Chapter 1

Basic Concepts of Infant Behavior and Development

CHAPTER OUTLINE AND OVERVIEW

The Importance of Infancy
What can be gained from the study of infants? What can be learned by reading this book?

A Brief History of Babies
How have responses to and ideas about infants changed historically? What are the historical origins of our current ideas about infants?

Infants Enter the World of Science
What is the current scientific conception of infants? How does it change our view of infancy?

Research Methods in Developmental Science
What are the main scientific approaches to the study of human development? Is science a viable source of information about infants?

Experimental Research Methods
What are the possibilities and limits of controlled experiments with infants? How can experimental research help us understand how infants think, perceive, or feel?

Observational Research Methods
What can be learned from the observation of naturally occurring infant behavior? How has video and computer technology contributed to the accuracy of observation?

Qualitative Research Methods
What is the infant’s experience of the world? What does it mean when a baby cries or smiles? What are the advantages and sources of bias that occur when adults try to answer these questions from their own point of view?
Have you ever wondered about the details of your own birth? Do you think it was painful or pleasurable? Did you cry a lot? Do you remember learning to crawl or to walk? What was the first word you ever said? If you know the answer to any of these questions, it is likely you have asked or were told about it by someone who was an adult when you were a baby. Infancy is mysterious to us. We appear to have no memory of our own infancy; we must rely on the memory of others who were there. And babies themselves cannot tell us what they feel, at least not in words. The mystery of the infant’s mind has intrigued parents, philosophers, and theologians for thousands of years.

The twentieth century, however, has given us powerful new methods for understanding infancy. Scientific research has helped us understand the limits and possibilities of the infant’s ability to sense, move, and feel. We now know some types of environments and forms of care that are conducive to the development of healthy and happy babies. Advanced technologies allow us to monitor the brain’s development and to observe the stages of prenatal growth. The fields of Infant Mental Health and Early Childhood Education have developed techniques to improve the lives of many infants and their parents. These methods have generated strong public interest in babies. Why are babies so interesting?

**THE IMPORTANCE OF INFANCY**

If you read the newspapers or watch television news programs, you will recognize some of these headlines and advertisement leads:

- Discoveries allow for the prenatal detection of genetic disorders.
- Sixty-year-old women can give birth to their own babies.
- Mothers may transmit AIDS to their babies through breast milk.
- Parents can recognize their newborn infants by touch alone.
- Day care may have harmful effects on the mother-infant relationship.
- You can teach your infant to read before the age of two.
- Inadequate parenting of infants causes lasting psychological damage.

If these statements are correct, they have a profound impact on our lives and on society. A sixty-year-old mother may die before the child is an adolescent or become too frail to care for the child. If day care is harmful to infants, we will have to reassess the value of parental work. But are these statements correct? In fact, there is some truth to all of them—but only under certain special conditions. A sixty-year-old can give birth by having a fertilized ovum implanted into her uterus, but only if she is in good health and can tolerate taking supplemental hormones. Day care can be harmful in settings where teachers are poorly trained and facilities are inadequate, or when infants are too young to tolerate the demands of a complex social environment; otherwise, it can have some beneficial effects, such as giving children advanced social skills with their peers.

AIDS can be transmitted through breast milk, but this can be prevented by using formula. Parents, especially mothers, appear to be able to distinguish their own newborn from another simply by touching each of the babies, although there are individual differences. If a mother cannot do this, it bears no relationship at all to her ability to become attached or to provide adequate maternal care. New research has shown that overuse of language videos and computer games in children under two years of age can actually have a harmful effect! For every hour per day that a baby spent watching videos such as “Baby Einstein” and “Brainy Baby,” they understood about 6 to 8 words fewer at age 2 years than babies who did not watch these videos (Zimmerman, Christakis, & Meltzoff, 2007). In general, TV is not very helpful and may even be harmful for babies.
By the end of this book, you should have a much better idea about how to evaluate claims such as the ones listed above. You will read about these and other issues and learn ways to understand research, so you can look up the answers for yourself. The study of infancy is important for many reasons. A few will be listed here, and you may be able to add some of your own.

The Experience of the Body and Its Movements and Senses

The consciousness of young infants is almost entirely occupied with bodily sensations, movements, and sensory experiences. Once children acquire the ability to talk, think, and conceptualize, they acquire an intellectual power that distinguishes humans from other animals. On the other hand, the preverbal experience of being a baby in a baby’s body is also uniquely human. After infancy, many physical and mental disorders of children and adults can be traced to their having lost touch with their own body, emotions, and senses. Cultural values can often run contrary to the needs of the body, as when work or family stresses cause muscular tension (headaches or backaches, for example) or when cultural ideals of physical beauty lead a person to eat less than her or his own body uniquely requires. Most healthy infants are flexible and soft, they breathe fully and deeply, and they love to be held and touched.

For a baby, losing touch with the body would be nearly impossible. For a baby, after all, what else is there? As you study this book and learn more about infancy, allow yourself to appreciate and to reexperience what is really special about being a baby. It can feel like a breath of fresh air.

In Chapter 4, you will read about research on the sensorimotor world of the infant. This, and other chapters, include brief Experiential Exercises you can do to appreciate the actual experience of being a baby, or at least of your own body as you move it in a more babylike way. With practice, these exercises may allow you to step back from thinking, reasoning, judging, and evaluating, and simply be present to your senses and movements.

Infants have Complex Emotional Lives

Infancy is a special time in one’s life. This is not only because it is the earliest stage of life, but because all of life’s stages are unique. Each has its pleasures and problems. For the first few years of life, infants are almost totally dependent on their caregivers for all their needs. Most of what happens to them is not within their understanding or control. As we’ll see in Chapter 7 on emotional development, infants cry easily and feel their pain deeply. They get frustrated with their own clumsiness and relative incompetence to achieve their goals. For reasons we do not fully understand, nature has required all humans to pass through this period and to experience its total reliance on others, its helpless emotional lows and its carefree emotional highs.

Babyhood has a number of high points. Infants can spend hours immersed in the pleasure of play and exploration. They are not plagued by self-doubt, worries, bills to pay, and the other things that can distract adults from living in the moment.

Parent, Caregiver, and Clinician Education

Infants require adult guidance, love, and support. For a young couple ready to provide this care, their first baby can be both rewarding and anxiety provoking. What is the best way to feed babies? How much sleep do they need? Can babies be spoiled with too much holding and affection? What does it mean if a baby cries for long periods? You will find some answers to these questions in this book. Aside from information about infants, some of the chapters review research on the experiences and development of parents. Generally speaking, the more parents know about infants and children, the less anxious they will be, and the better the outcomes will be for the child. Although they cannot substitute for direct experience with infants, books like this one can provide valuable information that enhances the parenting experience. Infant caregivers—such as day care providers, grandparents, and
other relatives—can also profit from this book. Infant mental health workers and other clinicians, such as nurses who work with infants and their parents or who work with adult clients and want to know more about the lasting impact of infant experiences on the adult psyche, will also find this book helpful.

**Improving Health by Early Prevention**

Many of the diseases of childhood and adulthood have their origins in the prenatal period and infancy. During prenatal development, for example, the brain is highly vulnerable to disease, malnutrition, and toxic substances to which the mother may be exposed. Many disorders can be prevented by changing maternal behavior during pregnancy, such as by eating properly, avoiding particular drugs and chemicals, and reducing stress (see Chapters 3 and 9). In addition, medical research has discovered remarkable new treatments for prenatal and infant disorders. In the most serious cases, parents may choose to terminate the pregnancy. In a growing number of cases, however, treatments given to fetuses directly can permanently eliminate the effects of such disorders. Due to advances in medical technology, premature infants are more likely to survive and live normal lives than ever before. In poor nations, simple treatments for combating infant death, caused primarily by diarrhea, are saving millions of lives.

If infants from a wealthy nation survive past birth, the chances that they will die from a serious disease are extremely small due to widespread immunizations and health care, explained in Chapter 9. Public health officials are beginning to make progress in reducing the largest cause of infant death in these countries: accidents. Parent education in infant health and safety, safer toys, better infant restraints for automobiles (more infants and children lose their lives in auto accidents in North America than from all other causes of death combined), and better enforcement of seat belt laws are all helping to reduce injury and mortality.

**Reexperiencing Infant-like States Can Be Healing and Rejuvenating**

Infants have an ability to take life as it comes, be fully “present” to their experiences, and take joy in everyday actions and sensations (Schafer, 2004). Movement, body awareness, and dance educators often use infant-like movements to help children and adults develop an awareness of their body and a sense of calm. These procedures have proved useful in expanding the range of movement for all individuals. Regular practice of these types of movements may promote relaxation and personal growth. Movement education based on a re-learning of infant patterns of movement works especially well with people who are afflicted with muscular disorders, such as cerebral palsy, and with those who have suffered accidents and injuries. It is also helpful for the relief of everyday tension and muscular pains.

Some psychotherapeutic techniques recreate within the patient-therapist relationship the innocence and trust found in healthy parent-infant relationships. Some touch therapies use gentle, noninvasive contact to create the type of relaxation and self-awareness that babies experience in their mother’s arms. Practitioners from all these therapeutic and educational methods assume that there will be a healing effect of recreating—in a safe and protected setting—some of the conditions of being a baby. Reexperiencing some of the traumas of one’s own infancy, especially within the supportive contexts of these treatment approaches, can also be therapeutic. Such clinical methods will be discussed in more detail in Chapter 2 and the Experiential Exercises found at the ends of chapters give examples of how to do this.

**Informed Public Policy**

Because of infants’ vulnerability, many social and medical problems could be prevented by making sure that they receive proper care and that young parents receive all the support necessary to provide the best environment for their children. Society can take positive steps toward the achievement
of such goals. Citizens who are knowledgeable about the possibilities and risks of prenatal and infant development can make better-informed decisions when asked to vote—as lawmakers or as part of the electorate—on legislation regarding infant, family, and child welfare. Should all families with infants be guaranteed the right to housing, proper nutrition, medical care, and parent education? Currently, these are not guaranteed rights in the United States. They are guaranteed, however, in northern European countries such as Sweden and the Netherlands. Because the quality of day care influences infant development and the parent-child relationship, should there be national standards for day care providers? The United States is one of the few industrialized countries without such standards. You can read more about public policy issues in Chapters 8 and 9.

