Chapter 2
Genetics, Prenatal Development, and Birth

Learning Objectives

After reading Chapter 2, students will know

- what our basic genetic endowment is and how human development can go off track.
- how the environment and genetics work together to determine human characteristics.
- which human characteristics are significantly influenced by heredity.
- what happens during the prenatal stages of development.
- what threats there are to the fetal environment and what can be done about them.
- what is the normal process of labor.
- what complications can occur at birth, as well as their causes, effects, and treatments.
Key Terms and Concepts

amniocentesis  homzygous
artificial insemination  in vitro fertilization (IVF)
behavioral genetics  infant mortality
Cesarean delivery  infertility
chorionic villus sampling (CVS)  Klinefelter’s syndrome
chromosomes  low-birthweight infants
dizygotic twins  monozygotic twins
DNA (deoxyribonucleic acid)  multifactorial transmission
dominant trait  phenotype
dominance  placenta
dizygotic twins  polygenic inheritance
dominant trait  postmature infants
dominance  preterm infants
embryonic stage  recessive trait
episiotomy  sickle-cell anemia
fertilization  small-for-gestational-age infants
fetal alcohol effects (FAE)  stillbirth
fetal alcohol syndrome (FAS)  Tay-Sachs disease
fetal monitor  temperament
fetal stage  teratogen
fetus  ultrasound sonography
Fragile X syndrome  very-low-birthweight infants
genes  X-linked genes
genetic counseling  zygote
genotype  
germinal stage  
heterozygous  

Chapter Outline

I. Earliest Development and the Foundations of Genetics
   A. Genes and Chromosomes: The Code of Life
      1. Humans begin life as a single cell.
         a. Our genetic code is stored and communicated in our GENES, the basic units of genetic information.
         b. Genes are composed of sequences of DNA (deoxyribonucleic acid) the substance that determines the nature of every cell in the body and how it will function.
         c. Humans have over 25,000 genes.
         d. Genes are arranged in specific locations and in a specific order along 46 CHROMOSOMES, rod-shaped portions of DNA that are organized in 23 pairs.
(1) At fertilization, one pair of chromosomes (via the gametes) is provided by the mother and one is provided by the father.

(2) Sex cells contain half the number of chromosomes (not in pairs).

e. Gametes (sperm and ova) are formed by a process called meiosis.
f. A ZYGOTE is one cell formed by fusion of the two gametes.
g. All other cells replicate the genetic code by a process called mitosis.
h. There are tens of trillions of possible genetic combinations.

2. Multiple Births: Two—or More—for the Genetic Price of One

a. Less than 3 percent of all pregnancies produce twins; the odds are slimmer for 3 or more children.
b. MONOZYGOTIC TWINS, who are genetically identical, form when a cluster of cells in the ovum splits off within the first 2 weeks following fertilization.
c. DIZYGOTIC TWINS, who are produced when two separate ova are fertilized by 2 separate sperm, are no more genetically similar than any two siblings.
d. Other kinds of multiple births (triplets, quadruplets, etc.) can form from either mechanism.
e. Using fertility drugs increases the chances of having a multiple birth.
   (1) One in ten are dizygotic.
   (2) Older women are more likely to have multiple births.
f. Racial and ethnic differences affect the rate of multiple births.
   (1) White American: 1 out of 86 dizygotic.
   (2) African American: 1 out of 70 dizygotic.

3. Boy or Girl? Establishing the Sex of the Child

a. The 23rd chromosome determines the sex of the child.
   (1) Females are XX.
   (2) Males are XY.
   (3) The father’s sperm determines the sex of the child.

B. The Basics of Genetics: The Mixing and Matching of Traits

1. An Austrian monk, Gregor Mendel (mid-1800s), discovered while working with peas that when two competing traits are present, only one can be expressed.

a. The trait that is expressed when two competing traits are present is called the DOMINANT TRAIT.
b. The trait that is present in the organism but not expressed is called the RECESSIVE TRAIT.
c. GENOTYPE is the underlying combination of genetic material present (but not outwardly visible) in an organism.
d. PHENOTYPE is an observable trait, the trait that is actually seen.
e. Alleles are genes for traits that may take alternate forms.
   (1) HOMOZYGOUS is inheriting from parents similar genes for a given trait.
   (2) HETEROZYGOUS is inheriting from parents different forms of a gene for a given trait.
f. If a child receives a recessive allele from each parent, it will display the recessive characteristic.

2. Most traits are the result of POLYGENIC INHERITANCE, in which *a combination of multiple gene pairs is responsible for the production of a particular trait.*
   a. Some genes (such as those for blood type AB) are neither dominant nor recessive, but are a combination.
   b. Some recessive genes are **X-LINKED GENES**, meaning *they are located on the X chromosome.*
      1. Males have a higher risk for a variety of X-linked disorders because they lack a second X chromosome to counteract the genetic information that produces the disorder.
      2. **Hemophilia** is a blood disorder produced by X-linked genes.
      3. Red-green color blindness is another.

