources of tension and emotion that were acquired during the oral and anal stages.
- Somatic awareness approaches use a combination of talk, movement, and touch to evoke nonverbal participatory memories, allowing people to remember the spontaneous capacities for organic learning and the full use of the senses and emotions that they experienced as an infant.