Origins of Individual Differences

Each human being is different. A lot of these differences come from experiences as a child and adult, such as one’s school experience, the effects of family and friends, the world of work, and unplanned opportunities and losses that occur during one’s life. But do any of the differences between people have their origins in early infancy? If so, which parts of one’s uniqueness are most likely connected to what happened to one as a baby? This is an extremely difficult question to answer because early experiences are rarely preserved in some pure form, but rather combine in complex ways with later experiences. Nonetheless, many differences between people during the prenatal and infancy periods do have a lasting impact. In Chapter 10 you will discover what is known and what is yet to be discovered about the infantile origins of differences between people.

The importance of studying about infants, as illustrated by each of the topics above, may seem self-evident. The importance of infancy, however, is not always appreciated. An infant born into today’s world may experience poverty or wealth, love or abuse, health or disease. More must be done to educate parents and political leaders about the need for protecting infants, who cannot protect themselves.

Was it always this way in the life of infants—this mixture of good and bad? In general, yes. In all periods of the past for which there are archaeological or historical sources, we can find evidence of both kindness to and neglect of infants. Nevertheless, there is more money, time, and care devoted to infants today than at any other known period of history. How-to articles, products, and books on child rearing, pregnancy, and childbirth are squeezing other items off store shelves. Most large supermarkets in Europe, Asia, and North America devote an entire aisle to baby products: diapers, oils, powders, foods, furniture, toys, designer clothing, strollers, packs, books, and magazines. In wealthy countries, it is not unusual for infants to be dressed in expensive high-tech running shoes and athletic clothes before they can even walk! More seriously, many countries devote a portion of their tax revenues to fund scientific research on the medical and psychological aspects of infancy, research that has led to many of the findings reported in this book.

To give you some insight into why infancy has become so important, the next section reviews some of the historical trends in the role of the infant in society. Because of limitations of space, the focus will be on the history of Western cultures (European and American). The heightened importance of infancy in today’s Western society began in the eighteenth century, with an increase in pediatric medical practice, advice for parents, parental devotion to the individuality of each child, children’s books, and other infant care products and resources. Readers are encouraged to integrate what is known about their own cultural history into this story.

A BRIEF HISTORY OF BABIES

Early Civilizations

As far back as there are recorded documents, history reveals a mixture of beliefs and prac-
tices about infants: love and cruelty, freedom and restriction, tolerance and intolerance (French, 2002). The history and literature of the ancient Greeks and Romans (200 B.C.–300 A.D.) indicates that they advocated a rather harsh upbringing for infants. Shows of affection were avoided, and infants were wrapped tightly in swaddling bands in order to mold the child’s body into one worthy of a citizen. Cold water was used to bathe the child to prevent the child from becoming too soft. Babies hated their baths all the more because nurses would press on the child’s skull to make it as round as possible and pull and stretch other body parts in order to shape them.

Similar beliefs in shaping the physical body of the adult by binding and manipulating the infant can be seen in such non-Western ancient practices as the foot binding of girls in China (which made their feet small but deformed). Head binding among both the ancient Maya of Mexico and among eighteenth-century Europeans was used to give the head an oblong shape (Johnson, 1992). While it may seem surprising to people today, Roman parents felt this treatment to be an expression of their love. They wanted their children to grow up strong, their bodies nicely proportioned and held in a proper posture. Roman literature, in fact, testifies to a strong devotion between parents and children, especially among the wealthy classes, and attests to the importance of hugging, kissing, and affection after infancy, as the child grew older and began to form his or her own character (Dupont, 1989; Gies & Gies, 1987). Historians of ancient Egypt (2,000–100 B.C.) and Greece (800–200 B.C.) have found evidence of toys and games for children and written documents describing the need to love and protect infants (Greenleaf, 1978).

The recognition of the role of the body in the development of the person is an important aspect of Westerners’ Greco-Roman heritage. Both Greeks and Romans believed that exercises for the body led to the development of a strong moral character. Upper-class boys learned athletics and gymnastics, while girls learned music and dance.

Many early civilizations, such as ancient Rome, practiced infanticide, the deliberate killing of unwanted infants. This was partly because Roman laws considered the child as the property of parents, and also made parents responsible for raising healthy and productive heirs (Borstelmann, 1983). It was the duty of the head of the family to decide if a newborn should live or die. This practice eliminated infants who were malformed, but many healthy babies too were left to die because the family was poor or the child unwanted (Dupont, 1989). Infanticide continued in Europe throughout the Middle Ages, and some societies today still practice it (see the section on family planning in Chapter 3).

The ancient Isrealites’ practices of childrearing are known primarily through the Old Testament. The biblical period dates from 2000 B.C.E. to 500 B.C.E. There are many stories in the Old Testament that reflect the importance of infants and children. Hannah, for example, prayed and made vows to God so that she might conceive and give birth to Samuel. Unlike Rome and Greece, children were not considered the property of parents, but rather as a gift from God who needed to be protected, loved, and educated. There is no evidence of infanticide among the ancient Hebrews.

The Bible also gives detailed—and medically informed—prescriptions regarding women’s behavior during menstruation, pregnancy, and childbirth. Direct descriptions of infancy are rare in the Bible, but many stories imply that infants should receive loving care, appropriate blessings for a good and holy life, and that male infants should be circumcised. Parental devotion was evident in stories of the suffering of parents who were asked to sacrifice their infants. When two mothers claimed to be the parent of the same child, Solomon’s threat to kill the child revealed the true mother, whose pain was sincere. The Hebrew slave revolt in Egypt, which led to the Exodus and return to the promised land, was precipitated by an Egyptian law to kill Hebrew first-born sons meant to limit the slave population. In order to save Moses, his heartbroken family sent him floating down the Nile, to be adopted with love by Egyp-
tian royal women and actually nursed by his own mother. This story suggests a comparison between the concept of human freedom from slavery in general with the act of saving a single infant from death (Frymer-Kensky, 1995).

The Bible asks parents not only to love but to educate their children. Abraham was told to “instruct” his children (Genesis 18:19). Regarding the important facets of Hebrew culture, parents were asked to “teach them intently to your children ... when you sit in your home” (Deuteronomy 6:7). Childrearing involved discipline accompanied by respect for the child, as the following passages illustrate: “Train a child in his own way, and even when he is old, he will not depart from it” (Proverbs 22:6); “Foolishness is bound in the heart of the child but the rod of correction shall drive it from him” (Proverbs 22:15); and “Chasten your son for there is hope, but set not your heart on his destruction” (Proverbs 19:18). While some have interpreted these statements as grounds for justifying corporal punishment, the Old Testament does not specify the type of punishment, but rather makes clear the need for discipline in the context of love. Other Bible stories reveal the undesirable outcomes when discipline is too harsh or nonexistent or when parents fail to educate their children about the stories, rituals, ideals, and history of the culture.

The Middle Ages and the Renaissance

Following the Greek and Romans, a mix of concern for children coexisted with what people today would consider to be harshness and deprivation throughout recorded Western history. The early Middle Ages in Europe (300–1100 A.D.) began with the fall of the Roman empire and the gradual spread of Christianity throughout the continent. The largely rural population began to move in large numbers to cities and towns. At the same time, the political boundaries changed frequently as empires dissolved and local powers asserted themselves. These social changes contributed to an increasingly educated urban population, on the one hand, and to the growth of a class of urban poor who suffered from disease, malnutrition, pollution, and ignorance, on the other. The poor people in the cities lived in much more unhealthy conditions than did the poor in the countryside.

Because of inadequate sanitation and other sources of urban pollution (pollution is not a new problem), infants of the urban poor were more likely to die or to suffer birth defects than those from rural areas. Because cities drew people away from family roots and because disease claimed the lives not only of infants but of mothers in childbirth, many orphaned children walked the streets as beggars, thieves, and prostitutes. As you can see, childhood among the urban poor then was not too much different from what it is today. This is especially true in the large and growing slums found in many of the “megacities” of the twenty-first century (defined as cities with more than 10 million people) such as Lagos (Nigeria), Bombay (India), and Mexico City. This does not mean that poverty inevitably causes problems for parents and children, but it does increase the risk that problems will occur.

The Christian church began to have an impact on the beliefs and practices of European child rearing after around 400 A.D. Christians, following the ancient Hebrew beliefs and practices, advocated parental love and worked to protect children from infanticide, abortion, and maltreatment. Grave stones for infants began to appear at this time, as well as special penances if a parent had done some wrong to a child (Gies & Gies, 1987).

During the late Middle Ages (1100–1300 A.D.), a few written medical texts giving advice on childbirth and early infant care appeared. Trotola, a female physician in twelfth-century Italy, advised rubbing the newborn’s palate with honey, protecting the infant from bright lights and loud noises, and stimulating the infant’s senses with cloths of various colors and textures and with “songs and gentle voices” (Gies & Gies, 1987). In England during the same period, birth often occurred in a warm chamber with plenty of bathwater, accompanied by the scent of olives, herbs, and roses. It was attended by a female midwife and female friends wishing mother and baby good fortune and joy (Hanawalt, 1993).
Infanticide, however, was still practiced. Although parents had to suffer penances, it was not a crime equivalent to homicide, as it is in most countries today. By the thirteenth century, some cities in Europe had created church-run hospices to adopt orphaned children as an alternative to infanticide. This was partly because of the belief that all life is sacred, and also, according to medieval church doctrine, a child who died unbaptized was barred from heaven for all eternity (Le Goff, 1987). In some countries today, because of urban stress and poverty, infants are left in woods, rivers, and trash bins. Some cities in the United States have begun programs that allow mothers to drop off unwanted infants at local hospitals without fear of prosecution. Social workers then help to find foster homes for these children. Times may have changed, but the problem of unwanted children still remains.

Not until the European Renaissance (1450–1650) do we begin to see the emergence of written philosophies of child rearing in Western cultures. Writers, mostly from the church, condemned the ancient practice of giving children to wet nurses from the poorer classes (a wet nurse was a woman who was paid to nurse the child with her own milk to spare wealthy women the task of nursing the baby themselves) because the child could pick up the habits and diseases of the nurse. The famous Renaissance artist Michelangelo jokingly claimed that his skill in sculpture came from his wet nurse, who was the wife of a stonecutter (Gies & Gies, 1987).
During the early Middle Ages, religious paintings depicted Christ as an adult. By the late Middle Ages, interest in children was growing, and Christ began to appear as an infant. However, the infant Christ in medieval art is typically shown in stylized clothing, with adult facial features and manners. One painting depicts Christ as an infant making the Catholic gesture of benediction to a group of people kneeling before him. In Renaissance art, by contrast, infants and children began to look and behave differently from adults. Children were sometimes shown playing with toys (Koops, 1996). Not only does the infant Christ begin to look more like a real baby, but we also see the emergence of secular paintings of everyday family life and portraits of individual children.