3. In 2001, molecular biologists succeeded in mapping the human genome—the specific sequence of genes on each chromosome.
   a. The number of human genes has been revised downward from 100,000 to 25,000.
   b. Humans share 99.9 percent of the gene sequence.

4. *The most recent approach to the study of the effects of heredity on behavior and development* is called **BEHAVIORAL GENETICS**.
   a. This field merges psychology—the study of behavior—with genetics—the study of transmission of characteristics through heredity.
   b. These researchers are learning how behavioral difficulties (such as schizophrenia) may have a genetic basis.
   c. Researchers also seek to identify how genetic defects may be remedied.

C. Inherited and Genetic Disorders: When Development Deviates from the Norm

1. Some genetic disorders are inherited (e.g., PKU).

2. Some genetic disorders are the result of genes that become physically damaged.
   a. Sometimes genes spontaneously change their form, a process called *spontaneous mutation.*
   b. Certain environmental factors, such as exposure to X-rays, can produce malformed genetic material.
   c. Some genetic disorders include:
      1. **DOWN SYNDROME** is a disorder produced by the presence of an extra chromosome on the 21st chromosome pair, once referred to as mongolism.
      2. **SICKLE-CELL ANEMIA** is a blood disorder that gets its name from the shape of the red blood cells in those who have it.
      3. **FRAGILE X SYNDROME** is a disorder produced by injury to a gene on the X chromosome, producing mild to moderate mental retardation.
(4) **TAY-SACHS DISEASE** is an untreatable disorder that produces blindness and muscle degeneration prior to death.

(5) One male out of every 400 is born with **KLINFEELTER’S SYNDROME**, a disorder resulting from the presence of an extra $X$ chromosome that produces underdeveloped genitals, extreme height, and enlarged breasts.

3. Genetic Counseling: Predicting the Future from the Genes of the Present
   a. **GENETIC COUNSELING** is the discipline that focuses on helping people deal with issues related to inherited disorders.
   b. Genetic counselors use a variety of data.
   c. They can take a thorough family history, seeking any familial incidence of birth defects.
   d. The ages of the mother and father will be taken into account.
   e. Blood, skin, and urine may be used to isolate and examine specific chromosomes.
   f. Possible genetic defects can be identified by assembling a *karyotype*, a chart containing enlarged photos of each of the chromosomes.
   g. Other tests take place once the woman is already pregnant.

   (1) **ULTRASOUND SONOGRAPHY** is a process in which high-frequency sound waves scan the mother’s womb to produce an image of the unborn baby whose size and shape can then be assessed.

   (2) **CHORIONIC VILLUS SAMPLING (CVS)** is a test used to find genetic defects that involves taking samples of hair-like material that surrounds the embryo.

   (3) **AMNIOCENTESIS** is the process of identifying genetic defects by examining a small sample of fetal cells drawn by a needle inserted into the amniotic fluid surrounding the unborn fetus.

4. Prenatal Testing: Screening for Future Problems
   a. involves testing parents for the possibility that they will transmit diseases to children
   b. presents a range of possibilities, rather than a simple “yes” or “no” answer
   c. **Huntington’s disease** and more than a thousand other disorders can be predicted based on genetic testing.
   d. Prediction is complicated, because environment as well as genes determine a person’s actual likelihood of becoming ill.
   e. Researchers as well as medical practitioners are actively working to change flawed genes for intervention and manipulation.

5. From Research to Practice: Are Designer Babies in Our Future?
   a. A genetic screening technique called preimplantation genetic diagnosis (PGD) screens a newly fertilized embryo for a variety of genetic diseases before it is implanted in the mother’s uterus to develop.

II. The Interaction of Heredity and Environment
A. The Role of the Environment in Determining the Expression of Genes: From Genotypes to Phenotypes
   1. An individual’s **TEMPERAMENT**, the patterns of arousal and emotionality that represent consistent and enduring characteristics, may represent **MULTIFACTORIAL TRANSMISSION**, traits that are determined by a combination of both genetic and environmental factors in which a genotype provides a range within which a phenotype may be expressed.
   2. Some genotypes are not as sensitive to the environment as others.

   1. The correct question is not whether behavior is caused by nature or nurture but **how much** by nature and **how much** by nurture.
   2. Nonhuman Studies: Controlling Both Genetics and Environment
      a. Scientists put laboratory animals bred to share genetic backgrounds in different environments to explore the effects of these environments.
      b. Conversely, they use genetically different animals in similar environments to determine the role of genetics.
   3. Contrasting Relatedness and Behavior: Adoption, Twin, and Family Studies
      a. Scientists use human twins to study the effects of genes and the environment.
      b. Differences between monozygotic twins separated at birth are most likely—but not always—due to different environments.
      c. If monozygotic twins are more similar than dizygotic twins on a particular trait, we can assume that genetics plays a role in the expression of that trait.
      d. People who are unrelated but share the same environment also tell us about environmental influences.
      e. Researchers also study biological parents and their children versus adoptive parents and their children to see the effects of heredity versus environment.
      f. Bottom line: virtually all traits, characteristics, and behaviors are the joint result of the combination and interaction of nature and nurture.
   4. The more genetically similar two people are, the more likely they are to share physical characteristics (e.g., height, weight).
   5. Genetics plays a significant role in intelligence; however, the environment is also a major factor.
   6. Increasing evidence supports the conclusion that at least some personality traits have a genetic component.
      a. **Neuroticism** refers to the degree of moodiness, touchiness, or sensitivity an individual characteristically displays.
      b. **Extroversion** is the degree to which a person seeks to be with others, to behave in an outgoing manner, and generally to be sociable.
      c. Certain traits reflect the contribution of genetics more than others.
         (1) novelty-seeking tendencies
         (2) social potency
         (3) traditionalism
d. Political attitudes, religious interests and values, and even attitudes toward human sexuality seem to have genetic components.

e. Environmental factors such as parental nurturance also impact traits.
   (1) parents’ attitudes and encouragement of high/low activity levels
   (2) Cultural contexts for parental attitudes shape differences in such traits.

7. Can Genes Influence the Environment?
   a. Children’s genetic predispositions might influence their environment (Scarr).
      (1) Children focus on aspects of their environment that connect with their genetically determined abilities, and attend less to environmental features that are less compatible with genetically determined traits.
      (2) The gene-environment influence can be more passive and less direct in other cases.
      (3) Genetically determined temperament of a child can evoke certain influences from the environment or parents.
   b. The relative influence of genes and environmental factors can shift over the course of the lifespan.

III. Prenatal Growth and Birth
   A. Fertilization: The Moment of Conception
      1. **FERTILIZATION** is the process by which a sperm and an ovum—the male and female gametes—join to form a single new cell.
      2. The Stages of the Prenatal Period: The Onset of Development
         a. The **GERMINAL STAGE** is the first and shortest stage of prenatal development, which takes place during the first 2 weeks following conception.
            (1) It is characterized by methodical cell division and the attachment of the organism (*blastocyst*) to the wall of the uterus.
            (2) The baby is called a *zygote* at this stage.
            (3) The cells become specialized with some forming a protective layer around the zygote, while others create:
               (a) **PLACENTA**, the conduit between the mother and fetus, providing nourishment and oxygen via the umbilical cord
         b. The second stage is called the **EMBRYONIC STAGE**, the period from 2 to 8 weeks following fertilization during which significant growth occurs in the major organs and body systems.
            (1) At this point, the child is called an *embryo*.
            (2) By the end of this phase, the embryo is about an inch in length, with a tail-like structure and the beginnings of eyes, lips, teeth, arms, and legs. The head and brain begin rapid development.
            (3) The developing child is now composed of three layers.
(a) The **ectoderm** is the outer layer forming the skin, hair, teeth, sense organs, brain, and spinal cord.

(b) The **endoderm** is the inner layer producing the digestive system, liver, pancreas, and respiratory system.

(c) The **mesoderm** is sandwiched between the inner and outer layers and forms the muscles, bones, blood, and circulatory system.

c. The **Fetal Stage** begins about 8 weeks after conception and continues until birth.

1. The developing child from 8 weeks after conception until birth is called a **fetus**.
2. The fetus dramatically increases in size and weight.
3. Organs become more differentiated and operational.
4. By three months, the fetus swallows and urinates.
5. By four months, the mother will be able to feel her fetus move.
6. Brain growth continues as the left and right hemispheres of the brain develop and neurons become coated with an insulation called **myelin**.
7. Hormones begin to flow differently to male and female fetuses.

3. Pregnancy Problems: Giving Nature a Boost

a. Fifteen percent of couples suffer from **infertility**, the inability to conceive after twelve to eighteen months of trying to become pregnant.

b. Infertility is produced by several causes.

1. The age of the parents
2. Previous use of birth control pills, illicit drugs or cigarettes, or **STDs**
3. Men who have an abnormally low sperm count
4. The woman’s mother taking certain drugs during pregnancy
5. The most common cause of infertility is failure to release an egg through ovulation—possibly caused by hormonal imbalance, damage to the fallopian tubes or uterus, or stress.

c. There are several approaches to conception in these cases.

1. **Artificial Insemination** is a process of fertilization in which a man’s sperm is placed directly into a woman’s vagina by a physician.

2. **In Vitro Fertilization (IVF)** is a procedure in which a woman’s ova are removed from her ovaries and a man’s sperm are used to fertilize the ova in a laboratory.