**The Enlightenment**

By the eighteenth century, new ideas about the value of human life, dignity, and freedom had begun to emerge, a shift of consciousness called the Enlightenment. In France, for example, Jean-Jacques Rousseau (1712–1778) argued that childhood was a time of special privilege, that children bring goodness, not original sin, into the world, and that education should be sensitive to the needs and inclinations of the infant and young child. The social movement Rousseau represented was called romanticsim. Its followers included such great English romantic poets as William Wordsworth (1770–1850), who wrote of childhood in idealized terms.

Behold the Child among his new-born blisses,
A six years’ darling of pygmy size!
See, where ’mid work of his own hand he lies,
Fretted by sallies of his mother’s kisses,
With light upon him from his father’s eyes!

(From “Intimations of Immortality from Recollections of Early Childhood,” in Williams 1952, 263)

William Blake (1757–1827), another English poet, rejected these simple romantic notions of innocence. In a poem called “The Scoffers,” Blake suggested that the scientific achievements of Sir Isaac Newton were far more lasting intellectual milestones than the mocking voice of Rousseau.

Charles Dickens was another author who rejected romanticism. Instead of depicting childhood in nineteenth-century England as a time of happy contentment, in *Oliver Twist* and other famous stories he courageously exposed the effects of disease, poverty, child abuse, and child labor for all to see.

All of these writers revealed a new concern for the individual and for the value of children, but they disagreed about what was “natural” compared to what needed to be provided for the child’s healthy development. The English philosopher John Locke (1632–1704) accepted the importance of early education for children but believed that children needed more structure than the romantics advocated. Locke is known for his rational approach to education, which was decidedly not a romantic one, because he thought children needed specific guidance and discipline. Beginning with the assumption that the infant’s mind is a *tabula rasa*, a blank slate on which anything could be written, Locke argued that education should provide the skills to make rational choices. The philosophical movement to which he belonged is called empiricism.

Both Rousseau and Locke revived the ancient Greek ideals of the body’s importance in healthy moral development. Locke wrote that “a sound mind in a sound body, is a short but full description of a happy state in this world.” Rousseau suggested that children should “run, jump, and shout to their heart’s content.” Their ideas were carried into educational practice by nineteenth-century educational reformers in Europe and North America, who made sure that school curricula offered art, music, and physical education (Friedrich-Cofer, 1986).

The romantic ideas of freedom and happiness combined with the empiricist ideas of reason and realism to create the philosophical foundations for the revolutions in France and the United States. This period also saw the rise in society of the value of the individual. It had been the custom in the past to give a newborn the same name as an older
sibling, or the name of a sibling who had died. Such practices gave way in the eighteenth century to a newfound respect for the individuality of the child. Not only did advice books for parents proliferate, but by 1800 a wide range of inexpensive books were being published exclusively for young children. There was a corresponding recognition of the importance of the nuclear family and the maintenance of a private and sacred family home.

Domesticity became a value for the first time. During the American colonial period, the main value of the family was to raise children according to the family’s particular beliefs and values. Many of these families came to the New World specifically to practice their own beliefs, away from the conservatism and religious persecution then pervasive in Europe (Clarke-Stewart, 1998). These values of individuality, autonomy, and self-determination had never before existed in the history of the world, and they changed how adults conceptualized the meaning and value of infancy and childhood.

These ideas also led in the nineteenth century to the growth of social responsibility toward infants and children and the rise of the idea of the child as an integral part of the definition of the family. The “discovery” of the child was due to urban forces in Europe and North America that segregated the family from the workplace, defined the mother’s role as major supervisor of the domestic scene, and allowed love or sentiment (rather than family inheritance or economic well-being) to be the bond holding the family together (Hareven, 1985).

Educators in the nineteenth century continued to emphasize the importance of the young child’s body in the development of the whole individual. Children who were obese, physically awkward, or handicapped could expect to get guidance from the school. The curriculum included free expression and creativity for the body, such as gymnastics and dance. Team sports and other exercise programs were meant to lay the foundation for the continuation of physical exercise through adulthood. Students were expected to understand the principles of health and hygiene. These programs grew out of the Greco-Roman and Enlightenment emphasis on the importance of the body as well as the mind (Friedrich-Cofer, 1986).

Not only did the child emerge as an individual during this period, but the role of full-time mother and housewife appeared on the historical stage for the very first time. It may be shocking for people in Western cultures in the twenty-first century to realize that the idea of a loving mother taking full-time care of an infant is a very recent cultural invention brought about by the rise of the nuclear family. For most of human history, infants were raised by many different caregivers, such as nurses, siblings, and other relatives.

It should be noted, however, that the development of this segregated nuclear family and its full-time mother was at first confined to the white middle class. Families from other classes and ethnic and racial groups preserved the preindustrial extended family, in which love, work, and education all took place within the home, and child care was shared by all family members. Women worked in the fields and in the home in the company of their babies, just as they had done for most of human history. Changes in the family have not occurred uniformly in all parts of American society, and these cultural patterns still account for many of the differences among families today (Hareven, 1982). Other cultural and economic forces have led most recently to the decline of the nuclear family, the reemergence of extended families and communal living, non-parental child care, and the rise of single-parent families.

Social changes in the nineteenth century led to the growing awareness of the public’s responsibility for the welfare and development of infants. Although the first English-language pediatric textbook appeared in 1545, welfare and medical institutions devoted exclusively to children did not open in Europe and the United States until the 1850s, around the same time as the rise of immunization and the pasteurization of milk. Maternal deaths during childbirth declined in this period due to the invention of anesthesia and procedures for sterilizing medical instruments (Greenleaf, 1978).

These medical advances further solidified the family by reducing infant mortality. As each child
could be counted on to live a healthy life, families began to consciously reduce the number of children so as to invest more emotional energy in each child. By the middle of the nineteenth century, infancy and childhood had emerged in the public mind as a separate and valuable stage of life (Hareven, 1985). Manufactured baby dolls first appeared in Europe in 1825. In 1840, half of all three-year-olds in Massachusetts were attending infant schools, a practice that later declined because experts began to doubt the wisdom of sending such young children to school (Clarke-Stewart, 1998). The first public playground was developed in Boston in 1885 (a few heaps of sand dumped in a vacant lot), but by 1915, there were well-planned public playgrounds in 430 U.S. cities (Blank & Klig, 1982; Greenleaf, 1978; Zeitz, 1969).

Imagine what it must have been like to raise a baby in North America or Europe before 1850. The pain of childbirth could be helped by home remedies and the advice of a midwife, but there was no protection from serious problems and severe pain. Women could not be sure if they would survive childbirth, and many husbands were left without a wife and mother to raise the new baby. Infants died frequently of unknown (at the time) causes. Daily life with the baby was also much harder than it is today. There were no disposable diapers, no manufactured toys, and no baby foods you could buy. Parents had to make the infant's clothing, diapers, toys, and food from scratch. A baby gets a lot of diapers dirty in a day, and there were no washers and driers. In fact, cotton fabric did not become widely available until the early nineteenth century (the textile mills of that period contributed to the exploitation of child labor, as depicted in the novels of Charles Dickens, among others). Most clothing before that time was made of wool and was hot and heavy. If you were among the few who were wealthy, you could hire a servant and a wet nurse to care for and feed the baby, although wet-nursing declined rapidly at the end of the nineteenth century because maternal love was deemed better for children. For most families, however, having a baby affected all aspects of their lives. There were no readily available forms of contraception, so most women gave birth regularly every three to five years.

**INFANTS ENTER THE WORLD OF SCIENCE**

The beginning of the twentieth century saw the rise of the scientific study of infant development. Earlier debates over romanticism versus empiricism were replaced by discussions about the contributions to development of nature (genes) versus nurture (environments). (See Chapter 2 for a discussion of the role of genes and environments in the emergence of individual differences between infants.) Arnold Lucius Gesell (1880–1961), working out of the romantic tradition, thought that the orderly changes seen in early development were specified by the genes. In this regard, Gesell also followed the ideas of Charles Darwin, whose theory of the evolution of species will be discussed in greater detail in Chapter 2. The genetic timetable for the patterning of development was called maturation. Gesell made a career out of the careful measurements of developmental changes in size, motor skill, and behavior in infants and young children. He was the first scientist to use a one-way mirror to observe infants unobtrusively and the first to use film to record their behavior.

Because Gesell believed in genetic maturation, he cared little about individual differences and focused instead on the “average” child. This created anxiety in parents who read his works and discovered that their own children walked or talked later than the average child. Even today, most parents want their babies to be above average. We now know that babies vary widely in the ages at which they attain developmental milestones, and that most babies—whether slow or fast—develop normally. There is, in fact, no such thing as an “average child,” since all children are unique, according to the perspective of the European Enlightenment. The normal and expected variability between infants will be discussed in later chapters.
In the empiricist tradition, and contrary to Gesell, John B. Watson (1878–1958) believed that children could be trained to do almost anything, given the right kind of “nurture.” He demonstrated this by doing studies in which he taught small children to be afraid of cuddly animals by making loud noises whenever they touched the animals. This type of research would be considered unethical today. Nevertheless, Watson’s work suggested that all our behavior, even the most basic and innocent, could possibly be controlled by outside forces. This kind of belief, in extreme form, still persists in some science fiction stories of a future in which an all-powerful government manipulates every aspect of learning and development to produce robot-like citizens who are slaves to the rulers. Recently developed dynamic systems theories (see Chapter 2), on the contrary, suggest that not all behavior can be controlled or predicted. Human life is full of surprises and unexpected twists and turns.