3. **Surrogate Mother**, a woman who agrees to carry the child to term; may be used in cases where the mother is unable to conceive

4. **Gamete Intrafallopian Transfer (GIFT)** and **Zygote Intrafallopian Transfer (ZIFT)**,
procedures in which an egg and sperm or fertilized egg are implanted in a woman’s fallopian tubes

d. Ethical Issues
   (1) Ethical and legal issues as well as emotional concerns are present, and may result in the rights of the mother, the father, the surrogate mother, and ultimately the child being in conflict.
   (2) Sex-selection techniques are even more troubling, and questions arise about intervening in the reproductive process to obtain a favored sex or other characteristics.
   (3) Evidence suggests that the quality of parenting in families who have used artificial means to conception may even be superior to the parenting in families with naturally conceived children.
   (4) The psychological adjustment of children conceived artificially is no different than that of children conceived using natural techniques.

e. Miscarriage and Abortion
   (1) A miscarriage—known as spontaneous abortion—occurs when pregnancy ends before the developing child is able to survive outside the womb.
      (1) Fifteen to twenty percent of all pregnancies end in miscarriage.
      (2) In many cases, the woman is not even aware that she was pregnant.
      (3) Typically, miscarriages are attributable to some sort of genetic abnormality.
   (2) Abortion is the voluntary termination of a pregnancy.

4. The Prenatal Environment: Threats to Prenatal Development
   a. Certain aspects of mothers’ and fathers’ behavior, both before and after conception, can produce lifelong consequences for the child.
   b. Some of the most profound consequences are brought about by a TERATOGEN, an environmental agent such as a virus, chemical, or other factor that produces a birth defect.
      (1) Timing and quantity of exposure to teratogens are crucial factors in assessing risk.
      (2) At some phases of prenatal development, a teratogen may have minimal impact; at other periods, consequences can be severe.
         (a) A mother’s diet clearly plays an important role in bolstering the development of the fetus.
         (b) Research shows that mothers over 30 and adolescent mothers are at greater risk for a variety of pregnancy and birth complications including premature birth.
         (c) About 90 percent of women’s eggs are no longer normal at age 42. Older women (relative to younger women) are at risk for having children with:
1. premature birth
2. low birth weight
3. Down syndrome

(a) Illness in a pregnant woman can have devastating consequences.
(b) *Rubella* (German measles) prior to the eleventh week can cause blindness, deafness, heart defects, or brain damage.
(c) *Chicken pox* and *mumps* may cause birth defects and miscarriage, respectively.
(d) *Syphilis* and *gonorrhea* can be transmitted to the child.
(e) Babies may acquire AIDS (*acquired immune deficiency syndrome*) from their mothers through the placenta.

(3) A mother’s use of legal and illegal drugs poses serious risks to the unborn child.
(a) Aspirin can lead to bleeding.
(b) *Thalidomide* causes missing limbs.
(c) *DES* (*diethylstilbestrol*) later caused cervical and vaginal cancer in daughters.
(d) Exposure to birth control or fertility pills in utero can affect brain structures in the fetus.

(4) Both alcohol and cigarettes can disrupt the development of the fetus.
(a) **FETAL ALCOHOL SYNDROME (FAS)** is a disorder caused by the pregnant mother consuming substantial quantities of alcohol during pregnancy, potentially resulting in mental retardation, delayed growth, and facial deformities.
(b) Even smaller amounts of alcohol can produce **FETAL ALCOHOL EFFECTS (FAE)**, a condition in which children display some, although not all, of the problems of FAS due to their mothers’ consumption of alcohol during pregnancy.
(c) Just two drinks a day has been associated with lower intelligence.
(d) Smoking reduces the oxygen content and increase carbon monoxide.
   1. Babies can miscarry or are born with abnormally low birth weight.
   2. Babies born to smokers are shorter and may be 50 percent more likely to have mental retardation.

(5) Fathers can affect the prenatal environment.
1. Secondhand smoke can affect the mother’s health.
2. Alcohol and illegal drugs can lead to chromosomal damage at conception.
3. Stress may produce an unhealthy environment for the mother.
4. Sperm damage may result from a father’s exposure to environmental toxins in the workplace.

B. The Process of Birth

1. About 266 days after conception, a protein called corticotropin-releasing hormone (CRH) triggers the process of birth.
   a. The hormone oxytocin is released from mother’s pituitary.
   b. Braxton-Hicks contractions have been occurring since the fourth month.
   c. Contractions force the head of the fetus against the cervix.
   d. Labor proceeds in 3 stages.
      (1) The first stage is the longest.
          (a) Uterine contractions occur every 8–10 minutes and last about 30 seconds.
          (b) Contractions increase to their greatest intensity, a period known as transition.
          (c) The mother’s cervix fully opens.
          (d) For first babies, this stage can last 16–24 hours (this varies widely).
          (e) Subsequent children involve shorter periods of labor.
      (2) During the second stage of labor, the baby’s head moves through the birth canal.
          (a) This stage typically lasts 90 minutes.
          (b) After each contraction the baby’s head emerges more and increases the vaginal opening.
          (c) An episiotomy is an incision sometimes made to increase the size of the opening of the vagina to allow the baby to pass.
          (d) This stage ends when the baby is born.
      (3) The third stage of labor occurs when the child’s umbilical cord and placenta are expelled.
          (a) This is the shortest stage.
          (b) lasts only minutes
      (4) Cultural perspectives color the way that people in a given society view the experience of childbirth.

2. From Fetus to Neonate
   a. The exact moment of birth occurs when the fetus passes through the vagina and emerges from the mother’s body.
   b. As soon as they are born, most babies cry to clear their lungs and begin breathing on their own.
c. In the U.S., 99 percent of births are attended by professional healthcare workers (worldwide, the figure is 50 percent).

3. Approaches to Childbirth: Where Medicine and Attitudes Meet
   a. There are a variety of choices for how to give birth and no research proves that one method is more effective than another.
   b. There are several alternative birthing procedures.
      (1) *Lamaze birthing techniques* (Dr. Fernand Lamaze)
          (a) The goal is to learn how to deal positively with pain and to relax at the onset of a contraction.
          (b) Low-income and minority groups may not take advantage of these *natural childbirth techniques*.
      (2) *Bradley Method*
          (a) known as “husband-coached childbirth”
          (b) principle: childbirth should be as natural as possible
          (c) involves no medication or medical interventions
      (3) *Hypnobirthing*
          (a) involves a self-hypnosis during delivery
          (b) produces peace and calm, thereby reducing pain

4. Childbirth Attendants: Who Delivers?
   a. Birthing centers are homelike, and less foreboding or stressful than a hospital.
   b. The use of birthing centers is becoming increasingly common.
   c. Some parents use a *midwife*, a nurse specializing in childbirth, instead of an *obstetrician*, a physician who specializes in childbirth.
   d. Although relatively rare in the U.S., midwives deliver some 80 percent of babies in other parts of the world.

5. Use of Anesthesia and Pain-Reducing Drugs
   a. The use of medication during childbirth has benefits and disadvantages.
   b. Eighty percent of women receive some form of pain medication during childbirth.
   c. One-third of women receive an *epidural anesthesia*, which produces numbness from the waist down.
      (1) A newer form is known as *walking epidural* or *dual spinal-epidural*, which use smaller needles and a system of delivering continuous doses of anesthetic, allowing women to move about more freely during labor.
      (2) Anesthetics may depress the flow of oxygen to the fetus and slow labor (e.g., Ransjo-Arvidson, 2001). It may harm the fetus.
          (a) depresses oxygen flow
          (b) slows labor
          (c) fetus becomes less responsive
          (d) fetus may have slower motor control
          (e) fetus may be slower to sit and stand during first year
C. Birth Complications

1. Preterm Infants: Too Soon, Too Small

2. PRETERM INFANTS, who are born prior to 37 weeks’ gestation (also known as premature infants), are at high risk for illness and death.
   a. The main factor in determining the extent of danger is the child’s weight at birth.
      (1) The average newborn weighs 3,400 grams (7 1/2 pounds).
      (2) LOW-BIRTHWEIGHT INFANTS weigh less than 2,500 grams (5 1/2 pounds).
      (3) Although only 7 percent of all newborns in the U.S. are low-birthweight, they account for the majority of newborn deaths.
      (4) SMALL-FOR-GESTATIONAL-AGE INFANTS, because of delayed fetal growth, weigh 90 percent or less of the average weight of infants of the same gestational age.
   b. Premature infants are susceptible to respiratory distress syndrome (RDS) because of poorly developed lungs.
   c. Low-birthweight infants are put in incubators, enclosures in which oxygen and temperature are controlled.
      (1) easily chilled, susceptible to infection, sensitive to environment
   d. Preterm infants develop more slowly than infants born full term.
      (1) Sixty percent eventually develop normally.
      (2) Thirty-eight percent have mild problems (learning disabilities, low IQ).

3. VERY-LOW-BIRTHWEIGHT INFANTS weigh less than 1,250 grams (2 1/4 pounds) or, regardless of weight, have been in the womb less than 30 weeks and are in grave danger because of the immaturity of their organ systems.
   a. Medical advances have pushed the AGE OF VIABILITY, or point at which an infant can survive a premature birth, to about 22 weeks.
   b. A baby born earlier than 25 weeks has less than a 50/50 chance of survival.
   c. Costs of keeping very-low-birthweight infants alive are enormous.
   d. Research shows that children who receive more responsive, stimulating, and organized care are apt to show more positive outcomes than children whose care was not as good.

4. What Causes Preterm and Low-Birthweight Deliveries?
   a. fifty percent are unknown causes
   b. multiple births
   c. young mothers (under age 15)
   d. too closely spaced births
   e. general health and nutrition of mother
f. African-American mothers have double the number of low-birthweight babies that Caucasian mothers do.