Watson nevertheless left a lasting imprint on North American society. The waves of immigrants who landed on the shores of the United States and Canada all believed that they could make a new life for themselves and their children. Watson’s idea that anyone could succeed regardless of past history or genetic heritage sustained the hopes of many of the new arrivals. Watson placed responsibility for a child’s outcome directly on the shoulders of the parents; if the child failed, it was the parents’ fault. He encouraged parents to avoid kissing and holding their babies in order to make them independent individuals. Today we recognize that a wide range of parenting styles is acceptable and appropriate for babies, and later chapters review individual and cultural differences in infant-care patterns. Systems theories of development (Chapter 2) propose that the family, parent, and infant all make important contributions to developmental outcomes. Human development is not so simple that blame or credit can be assigned to a single individual.
Sigmund Freud (1856–1939) presented strong counterarguments to Watson and Gesell. Freud focused on psychological experience rather than on behavior. He recognized that all infants experienced emotional highs and lows and that even infants felt the need for love and possessed powerful desires. Freud’s daughter, Anna, devoted most of her life to bringing her father’s insights out of the adult psychoanalytic session and into the real lives of parents and children. Anna Freud taught parents to hold and cuddle babies and to be patient while babies discovered and tried to manage their own desires in appropriate ways (A. Freud, 1965). Nurture was important here too, but only to the extent that it encouraged the child’s nature to blossom. Unfortunately, Anna Freud too faulted parents for their children’s developmental problems—in this case, for giving them too little attention and affection and for “selfishly” not understanding the situation from the child’s point of view. Even the most understanding parent sometimes has bad days, and there are many times when infants are in fact incomprehensible. Sigmund Freud will be discussed more in Chapter 2.

The scientific theories of infant care and infant development spread rapidly through Western culture in the nineteenth and twentieth centuries because of the rise of the mass media and electronic communication. Urbanization and the automobile created an increasingly mobile and nuclear family, separated from grandparents and dependent on the advice of child-care experts. Society thus created a demand for better trained and better supported behavioral scientists who could share their expertise with a public hungry for rational approaches to child rearing.

Let us return to the question raised earlier in the chapter. Why is infancy even more in the public mind today than it was fifty years ago? Although there is no single answer, it may be a reaction to the rapid growth of scientific approaches to psychology and human development since the 1960s. This growth was inspired in part by the Cold War, when Western leaders decided that the education and training of their citizens was the best way to combat the technological threats of advanced weapon systems.

The scientific revolution in behavioral research on infancy during these years was very much in the empiricist tradition, but unlike Locke’s focus on the whole child’s mind and body, the research of the 1970s emphasized infant learning and cognitive development. Cognitive and learning theories rose in importance. The publication in 1973 of Stone, Smith, and Murphy’s *The Competent Infant* reflected a desire to discover ever-earlier signs of intelligence in infants. Parents strove to train their infants to achieve the maximum mental potential at the earliest possible age. This was based on the belief that education, rather than natural endowment, was the best guarantee of child success (Clarke-Stewart, 1998). Many parents placed their infants into tightly structured study programs to teach them reading, word learning, music, and mathematics before they reached the age of three years.

This new scientific focus on childhood, for all its benefits, came at a price for children. The research became more focused on using quantitative measures of children’s growth and on reporting statistical averages. Much of the research on children in the nineteenth and early twentieth centuries had focused on individual children using qualitative case studies (see the Research Methods section in this chapter). The individual child became lost in the quest for scientific generalizability and validity.

Another consequence that affected the lives of children directly is that the emphasis on intelligence and mental development led to a steady decline in a balanced view of the whole child as needing education not only for mind but for body, emotions, and social connections. According to one historian, “as the individual child and adolescent with bodies faded from view, many of the humanistic ties which bound scientist, teacher, family, and child faded with them” (Friedrich-Cofer, 1986, p. 133). Children’s progress began to be reported in the form of standardized test scores, rather than individualized assessment of mental and physical health. Physical education,
music, and art programs that had been created for all children declined or disappeared entirely from schools, replaced by competitive athletics and music programs designed for an elite group of talented students. This pattern continues today in the United States with the federal No Child Left Behind (NCLB) Act, which mandates that students need to have a minimum score on standardized tests for the school to qualify for federal funding. This policy has created more drop-outs, especially of minority youth, in order for the school to maintain its scores, with a continued erosion of programs for the enrichment of the body and spirit (Cofer, 2008).

This focus on the early structuring of the infant’s intellectual growth was followed in the 1980s by an interest in targeting infants who were at risk for developmental difficulties, such as those who were premature, handicapped, or victims of abuse. The focus on risk was associated with the idea that all humans could become perfect if given the right kind of child rearing. For healthy and wealthy infants, this meant a quest for developing a “superbaby” and giving children a “head start” (Clarke-Stewart, 1998). It also brought the ideal of a “supermom,” who could be employed outside the home and at the same time be a great mother and a wonderful and loving wife. The 1980s also saw a rise in the amount of time fathers spent with their babies.

More recently, however, romantic ideas have returned to scientific studies in psychology and in infant development (Schneider, 1998). Perhaps in reaction to what was seen as an overemphasis on intellectual achievement, since the 1990s we have seen a rise in studies of parent-child relationships, emotional development and attachment, the role of the body and touch, and communication and language. Of course, the more rational approaches to infant development continue to grow in such fields as cognitive neuroscience and behavior genetics. On the other hand, some of the trends of the 1970s and 1980s, which focused on babies growing up and getting smart as quickly as possible, were replaced by ideas about slowing down and appreciating the beauty of each phase of a baby’s life and the specialness of being a baby.

It may be enlightening to realize that the view of science as quantitative and the focus on the study of the mind to the exclusion of that of the body is a relatively recent cultural invention that temporarily replaced a long Western cultural history of belief and practice in the holistic integration of body and mind. In the next few sections, a conceptualization of infancy based on these scientific approaches will be discussed, followed by a review of some of the research methods that have been devised for the study of infant development.

Conceptualizing Infancy

How you conceptualize infancy depends on what you want to know about infants. If you are a painter, a poet, or a filmmaker, infants may serve as metaphors for divinity or innocence. If you are a clinician, contacting one’s infancy experiences and traumas is a source of healing and new psychological and physical growth. Scientists strive to understand infants in their own right, detached from social and cultural conceptions about infancy. Many scientists admit that they, as products of their own society and culture, can never rid themselves completely of cultural bias. Later in this chapter, I will discuss different scientific methods that either ignore the cultural beliefs of the researcher or take them explicitly into account.

Stages and Changes in Infant Development

The definition of infancy includes how we mark the important developmental transition points during the infancy period. In reality, infancy is a slow and continuous process of developmental change. Not all changes that we observe in infants are developmental changes. A baby can change from being happy to being angry, but we would not call such changes developmental, since the child frequently changes back and forth between these two emotions. Developmental change is characterized by the following three features:
• **Developmental changes are not reversible.** Developmental change is a reorganization of the entire person such that the earlier patterns of behavior, thought, and feeling cannot be easily recognized or recaptured.

• **Developmental changes are stable.** Organized patterns that emerge in development persist over relatively long periods of months or years.

• **Developmental changes occur in sequence.** Development occurs in an orderly sequence that is similar across infants.

  The progression of language development—for example, crying, cooing, babbling, one-word speech, and multiword speech—has all the required features of developmental change. These changes reflect a reorganization of the whole infant in relation to the social world. Once babies learn to talk, for example, they can express their needs more clearly and participate more fully as partners in relationships. They can acquire conceptual thinking and social understanding. The change is not reversible, since babies rarely go back to simply crying when they need something. The only evidence for reversibility in development would be in the case of neurological damage due to accident or disease. Even here, what is occurring is not, strictly speaking, reversibility, but rather a different reorganization of the whole person that takes account of the deficit.

  The developmental progression from crying to speaking also shows stable and persistent patterns called **developmental stages** that last for long periods. The period during which infants cry to get their needs met lasts for three or four months at the beginning of the first year. One-word speech begins around ten months and lasts almost one year for most babies. Even though development is a continuous process of change, people can recognize that there also appear to be persistent stages. Stages also have the characteristic of occurring in an ordered sequence. Few infants can speak in whole sentences without first passing through the period of one-word speech.

  Each culture views the stage divisions of an infant’s life differently. The Alor people of the Lesser Sundra Islands do not even count the infant’s development in days or months, but rather in terms of a series of stages of development. The first stage lasts from birth to the first smile, the second from smiling to sitting up alone or crawling, and the third from this point to the onset of walking. The Chagga of Tanganyika apply different names to infants depending upon their stage of development. A newborn is called *mnangu*, or “incomplete,” a *mkoku* is “one who fills the lap,” and a *mwana* is an infant before the age of three years (Mead & Newton, 1967). These linguistic labels are comparable to the terms newborn, infant, and toddler in English.

  Parents and other infant caregivers may use another type of division for the first three years. They may be more concerned about the ages at which infants become capable of independent play with other infants, the age of the beginning of toilet training and the onset of bowel control, or the age at which infants become more relaxed when separated from their parents. Developmental scientists tend to divide stages according to milestones having to do with one of the areas mentioned in the last section, such as the progression in communication from crying to speech. Another example is the motor development sequence.

### RESEARCH METHODS IN DEVELOPMENTAL SCIENCE

What causes people to develop along different pathways and to acquire different ways of experiencing the world? Each culture has its own theory of the formation of individual differences. As explained earlier, for example, the ancient Greeks and Romans believed that exposing an infant to a variety of fearful and stressful events early in life would make the child less fearful and more emotionally balanced later. Nineteenth-century Europeans believed just the opposite—that protecting the child from fear-producing experiences was the best way to create an outgoing child (Kagan, Kearsley, & Zelazo, 1978). Which one of these “folk” theories is more correct? How could you decide?
The position taken in this book is that while folk theories are important parts of people’s beliefs that structure the way people behave, scientific theories are a viable alternative for conceptualizing the processes that create developmental change and individual differences. The reason is that the scientist relies on many sources of evidence (folk theories may be based only on experience within one’s own family), tries to separate what is repeatable and stable from what is coincidental (folk theories tend to infer general patterns from a small number of instances), and attempts to rid observations of bias (folk theories often embody what the observer hopes to see or believes should occur, rather than what actually does happen).

This does not mean that scientists always succeed in reaching these ideals. As research in the behavioral sciences has returned to a more romantic approach, many scientists are beginning to question this ideal. No scientific study can be flawless, and all science is infused with the values and perspectives of individual scientists. Some scientists have attempted to put themselves into a scientific study as participant observers using qualitative, as contrasted with quantitative, research methods.

Quantitative research methods represent complex behavioral processes using a numerical index called a variable. Qualitative research, on the other hand, attempts to capture the meaning or quality of the behavior. Qualitative researchers use verbal or pictorial descriptions of behavior rather than numbers, and they try to understand how their own perspectives influence the subjects and shape the findings and interpretations. They make explicit the idea that science is one type of human interpersonal relationship. These qualitative researchers are like folk theorists in that they do not divorce their own beliefs from the observations, but they maintain a scientific stance by taking multiple perspectives and entertaining alternative interpretations. In the following sections, traditional quantitative research methods will be discussed, including methods for experimental and observational research. This will be followed by a section that discusses qualitative research methods.

Jean Piaget (1896–1980), one of the founders of the field of developmental psychology (Chapter 2), began his career in research on children by making extensive written notes, often on a daily basis, about the behavior of his three infant children. Piaget not only observed natural behavior, but tried out little experiments to test alternate interpretations of what the children could do. At one point, Piaget tried to determine whether his eight-month-old daughter Jacqueline (J.) was capable of imitating mouth movements and sounds. In the following example, Jacqueline seemed to imitate her father’s biting movements. Or did she? Piaget was not sure whether Jacqueline only appeared to imitate him because he had started out by imitating movements she could already make.

J. was moving her lips as she bit on her jaws. I did the same thing, and she stopped and watched me attentively…. J. began to imitate me an hour later…. In order to understand this new development, two circumstances must be noted. Firstly, for some days she had not merely imitated sounds for their own sake but had watched the mouth of the model with great attention. Secondly, as she moved her lips, J. began by making a slight noise with her saliva… and I had imitated this sound at the outset. Her interest in the movements of the mouth was thus clearly due to interest in the production of sound. [Three days later] I resumed the experiment without making any sound and without J. herself having made the movement beforehand. She watched my lips moving and then distinctly imitated me three times, keeping her eyes fixed on my mouth. (Piaget, 1962, pp. 30–31)

**EXPERIMENTAL RESEARCH METHODS**

In this example, Piaget combined observational research with an experiment. An experiment is a research study in which one aspect of the situa-
tion is manipulated while all other aspects are held constant or controlled. In this case, in order to discover Jacqueline’s ability to imitate mouth movements on her own, Piaget waited for a time when Jacqueline had not made the movement spontaneously for some time, and he did not produce any sound when he made the movements himself. The prior condition (the child makes no similar spontaneous movement and the adult does not imitate the child) and the presentation of the adult model (absence of sound) were controlled. The experimental manipulation is the presence or absence of a movement-only adult model.

In modern versions of Piaget’s famous imitation experiment, many other aspects of the situation are controlled: the position in which the child is sitting, the behavior of the adult model, the familiarity of the infant with the adult, and the observation procedures. The following are some standard experimental procedures.

Control groups that do not receive any manipulation are compared to a group of infants who receive the experimental manipulation. Alternatively, different groups can be compared if each receives a different type of manipulation. These are called contrast groups. In imitation research, for example, different contrast groups of infants are presented with a different model (tongue protrusion, mouth movement, or a facial expression). If imitation occurs, the frequency of tongue protrusion following the model should be highest in the group that has seen the tongue-protrusion model. This procedure controls for the fact that most babies produce tongue protrusion spontaneously, so that some tongue protrusion would be seen in all the groups.

Random assignment is used to determine which subjects belong to each experimental group. A flip of a coin or some other random process is used to assign subjects to groups. In some cases, it is unethical to use random assignment in a study. For example, suppose we want to compare the effects on language development of differences between mothers in their speech to infants. We obviously cannot randomly assign mothers to infants.

Experiments generally have two important measures, also called variables. The independent variable is that which is controlled or manipulated by the experimenter. In the case of imitation studies, the independent variable is the type of model given to the infant. The independent variable is the presumed cause of the phenomenon; that is, different types of models are presumed to cause the infant to imitate different movements. The dependent variable is the presumed effect or outcome behavior that is observed in response to the changes in the independent variable. In the case of the imitation study, the dependent variable is the frequency of different actions of the infant, such as the frequency of mouth movements or tongue protrusions. The dependent variable is presumed to be affected by the causal independent variable such that manipulations of the independent variable should lead to systematic changes in the dependent variable.

Infants are not as easily studied as older children or adults. Infants cannot describe their inner states, take standardized written tests, or respond to interview questions. Because of the difficulty of working with infants, special procedures have been devised to measure their behavior.

Standardized Experimental Procedures for Use with Infants

In paired-preference procedures, infants are shown two visual stimuli side by side, or they hear sounds presented to one or the other ear. Researchers then try to determine which of the two stimuli is preferred by the infants. During such procedures, infants are either held quietly by their mothers or sit in an infant seat in a darkened room to reduce competing sources of stimulation. Directly in front of the infant there is usually a blank screen on which is mounted a display of flashing lights. A small peephole in this screen, invisible to the infant, allows an observer to look directly at the infant’s face and judge where the infant is looking and for how long (Fantz, 1961). In a more sophisticated variation of this procedure, an invisible infrared light is reflected off the infant’s cornea,
and the angle of reflection is detected by an electronic sensor. The angle of reflection can be translated electrically to determine the precise position of the infant’s gaze (Haith, Bergman, & Moore, 1977). The latter procedure has also been used to examine the developmental changes in the way infants scan visual objects.

At the beginning of an experimental trial (a presentation of one pair of stimuli), the light display flashes to attract the infant’s attention to the center. When the infant is judged to be looking at the center, the flashing lights are turned off and the paired visual display is presented, usually by a rear-screen slide projector (for example, mother on left, stranger on right). The length of time the infant looks left or right is recorded before the visual displays go off. On the next trial, the flashing lights are again used. After the infant looks to the center, the mother appears on the right and the stranger on the left. The order of presentation of the stimuli is counterbalanced across trials to eliminate any bias due to an infant’s preference for turning to one side or another. Preference is determined by the average across trials of the length of time the infant looks to its mother and to a stranger.

Paired-preference methods have been used in many research studies that will be reviewed in this book. Using this method, for example, infants in the first month of life have been found to prefer the sound of their mother’s voice to that of another woman and the odor of their mother’s breast milk to the milk smell of another woman (Chapter 4). Five-month-old infants prefer a video image of their own legs as they would appear normally to the infant, compared to a manipulated video image in which the left and right legs have been reversed.

A second procedure for the assessment of infant psychological experience uses repeated exposure to the same visual or auditory stimulus. Each time the stimulus is repeated is one trial. If a researcher repeatedly shows the same picture to a baby—say, a picture of a face with a sad expression—the baby spends less and less time looking at the picture with each new presentation, acting as though he was getting bored with the same old thing. The gradual decline in looking time over repeated trials of the same stimulus is known as habituation, which results from increasing familiarity with the stimulus.

Researchers select some minimum amount of looking time as the criterion to decide when the baby has become habituated to a stimulus. For example, if the baby’s initial looks at a facial expression last about thirty seconds, a reasonable habituation criterion for subsequent trials might be five seconds. Once the baby has reached the criterion looking time, researchers change the picture or sound; in our example, from the face with a sad expression to the same face with a happy expression. If the baby cannot tell the difference between the two expressions, he or she will go on looking at the happy expression for durations shorter than the habituation criterion. However, if the baby can detect a change, the infant will begin to look longer at the happy face than at the last presentation of the sad face. This abrupt increase in looking time after a change in the stimulus is called recovery. Field et al. (1982) used this technique with newborns to see if they could differentiate between happy, sad, and surprised facial expressions. Remarkably, they could.

A final standardized procedure we will review is called the response-contingent procedure, which is often used in studies of auditory and taste perception. In this technique, infants are trained to change their behavior if they can detect certain features of the sounds or tastes. Once taught, infants will alter their behavior in order to hear their favorite sound or to receive their preferred taste.

DeCasper and Fifer (1980) used this technique with an automatic suck recorder. The suck recorder is a pacifier that is connected to a pressure transducer (which converts varying degrees of pressure into electrical impulses), which in turn is connected to recording equipment. Each infant in the study was equipped with a set of headphones and a suck recorder. After a two-minute adjustment period, the infant’s sucking was recorded for five minutes with no sounds coming through the headphones.
During this period, the experimenter computed the median duration of the pauses between suckling bouts (see Chapter 4). If you make a list of the durations of all the pauses observed for the infant, the median is the duration at the midpoint of the list: half the durations are above the median and half below.

In the experimental period, infants sucked as usual, such that half of their pauses were below the median and half above. When the experimenters detected a pause that was longer than the median interval, they presented the infants with the recorded voice of either their mother (reading a segment of a Dr. Seuss story) or a stranger (reading the same segment). Five of the infants were randomly assigned to a group that could evoke their mother’s voice by pausing their sucking for longer than the median pause length and evoke the stranger’s voice by pausing for less than the median pause interval. The other five infants had the reverse conditions.

Because the presentation of the adult voices was made contingent upon the duration of the sucking pause, infants quickly learned that by speeding up or slowing down their sucking, they could produce one or the other voice. If the infants had a preference for one or the other voice, they could then systematically shift their pause length to “suck for” that voice. Eight of the ten infants showed a tendency to shift their pause length to produce their own mother’s voice. Four of the infants were retested twenty-four hours later in a situation in which the criterion for obtaining the mother’s voice was reversed from the previous day. All four continued to suck for their mother’s voice.

Babies can tell us very little about themselves using ordinary means of communication. These remarkably creative research methods, therefore, are very useful for finding out more about what infants know. The main problem with all these techniques is that the failure of an infant to respond does not necessarily mean the infant cannot respond. The infant may recognize the difference and choose not to respond. Thus, it is necessary to test the same infants repeatedly. One could also use a relatively large sample of infants with the expectation that if a sizable number of infants at a particular age can detect a difference, then infants at that age are in general capable of detecting a difference.

Physiological Recording

Because infants cannot report on their internal states, physiological activity is one method of discovering more about what is going on inside the baby. Please note, however, that physiological recording can be used for both experimental and observational research. The level of arousal in the autonomic nervous system (ANS) can be measured with a variety of techniques. Heart rate recordings tell us about the level of the infant’s physiological arousal associated with particular types of observed behavior and in different situations. An example of the use of heart rate in research is in the measurement of whether infants can perceive depth. Gibson and Walk (1960) discovered that infants older than six months would not continue to crawl to their mothers if they suddenly saw a deep drop-off between themselves and the mother. The drop-off was created by a trough several feet deep that interrupted the surface on which the infant was crawling. To protect unwary infants from harm, the researchers covered the trough with plexiglass, creating the so-called “visual cliff” device.