5. Postmature Babies: Too Late, Too Large
   a. **POSTMATURE INFANTS**, those still unborn 2 weeks after the mother’s due date, face several risks.
      (1) Blood supply to the baby’s brain may be decreased and cause brain damage.
      (2) Labor and delivery become more difficult.

   a. Over a million mothers in the U.S. today have a **CESAREAN DELIVERY**, where the baby is surgically removed from the uterus, rather than traveling through the birth canal.
   b. Several types of difficulties can lead to Cesarean delivery.
      (1) Fetal distress is the most frequent reason for a Cesarean section.
      (2) used for **breech position**, where the baby is positioned feet first in the birth canal
      (3) used for **transverse position**, in which the baby lies crosswise in the uterus
      (4) when the baby’s head is large
      (5) Mothers over age 40 are more likely to have Cesarean deliveries than younger ones.
   c. Routine use of **FETAL MONITORS**, devices that measure the baby’s heartbeat during labor, have contributed to soaring rates of Cesarean deliveries—up 500 percent from 1970s—their use has evoked several criticisms.
      (1) There is no association between Cesarean delivery and successful birth consequences.
      (2) It involves major surgery and a long recovery for the mother.
      (3) There is a risk of infection to the mother.
      (4) Easy birth may deter release of certain stress hormones, such as catecholamines, which help prepare the infant to deal with stress outside the womb.
      (5) Babies born via Cesarean delivery are more prone to breathing problems at birth.
      (6) Mothers who deliver via Cesarean birth report less satisfaction with the birthing experience.
      (7) Medical authorities currently recommend avoiding routine use of fetal monitors.

7. Mortality and Stillbirth: The Tragedy of Premature Death
   a. **STILLBIRTH** is the delivery of a child who is not alive and occurs in less than 1 delivery in 100.
   b. The rate of stillbirths has been declining since 1960s.
   c. **INFANT MORTALITY** is defined as death within the first year of life.
      (1) The overall rate is 7.0 deaths per 1,000 live births.
(2) Parents grieve in the same manner as if an older loved one had died.

(3) Depression is a common aftermath.

D. Developmental Diversity: Overcoming Racial and Cultural Differences in Infant Mortality

1. African-American babies are twice as likely to die before the age of one as white babies.

2. This may be the result of socioeconomic factors such as poverty which result in poor prenatal care.

3. The overall infant mortality rate in the U.S. is higher than the rate in many countries.
   a. The U.S. has a higher rate of low-birthweight and preterm deliveries.
   b. The U.S. has more people living in poverty who are less likely to get adequate medical care.
   c. Other countries do a better job providing prenatal care at low cost and even free.
   d. The percentage of pregnant women in the U.S. who receive no prenatal care has increased since the 1990s.
   e. Free or inexpensive healthcare and basic education could reduce these problems.

Supplemental Reading

This magazine is published for expectant mothers and fathers and uses some of Nilsson’s photographs to describe how the fetus develops month by month. To obtain a copy write to Cahners Publishing Company, 249 West 17th Street, New York, NY 10011 or call (212) 645-0067.

This is a moving account of the difficulty an adoptive father has raising his son, who was born with fetal alcohol syndrome.

This is an excellent and comprehensive guide that covers conception, pregnancy month by month, and childbirth.

*A State of the Art Pregnancy* and *Fetal Psychology* provide additional information on the importance of a healthy prenatal environment.

Lennart Nilsson is justly famous for his amazing photographs of babies in utero. Share these with your class. The film The Miracle of Life also uses some of his microphotography. As one student exclaimed, “He must be a very small photographer!”

Multimedia Ideas

*Biological Growth: Nature’s Child* (Insight Media, 1991, 60 minutes)
- Explores the nature-nurture controversy. Examines the influences of genetics on behavior, concentrating on hereditary contributions to intelligence, temperament, personality, sex differences, and mental illness. It also investigates the influence of environment on prenatal development.

*Birth Defects* (Films for the Humanities and Sciences, 1987, 19 minutes)
- Describes both genetic and environmental causes of birth defects.

*Brave New Babies* (Penn State Audio-Visual Services, 1982, 48 minutes)
- An introduction to genetic engineering.

*Developmental Phases Before and After Birth* (Films for the Humanities and Sciences, 28 minutes)
- This program examines the development of the fetus in utero and the child during the first year.

*Fetal Alcohol Syndrome and Other Drug Use During Pregnancy* (Films for the Humanities and Sciences, 19 minutes)
- This program profiles an 8-year-old boy born with FAS, showing how alcohol enters the bloodstream of the fetus; it describes common characteristics of children with FAS and the learning disabilities, mental handicaps, and behavioral problems that are common. Also shows how cocaine impairs the growing fetus.

*Heredity and Environment* (Insight Media, 1988, 30 minutes)
- Describes the basic mechanisms of heredity and discusses the joint role of heredity and environment in determining human characteristics and development.

*High Tech Babies* (Coronet/MTI Film and Video, 1987, 58 minutes)
- Useful as a way of increasing students’ awareness of the issues surrounding the new reproductive technology: in vitro fertilization.

*The Miracle of Life* (Time-Life Films, 1983, 57 minutes)
- Shows development from conception to birth using Nilsson’s microphotography techniques. Actually presents footage of the fetus moving in utero.