The visual cliff could not be used to study depth perception in infants under six months because it required that the infants be able to crawl. When attached to heart rate monitors and placed next to the visual cliff, however, infants as young as two months showed some changes in their heart rate indicating moderate arousal (though not fear) and thus perception of the depth (Campos, Langer, & Krowitz, 1970). It was not until infants began to crawl that they showed heart rate changes similar to those measured during a fearful response. Thus, although two-month-olds perceive the depth, they must have the experience of crawling around in the real world to be able to appreciate the depth with an appropriate level of fear (Campos, 1976).
Behavior can be automatically recorded using a number of techniques. Gross motor activity has been recorded with a device called an actometer, which can be fixed to the infant’s clothing or attached to a crib mattress. It records the number of position shifts made by the infant as a function of time. Infant sounds can be studied with a sound spectrograph that shows the duration, pitch, and frequency of vocalizations. Changes in sucking, respiration, and gaze direction can also be detected by electronic devices and recorded as a continuous function of time.

Hormonal activity can be recorded from blood tests, but some hormones can be detected more easily from saliva. Saliva contains the hormone cortisol, which has been shown to increase in response to environmental stresses, such as during medical treatments, and to decrease during periods of relaxation.

Central nervous system (CNS) activity has been measured with a variety of techniques. Electrodes are fastened to the infant’s scalp with a small amount of petroleum jelly. The electrodes detect the minute changes in electrical activity inside the brain without hurting the infant. Because the currents generated in the brain are small, infants must be presented with a particular stimulus—a sound or a visual object—many times, and the electrical responses must be averaged by a computer in order to detect the existence of the “signal” of the response to the stimulus against the “noise” of normal spontaneous brain activity. The resulting averages are called averaged event-related potentials (ERPs). Although such techniques cannot be used to monitor an infant’s ongoing mental state, they can tell us whether there is a general ability to detect a stimulus. ERP methods have also been used to diagnose brain disorders in the form of abnormal patterns of electrical activity or lack of predicted responses.

One advantage of ERP research is that it shows the amount of brain activity when the infant is doing ordinary tasks. Other methods, called neuroimaging techniques, create pictures of the brain showing where in the brain an activity is taking place. Two commonly used methods are CT (computed tomography) and fMRI (functional magnetic resonance) to track changes in the brain’s metabolic function. CT scans are gradually being replaced by fMRI for infancy research and diagnosis of brain damage. CT scans use X-rays but do not require sedation of the infant. fMRI requires the infant to be sedated in order to lie completely still inside of a large tubular chamber with a great deal of noise, but the resolution is considerably better (Hoon & Melhem, 2000).

Although physiological recording devices allow us to detect information we could not otherwise observe, and although they reduce human error, they have important limitations. For one thing, we can never be sure of the precise meaning of a change in a physiological measure. Many events other than emotion or perception could trigger a change in heart rate or brain activity. Second, physiological activity is itself a response. Just because the heart rate changes when the infant is afraid does not mean the heart is the source of the emotion. All bodily systems are intimately linked together as a complex system such that small changes in one part can have major repercussions throughout the entire system. There is no way to say when and where a response originates or is encoded in the body.

OBSERVATIONAL RESEARCH METHODS

The inability to randomly assign subjects to groups is a major limitation in the application of the experimental method to infant studies. Many of the important questions in infancy research—such as the effects of prematurity and of variations in parental styles of child care—cannot be studied experimentally. We cannot randomly assign infants to be premature, and we cannot randomly assign particular types of parents to particular types of infants. We use, instead, the natural variations within the existing population of infants and mothers.

Methods that rely on natural variations rather than random assignment to create contrast groups
are called observational research methods. The obvious advantage of observational research is that we can study many issues of grave importance to our understanding of early human development that would be unethical or impossible to study experimentally. The problem with observational studies is that the variable on which the groups are assigned (the style of parental child rearing) may also correlate with other factors (such as the mother's social skills and general expressiveness). If this occurs, it is impossible to say which factor—child rearing, social skills, or expressiveness—is the cause of differences in infant behavior.

In most cases involving human infancy, however, observational studies are all we can do. As discussed later in this book, researchers have developed ways to examine the mutual influences of many potential causes that enter into an observational study. Observational studies can be either longitudinal or cross-sectional. In a longitudinal study, researchers follow the same group of children as they get older. Longitudinal studies are important for determining how particular early experiences of individuals affect their later development and also for revealing patterns of change over time. Change is measured against the individual's own record of growth. The disadvantage is that the researcher must wait for the child to grow, although this takes less time for infants than for older children because infants grow at a faster rate; few researchers can find the research funding to support such long-term efforts. Another problem is attrition, which occurs when subjects of a longitudinal study drop out of the study before they complete the entire period of observation. Not only does attrition lower the number of subjects in a study, but researchers worry whether the subjects who remain are different from those who drop out, making the study less representative of the larger population.

One of the methods most commonly used today to study developmental change is a cross-sectional study, in which the researcher selects a different group of children at each age period of interest. Cross-sectional studies have the advantage of giving us a sense of age change in development without having to wait for the children to grow up. An additional advantage is that research-
ers who observe children from only two or three different age groups have more time to collect data from a large number of children and thus may find patterns of between-individual variation in behavioral characteristics and age of attainment of developmental milestones. Thus, while cross-sectional studies allow us to make generalizations about groups of infants, they cannot tell us how individual infants develop over time.

Observational research, like experimental research, can be quantitative. This means that observations are transformed in numerical indices called variables. The variable that is the presumed cause—such as child-rearing styles—is called the predictor variable. The presumed effect—child behavior—is called the outcome variable. There is an analogy between independent variables and predictor variables, and between dependent variables and outcome variables.

Reducing Bias in Research

Regardless of whether one does observational or experimental research, caution must be taken to assure that variables reflect accurate and unbiased measures of the phenomenon. Reliability and validity procedures are ways of attempting to reduce bias in quantitative research. Reliability is a measure of the consistency with which an assessment procedure is applied. If one is trying to measure an infant’s preference for looking at her mother compared to an unfamiliar woman, observers may be asked to record the duration of time the infant spends looking at each adult. If two people, working independently, are asked to judge the duration of the same event, the measurement of duration is reliable to the extent that the two observers agree with each other.

Validity is the degree to which the procedure accurately measures what it is intended to measure. For example, one might ask if the duration of time the infant spends looking at the mother versus that spent looking at the stranger is a valid measure of the infant’s preference for one or the other. A baby may look longer at an unfamiliar face because it is new and the baby is curious about it, not because the baby prefers to look at that face. In this case, the duration of time the infant looks at the stranger would not be a valid measure of preference for the stranger. To test whether the duration of the infant’s looking is a valid measure of preference or of curiosity, one would have to compare this measure with other measures of preference and curiosity. An additional measure of preference might be the duration of time the infant smiles at and vocalizes to each adult. An additional measure of curiosity might be the duration of time the infant looks at pictures of novel compared to familiar objects.

To test the validity of the measure, a group of infants would have to be assessed on that measure and also on the other validating measures. The same infants, for example, would be tested to measure the duration of time they looked at the stranger compared to their mother. In addition, measures would be taken of the duration of time spent smiling at the stranger (a preference measure) and the duration of time spent looking at unfamiliar objects (a curiosity measure). If the babies who had high durations of time spent looking at the stranger also had high durations of time spent smiling at her, but low durations of time spent looking at unfamiliar objects (a curiosity measure), one could conclude that the duration measure of an infant’s looking at a stranger is a valid measure of preference for the stranger. It could also turn out that high durations of time spent looking at the stranger are related to high durations of time spent looking at novel objects, suggesting that looking at the stranger is a valid measure of curiosity. Finally, it may be that there is no consistent relationship between the duration of time the infant looks at the stranger and the durations of the other two measures. If this happens, it means that looking at the stranger may sometimes reflect preference and sometimes curiosity. It cannot, therefore, be considered a valid measure of either one.

Another means of lowering research bias is to protect the outcomes of a study from the unin-
tended influence of the subjects on the experimenters. This is usually accomplished by assuring that both the subjects and the experimenters are blind to the specific purpose of the research and to the group assignment of the subjects. **Blindness** in quantitative research refers to limiting the access of researchers and participants to knowledge that may bias the outcomes of the study. In a study on the relationship between infant language and mother’s speech, for instance, experimenters who administer the tests of infant language should not be the same as those who observe the mother’s speech, and they should not know anything about the mother’s speech score. The mothers should not be aware of the precise measures and relationships being tested, although they might be told that they are participating in a study on infant language development.

Finally, bias in research can be reduced by assuring that the group of infants and parents who participate in a research study is representative of the larger population of infants (**representative research**). A study is representative if its conclusions can be applied to infants who were not direct participants in the study. Most infancy research is done with white, middle-class North American and European infants. It is important to ask whether these findings apply equally to infants from other ethnic groups, cultures, and socioeconomic groups. Research grants from the National Institutes of Health in the United States, which funds both medical and behavioral research on human subjects, cannot be obtained unless the subjects of the study represent both genders and a cross-section of ethnic groups.

**Research Ethics and Informed Consent**

Research ethics adopted by most institutions in North America require that human subjects give their informed consent to participate in research. **Informed consent** is a voluntary agreement to participate in a research study. It must be based on accurate information about the purpose, procedures, risks, and benefits of the research study (Keith-Spiegel, 1983). Special provisions are required for research subjects who cannot give consent for themselves, specifically infants and small children. In these cases, one or both parents must sign the consent to participate. Parents are told about the possible risks and benefits of the research, both for themselves and for their infants.

In order to meet requirements of informed consent as well as the scientific requirement that subjects be blind to the purpose of the research, researchers usually tell subjects about the general purpose of the study but not about the specific measures to be used. Subjects must be told about all the procedures, but they need not be told about the specific purpose of the procedures. Most researchers will provide a debriefing session for subjects following the completion of their participation. During the debriefing, more details are provided, and all the subjects’ questions should be answered frankly. In research using human subjects, researchers have the responsibility of designing studies of lasting value to society and respecting the rights and dignity of the individuals who volunteer their time to participate. Due to these ethical considerations in research, some of the early studies of infant behavior and development—such as John Watson’s research in which he made infants fear cuddly animals—would not be allowed today.

Researchers must pledge to keep the subjects’ identity confidential and to limit access to their data only to those persons directly involved with the research. There are several situations, however, in which confidentiality cannot be assured. In the event that the researchers observe behavior constituting child abuse, they are required by law to report it to the appropriate community agency. Also, researchers cannot protect their data if they are subpoenaed in a child-custody dispute. Parents need to be informed about these limits to confidentiality before they agree to participate. Fortunately, these situations rarely occur. In the past thirty-five years of doing infancy research with many hundreds of families, I have never had to violate a subject’s confidentiality for these or any other reasons.
CHAPTER 1
Methods of Observational Research

A large portion of research on infants involves the observation of their behavior in relatively natural circumstances without experimental control. Observing the ongoing behavior of infants is difficult because many things are happening at the same time. Imagine trying to write down everything that happens during a social interaction between two partners in the exact sequence in which it occurs, including not only what they say to each other, but all of the nonverbal social behaviors, such as looking, facial expressions, gestures, and body movements. **Microanalysis** is a research approach that focuses on recording and analyzing minute changes in behavior as they occur over some predetermined period of time during an observation session.

Researchers have developed a number of techniques to simplify the task of microanalysis and to increase accuracy. First of all, it is important to be selective in what you want to observe. Since you cannot see everything, your choice should be guided by some conceptual framework. Suppose, for example, you wanted to observe how an infant interacted with her mother before and during the approach of an unfamiliar person. Based on the theory of infant attachment, we expect that the presence of a stranger may be associated with behavior categories such as the child approaching the mother, following the mother, and staying near the mother’s side. Older infants may also ask about the stranger or ask to be picked up and held.

After choosing a list of relevant behavioral categories, the observer is trained to recognize each category until an acceptable level of inter-rater reliability can be obtained. **Coding** is the process by which observers record the presence or absence of the predefined categories as they are watching the research subjects during an observation session.

One relatively easy coding strategy is pencil-and-paper recording of live observations. When any one of the categories is seen, it is checked off on a sheet of paper on which the categories have been listed. Audio and video recordings can improve the accuracy of observational data. Once behavior is recorded on tape, observers can replay the tape as often as necessary to code the entire observation period. Videotapes can be made with a digital clock image in the corner of the screen so that elapsed time between behavior onsets and offsets can be recorded.

In addition to increasing the accuracy of observational research, videotape has been revolutionary in showing us things babies do that are not apparent in live observations. Hand movements and facial expressions of two-month-old infants often give a picture of disorganized or chaotic movement. Looking at them in slow motion on a videotape, however, one can see recognizable patterns of smiling, eyebrow raising, and finger pointing. Computers can be electronically interfaced with videotape players. A timing signal is recorded on the videotape. When the observer presses a key representing a particular behavior category, the computer automatically records and saves the category and the time of onset. The observer can ask the computer to fast-forward through the tape, stopping at all previously coded events in order to compare them or to do more detailed coding.

New methods have been devised for using the computer to automatically identify behavior from a videotape recording, without the need for an observer. The computer is programmed to recognize particular images, such as when an infant smiles, frowns, or moves his or her body in a particular way, and to record the onset and offset time as well as dynamic changes in intensity (Tian & Kanade, 2001). This is similar to the voice recognition programs often used in automatic telephone answering systems. Scientists hope that by using these tools for microanalysis, they will be better able to understand the complexity and dynamic changes in human communication.

A final type of observational research, called **macroanalysis**, focuses on the overall or summary features of behavior, rather than its details and sequences of occurrences. Macroanalysis is usually done with the use of a **rating scale**. A rating scale is a list of categories, usually ordered in...
a numerical sequence, which allows observers to
differentiate the amount or quality of a particular
type of observed behavior. In the example of a
stranger approaching an infant described earlier,
the microanalytic coding categories were discrete
behaviors: approaching, following, and staying
near the mother when a stranger is present. The
observer recorded each category separately whenever it occurred and noted the onset and offset
times. A macroanalytic rating scale for the entire
interaction could be devised that would elimi-
nate the need for detailed behavior records. For
equality, after watching the entire observation
session of the infant with mother and stranger,
an observer might rate the child on a scale of 1
to 5, where 1 is comfort with the stranger (not
approaching or following the mother), 3 is some
discomfort (maintaining a moderate distance from
the mother), and 5 is extreme anxiety (clinging to
the mother and following her closely).

Macroanalytic ratings are effective when the
measure of interest to the research need not be
equated to specific behaviors—in this case, only
the overall level of comfort versus anxiety. Rat-
ings are easier to do, but they often require more
coder training since they are open to subjective
interpretation. Microanalytic behavior codes are
often simpler to learn but require more coder time
since they must be assessed continuously during
an observation period. Microanalysis is necessary
when one is interested in the dynamics of behavior—in how it unfolds over time.

Using macroanalysis, an infant’s social play
might be assessed according to Mildred Parten’s
(1932) rating scale of mutual involvement in play
(see Table 1.1). One could observe children and
rate the highest level of play. A rating of 3, for
example, means that children have achieved asso-
ciative but not cooperative play. Bakeman and
Brownlee (1980) used Parten’s coding categories
but did a microanalysis. They observed three-year-
old children in out-of-doors free play. Instead of
rating, they recorded the presence or absence of
each category of play during successive fifteen-
second time intervals for about a hundred minutes.

Besides learning about the overall level of
play in the children, Bakeman and Brownlee were
interested in the sequence of play. For example,
when did parallel play occur in relationship to
group play? It could be that parallel play occurred
during the first half of the observation, and then
group play took over. However, the microanalysis
revealed that parallel play was sandwiched between
episodes of group play.

What does it mean for the children that parallel
play occurs between episodes of group play? The
microanalysis and macroanalysis are not sufficient
to answer this question. In order to find out, it is

<table>
<thead>
<tr>
<th>Type of Play</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solitary play</td>
<td>Child plays alone.</td>
<td>A child sits alone in a sandbox and fills a pail with sand.</td>
</tr>
<tr>
<td>Parallel play</td>
<td>Play in close proximity to other children but without interaction.</td>
<td>Two children sit next to each other in a sandbox, each filling a pail.</td>
</tr>
<tr>
<td>Associative play</td>
<td>Children respond to each other during play but maintain separate goals.</td>
<td>Two children talk to each other while playing with sand in a sandbox.</td>
</tr>
<tr>
<td>Cooperative play</td>
<td>Play is organized around joint activities.</td>
<td>Two children work together to build a sand castle.</td>
</tr>
</tbody>
</table>

necessary to observe what happens during these periods of parallel play. What happens when the children change to group play? The authors took their findings from the quantitative microanalysis and went back to the playground to observe the situation without focusing on a particular type of behavior. They discovered that for children of this age, parallel play was a “time out” from group play. During periods of parallel play, children could relax, work momentarily on their own, or observe each other’s behavior before reentering the mainstream of group activity. This type of research, which focuses on the meaning of the behaviors for the participants, is called qualitative research.

QUALITATIVE RESEARCH METHODS

The previous sections covered quantitative research using experimental and observational methods. In quantitative studies, the phenomenon is measured—that is, it is coded into a number or category. The number could be an onset time, a duration, a frequency, or a score on a rating scale. Qualitative research, on the other hand, does not use quantity or number. It is characterized by one or both of the following features.

1. The observers focus on the meaning of the situation for the participants.
2. The role of the researcher in the situation is taken explicitly into account.

To infer the meaning of the situation and to take account of the observer as part of the situation, qualitative research needs to examine the situation in its broader context. The child is observed in relation to the setting, the actors, the sequences of behavior, the history of previous encounters in similar situations, and the presence of the observer. If the researcher is part of the observation situation as a participant observer, he or she has a direct effect on the people being studied and they have an effect on the researcher. If the observer is watching a videotape or some other already collected data, the researcher’s interpretations play a role in deciding what the participant’s behaviors mean.

One example of qualitative research is the final part of the study by Bakeman and Brownlee (1980). This part of the study fits the first characteristic of qualitative research: a focus on the meaning of the behavior for the participants. The study done by Piaget on Jacqueline’s imitation was described earlier as an example of quantitative research, in the sense that Piaget counted the number of times Jacqueline imitated him under different experimental conditions. It is also an example of qualitative research, because he used a verbal narrative of the whole situation to highlight the broader meaning to Jacqueline of the behavior. Piaget also was explicit about taking account of his own role in the outcome. Having recognized the possible effects of his own behavior on his daughter, he was better able to sort out the possible causes and effects, which led him to design a better experiment.

The earliest known systematic observation and recording of infant behavior, done by educated European and North American parents during the eighteenth and nineteenth centuries, is an example of qualitative research. Some of these parents kept a daily diary about their baby’s life, a baby biography. These diaries satisfied the first characteristic of qualitative research: they were narratives intended to understand the meaning of infant behavior rather than to measure it. The German philosopher Dietrich Tiedemann (1748–1803), for example, recorded the development of motor skills, language, thinking abilities, and social behavior in his infant son. Tiedemann described what we now call the Moro reflex (see Chapter 4) as follows:

If he was held in arms and then suddenly lowered from a considerable height, he strove to hold himself with his hands, to save himself from falling; and he did not like to be lifted very high. Since he could
not possibly have any conception of falling, his fear was unquestionably a purely mechanical sensation, such as older persons feel at a steep and unaccustomed height, something akin to dizziness. (Tiedemann, 1927, p. 216)

Notice that Tiedemann not only described his son’s behavior in the manner of observational research, but also interpreted the meaning of the behavior for the infant when he speculated that the infant’s experience was “purely mechanical.” Tiedemann may have been an accurate observer of the outward behavior of the baby, but he would not be considered a good qualitative researcher by today’s standards. Although we readers can see that his interpretations of the meaning of the child’s behavior is based on his own point of view as an adult, Tiedemann did not take explicit account of his role in the interpretive process. He was not, in other words, aware of his own biases. Those biases seem to reflect his view that babies of this age are not capable of feeling emotions, which today we know to be inaccurate.

Charles Darwin, whose theory of natural selection will be discussed in Chapter 2, was also a baby biographer. Darwin was very aware of his role in the interpretive process. When his son, William, was only a few months old, Darwin was a relatively objective observer. But as William became more active and expressive, Darwin added more references to himself and his affections for William. Because Darwin thought these references to himself were unscientific, however, they were deleted in the versions of his diary that he published (Conrad, 1998). Darwin also made explicit mention of his own point of view in a memorial he wrote at the time of the death of his daughter, Anne, when she was 10 years old (Conrad, 2004).