*Motherhood on Hold* (Films for the Humanities and Sciences, 23 minutes)
In this program, a reproductive endocrinologist explains why a woman’s chances of conceiving drop dramatically after her 20s, and 4 women discuss their own very different experiences in trying to have children and the factors that shaped their choices in determining when to conceive.

*Pregnancy and Substance Abuse* (Films for the Humanities and Sciences, 28 minutes)
This program follows several couples through pregnancy and prenatal care. Former U.S. Surgeon General C. Everett Koop talks about the risks of smoking, and Michael Dorris, author of *The Broken Cord*, discusses his life raising an adopted son with fetal alcohol syndrome. Highly recommended.

*Prenatal Development* (Insight Films, 1979, 30 minutes)
Describes development from conception to birth. Illustrates the effects of cigarette smoking, alcohol, and drug use on a developing fetus. Shows fetal responsiveness to foods ingested by the mother and to music. Shows a birth at the end.

*Prenatal Diagnosis* (Filmmakers Library, 1982, 45 minutes)
Explains amniocentesis, fetoscopy, and ultrasound. Discusses the ethical and practical aspects of making a decision about whether to abort an abnormal fetus.

*Psychological Development Before Birth* (Films for the Humanities and Sciences, 22 minutes)
The development of the individual can be followed in utero. This program shows how it is possible to determine the well-being of the fetus; when the fetus begins to react to sound; and how mothers-to-be deal with pregnancy and prepare themselves for the birth.

**Lecture Suggestions**

**Dominant and Recessive Traits (Handout 2-4)**
This handout shows various dominant and recessive traits, and can be used when discussing heritability of traits.

**The New Genetic Code**
Begley’s 1992 article discussed the discovered exceptions to Mendel’s rules. For example, it is genetic dogma that children inherit 23 chromosomes from mom and 23 from dad. However, research shows that individuals can inherit both chromosomes from a pair from the same parent (that’s how diseases like cystic fibrosis are inherited).

*Source:*

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Fertility

Traditionally, women’s fertile period ranged anywhere from 2 days to 10 days per month. However, a study by the National Institute of Environmental Health Sciences in Research Park, NC, published in the *New England Journal of Medicine* (December 7, 1995) found that women are fertile for 5 days before ovulation as well as on the day of ovulation. Researchers were surprised to find that having sex just 1 day after ovulation will not result in a pregnancy. Kits are available which tell when a woman is ovulating. (For couples wanting to avoid pregnancy, these researchers suggest abstaining from sex, or using birth control, during this 6-day period.)

According to the study, the probability of conception ranges from 10 percent when intercourse occurs 5 days before ovulation to 33 percent when it happens on the day of ovulation. Daily intercourse results in the highest chance of pregnancy: 37 percent. The study had some other findings: there is no evidence that the timing of intercourse influences whether the baby will be a boy or a girl. Also, there is no sign that aging sperm is more likely to produce babies with defects, although the study was too small to prove this conclusively.

On average, couples have a 20 percent chance of getting a viable pregnancy each month. However, according to Dr. Allen Wilcox, who conducted the study, “even couples who are very fertile are not fertile in every cycle. We don’t understand why that is.” Results from another study show that women who drink 3 or more cups of coffee a day reduce their chances of conception by 26 percent. It is believed that caffeine disrupts the menstrual cycle and may lead to early pregnancy loss.

*Source:* Fertility window placed at 6 days. Arizona Republic (December 7, 1995).

Infertility

“Infertility is defined as the inability to get pregnant after one year or more of regular sexual activity without the use of contraception, or the inability to carry a pregnancy to a live birth . . . . Some specialists use two years as the cutoff point” (Jewelewicz, 1989, p. 170). Contrary to popular opinion, infertility rates are not on the rise. In 1965, the U.S. infertility rate was 13.3 percent; in 1988, it was 13.7 percent. However, estimates are that one-sixth of all couples who try to conceive are sterile or infertile. Jewelewicz (1989) cites several reasons for this:

1. There are more couples trying to conceive because the post-WWII baby boomers are reaching the end of their reproductive years.
2. The rise in sexually transmitted diseases, women entering the workforce and being exposed to occupational hazards that affect their fertility, and the possibility of being exposed to more environmental toxins are all reasons hypothesized for increased infertility.
3. Women are delaying childbirth, and increased maternal age is related to decreased fertility.
4. Oral contraceptives and use of an IUD may account for some cases of infertility.
5. Because of second marriages, some couples seek to reverse previous surgical sterilizations.
6. More techniques are available and written about in the media so couples are more aware of help for infertility.