Qualitative researchers today do not think it is unscientific for observers to take account of their own reactions. They suggest that a deeper understanding of the meaning of behavior for the subjects can only come from a deeper self-awareness of the researchers about their own reactions and biases (Moustakas, 1994). Perhaps the only way to get to know another person meaningfully is to share a long-term relationship full of emotions, opinions, and attachments.

Researchers always have some kind of relationship with their subjects. In the quantitative approach, the relationship is one of keeping a distance and remaining objective as an observer. In qualitative research, observers allow themselves to experience some of the feelings of participation that might be present in any interpersonal relationship (Aureli, 1997). Their training and self-awareness, however, allow them to use their own feelings to enhance their understanding of the subject’s perspective. On the other hand, quantitative researchers also have biases, which they quantify by means of reliability and validity measures. Each type of research has its advantages and disadvantages.

The assessment of a student’s performance in school, for example, can occur through either a distant or a close teacher-student relationship. In large classes, a quantitative approach is most typically used. Instructors use primarily numerical and presumably objective indices of student performance, based on exams and other graded assignments. In small classes, on the other hand, evaluations are based not only on grades but also on a more in-depth interpersonal relationship between teachers and students. In this situation, the teacher has an opportunity to get to know each student. Experienced teachers are able to develop meaningful interpersonal relationships with their students while maintaining the ability to judge the student’s performance and guide her or his learning. Experienced clinicians, such as psychotherapists, also have this skill of being able to evaluate their client’s progress while maintaining a strong interpersonal relationship.

Validity in quantitative research is based on comparing different types of numerical measurements with each other. It is an assessment of the quality of the measurement instrument, such as an automatic recording device or category of
behavior. In qualitative research, the researcher is the instrument of observation. Credibility in qualitative research is similar to validity in quantitative research. A researcher has more credibility if the researcher is highly trained, has spent many hours doing comparable observations, and/or has had a prolonged engagement with the particular subjects of the study (Denzin & Lincoln, 1994). This is true for Piaget, since he was a trained scientist and he obviously had prolonged contact with his own children. In the example of teaching, more experienced teachers tend to be more credible.

Even if researchers are credible, however, they can still be biased, because the interpretation of meaning is always from their own point of view. Qualitative researchers feel there is a trade-off between the accurate but limited scope of a quantitative measure compared to the flexibility, human insight, and awareness of broad meaning of a highly trained qualitative observer (Patton, 1990). In some qualitative research methods, the researcher allows the subjects to give feedback and to play a role in the interpretation of the data. This is impossible with infant subjects, but sometimes parents can participate as co-researchers.

In quantitative research, reliability is assessed by comparing the coding or rating of behavior between two independent observers. In qualitative research, on the other hand, reliability assessment is replaced by the constant comparative method in which the same observers go over the same data many times in order to check and revise their interpretation of the meaning of the behavior for the participants (Strauss & Corbin, 1990). Revisions are repeated until the observers feel confident that the interpretations are consistent throughout, and new interpretations do not emerge during the process (Patton, 1990).

Because prolonged engagement with data is important to assure the credibility of the observer, and also in order to use the constant comparative method, many qualitative researchers use case studies. In a case study, the same subjects are observed over a long period of time, as in the baby biographies and Piaget’s studies of his own children. Case studies are often used as a means for gathering data on individuals in their real-life contexts. They are also used to study changes in individuals over time. Generally, case studies provide more detail about individuals than can be obtained using quantitative methods on large groups of individuals.

Generalizability is when the results of a research study can be applied to people other than the ones who were observed. Research that is done on many individuals using representative samples of subjects is more likely to be generalizable. On the other hand, if there are a lot of subjects, the research can only obtain a limited amount of quantitative information about each individual. When researchers focus on a few cases, they can obtain a more detailed picture of the lives of those individuals and the meaning of their behavior, but the results may not be generalizable to a larger group. Once again, there is a trade-off between the kind of meaning and detail in a case study compared to the generalizability of a large-sample quantitative study.

Which is better, qualitative or quantitative research? Many people believe research is not scientific unless one uses quantitative methods such as representative samples, control groups, random assignment, and reliable and valid measures. Others believe that a scientific approach is not defined by a particular type of method, but rather by the flexible combination of different methods that best allow the scientist to appreciate the beauty and complexity of nature. Qualitative researchers are also scientists who need special training and plenty of experience in order to establish a long-term relationship with particular infants and family while retaining a questioning stance.

As a consumer of research information, you can train yourself to respect your human attachments and needs while at the same time remaining open to sources of data that may contradict your beliefs. It is important to remember that research on infants is, above all, a human enterprise, a relationship between scientist-persons and subject-persons. Every research study is, therefore, a particular point of view on nature, a point of view...
at the intersection of the scientist’s focus of attention and what that scientist has allowed herself or himself to be taught by the subjects.

A single study on a topic is always limited in this way. More information can be gained by reading different studies that use a variety of different measures and research methods. A study on infants from one culture many not apply to another. Research on normal children may not apply to children who are at risk because of poverty, abuse, or prematurity. Reading this book may give you at least some training in how to decide whether research results can be applied to your personal or professional situation.

**EXPERIENTIAL EXERCISE**

Observing Children using Qualitative Observational Research Methods

by Alan Fogel

Naturalistic observation is the practice of studying real-world situations as they unfold naturally. Following the principles of qualitative research (see Chapter 1), this form of observation is non-manipulative, unobtrusive and non-controlling. It is open to whatever emerges, and as such must be lacking in predetermined constraints on outcomes. In contrast, experimental research attempts to control conditions through manipulating, changing, or holding constant external influences, and in which a very limited set of outcome variables are measured. Qualitative observation is a “discovery-oriented” approach. It focuses on capturing process, documenting variations, and exploring important individual differences in experiences and outcomes. Thus, an important part of qualitative methods includes the investigator’s personal experiences and insights. It is important to understand and acknowledge your own history and influence in the existing system during your direct participation (Patton, 1990).

Arrange to observe at a day care center, nursery school or a home where there are children aged 2 to 4 years. At some locations you can choose to observe only or participate with the children. In either case, plan on spending 2 to 3 hours in observation.

During your observation or following your participation at one of the sites, record field notes about your observations. Emphasize your experience as a participant and as an observer, even if you are not in direct contact with the children. Report any insights that you may have about personal experiences or memories that are elicited through your observations. This is a very free format, so be open to any thoughts, feelings, or ideas that come up for you. This is an opportunity to reflect on your own experience and think critically about its direct relevance to you personally and to how you interpret the behavior of the children you observe. Using the definition given in this chapter, how would you rate your credibility as an observer?

**SUMMARY**

The Importance of Infancy

- Prenatal and infant development are frequent topics in the news, on television, and in the movies today.
- The more a parent knows about infants and children, the lower his or her anxiety will be, and the better the outcomes will be for the child.
- Infancy is a unique stage in the life course. This is not only because it is the earliest stage of life, but because all life’s stages are unique.
- The preverbal experience of the body is uniquely human. After infancy, many physical and mental disorders of children and adults can be traced to a person’s losing touch with his or her own body.
- Practitioners from different therapeutic and educational methods assume that a healing effect will
ensue from recreating—in a safe and protected setting—some of the conditions of being a baby.

• Many disorders can be prevented by changing maternal behavior during pregnancy. Advances have been made in the treatment of prenatal disorders and in the care of premature and sick infants.

• Because of the vulnerability of infants, many social and medical problems could be prevented by making sure that infants receive proper care and that young parents receive all the support necessary to provide the best environment for their children.

• Many differences between people during the prenatal and infancy periods have a lasting impact on later individual differences.

A Brief History of Babies

• During all periods of recorded history, some infants and children have received love and care while others have been abused or neglected.

• Beginning in the Middle Ages, urbanization brought about changes in the family and in the health and safety of infants.

• In the eighteenth century, the ideas of romanticism and empiricism marked the beginning of philosophical and educational efforts directed toward infants.

• In the nineteenth century, the development of the nuclear family, along with advances in infant medical care, led to the discovery of infancy as an important period in the life course.

The Scientific Perspective on Infancy

• In the nineteenth and twentieth centuries, infants became the subjects of scientific study sparked by the debate over whether nature or nurture has the most influence on behavioral development.

• Developmental changes are nonreversible and permanent, and they occur in a sequence.

• The division of infancy into stages of development is somewhat arbitrary and depends on the purposes of the culture or group.

Research Methods in Developmental Science

• Individual differences between infants may or may not be stable over the course of infancy. Scientists are still trying to determine whether these differences are due to genetic or environmental factors.

• Scientists rely on many sources of evidence, try to separate what is repeatable and stable from what is coincidental, and attempt to rid observations of bias.

Experimental Research Methods

• An experiment is a research study in which one aspect of the situation is manipulated while all other aspects are held constant or controlled.

• The independent variable is that which is controlled or manipulated by the experimenter. The independent variable is the presumed cause of the phenomenon. The dependent variable is the outcome behavior that is observed in response to the changes in the independent variable.

• Automatic recording of behavior involves measurements of heart rate, respiration, brain activity, and aspects of behavior.

• Paired-preference tests, habituation procedures, and response-contingent procedures are techniques for testing perception and cognition in infants.

Observational Research Methods

• Methods that rely on natural variations rather than random assignment to create contrast groups are called observational research methods.

• Longitudinal studies follow the same children at different ages, while cross-sectional studies use different children at different ages.

• In observational studies, the variable that is the presumed cause is called the predictor variable. The presumed effect is called the outcome variable. There is an analogy between independent variables and predictor variables, and between dependent variables and outcome variables.

• Bias is reduced in research by attention to reliability, validity, observer bias, and representativeness.

• Since infants cannot provide informed consent to participate in research, their parents must do so. Researchers need to observe ethical guidelines when using human subjects in research.

• Research focusing on minute changes in behavior is called microanalysis.

• Macroanalysis focuses on the overall or summary features of behavior rather than its details and
sequences of occurrences. Macroanalysis is usually done with the use of rating scales.

Qualitative Research Methods

• Qualitative research does not use quantity or number. It is characterized by one or both of the following features: (1) the observers focus on the meaning of the situation for the participants; and (2) the role of the researcher in the situation is explicitly taken into account.

• Qualitative researchers’ credibility depends upon their skill, experience, and rigor.
• Using the constant comparative method in qualitative research, the same observers go over the same data many times in order to check and revise their interpretation of the meaning of the behavior for the participants.
• In a case study, the same subjects are observed over a long period of time.