It is estimated that over 3 million couples will seek reproductive help each year. The top 5 procedures include:

- in vitro fertilization (IVF)
- gamete intrafallopian transfers (GIFT)
- intrauterine insemination (IUI)
- zygote intrafallopian transfer (ZIFT)
- intracytoplasmic sperm injection (ICSI)

There are some pros and cons about the new reproductive technologies. For example, before the 1970s, only donor insemination— injection of sperm from an anonymous man into a woman— was available for infertile women. Today, in vitro fertilization is a common choice: hormones are used to stimulate the production of several ova, which are removed. The eggs are placed in a dish of nutrients, sperm are added, and then the fertilized eggs are injected into the mother. Ova can be screened for genetic defects and fertilized ova can also be frozen for use in the future. Sperm can also be frozen. Few states have legal guidelines for these procedures. Consequently, problems that might arise include:

- genetic defects
- sexually transmitted diseases
- poor records of donor characteristics
- possibility that children from same donor may grow up together and marry
- use of genetic selection for the “perfect child”
- use of “surrogate mothers”

Sources:


Teratogens

Teratogens (from the Greek tera meaning “monsters”) are any agents that may pass from the mother through the placental barrier and affect the fetus. Teratogens are a major cause of birth defects. Use Handout 2-5 to go with this lecture.

Source:
Obesity

According to recent statistics, the number of obese or seriously overweight children and adolescents in the U.S. has more than doubled during the last 30 years. A study released by the National Center for Health Statistics shows that 4.7 million American children and adolescents are severely overweight. According to the American Medical Association, children who weigh more than the following are considered overweight:

<table>
<thead>
<tr>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Height</td>
<td>Weight</td>
<td>Age</td>
</tr>
<tr>
<td>6</td>
<td>3'9&quot;</td>
<td>56</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>4'2&quot;</td>
<td>75</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>4'6&quot;</td>
<td>96</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>5'0&quot;</td>
<td>123</td>
<td>12</td>
</tr>
<tr>
<td>14</td>
<td>5'5&quot;</td>
<td>164</td>
<td>14</td>
</tr>
</tbody>
</table>

The researchers defined obesity as those in the 95th percentile of BMI (Body Mass Index).

\[
\text{BMI} = (\text{weight} \times 2.2 \times \text{height} \times 0.0254)^2
\]

The study examined a national sample of nearly 3,000 children and adolescents from 1988 to 1991 and found some of the steepest increases among African-American girls. Among boys, those least likely to be overweight were whites from 6 to 11 years old and African Americans from 12 through 17.

Experts believe that children are overweight for the same reasons adults are: lack of physical activity as a result of too much TV, video games, and computers, in addition to eating a diet with too many calories.

In addition to being a serious health hazard (increased risk of heart attacks, high blood pressure, strokes, and diabetes), being obese carries a social stigma. You can ask the class for any volunteers to talk about whether they were obese when young or if they knew anyone in grade school who was overweight. What were the consequences?

Sources:
This up-to-date article is very informative about obesity and the fact that in all industrialized nations, people are getting heavier. It also dispels the myth that Americans are the heaviest in the world (Western Samoa and several Pacific islands are worse). There is a good chart showing the health risks of being over a certain BMI.

**Bulimia: Too Much, Too Little, Too Many**

Eating too little and eating too much have probably been problems as long as there have been people. Nearly everyone has pursued one of these behaviors at one time or another. But like so many behaviors, when they are carried to extremes they can be dangerous. In the case of eating disorders, these behaviors can sometimes be deadly. Also, they are very prevalent among the high school and college female populations. Many students (especially males) are surprised at how prevalent eating disorders are, especially bulimia (bingeing and purging), among their peers.

In bulimia, there are periods of binge eating during which enormous amounts of food (usually starches and sweets) may be eaten. To prevent body weight and shape from ballooning, the person compensates by vomiting, exercising, or using laxatives or diuretics. Although bulimic individuals are concerned about their weight and appearance, they do not have the distorted self-image typical of anorexia nervosa. Bulimia, in fact, is not limited to underweight people; in fact, it is probably more common in people of normal weight.

The DSM-IV criteria for bulimia include:

- Person repeatedly eats in binges. In a binge episode:
  - Person consumes much more food than most people would in similar circumstances and in a similar period of time;
  - Person feels that eating is out of control;
  - Person repeatedly controls weight gain by inappropriate compensatory means, such as fasting, self-induced vomiting, excessive exercise, or the abuse of laxatives or other drugs;
  - Self-evaluations are unduly influenced by body shape and weight.

One popular perspective on bulimic bingeing is that these individuals fill themselves up because they feel so empty inside. Eating is one of the few ways some people take care or give something to themselves. If you feel deprived, upset, or unhappy, eating is one way to cheer yourself up (think of the stereotypical “grandmother solution” of cookies and milk to make you feel better). The binge eater is just going to an extreme because emotions are extreme. From this view, food addicts use food to feel in control and protected from the need for love. Eating becomes a substitute for intimacy, involvement, and love. (See **Supplemental Reading** list for Geneen Roth’s *Feeding the Hungry Heart* and *When Food is Love*.)

**The Tyranny of Slenderness: A Female Obsession**

The biggest-selling books in the U.S. are diet books. It is estimated that almost 40 percent of the population is dieting at any one time. How did all of this dieting/thinness concern get started? Is it true, as some people say, that American popular culture (and other Western cultures) supports the view that you can never be too thin? In fact, the result of all of the social pressure on thinness...
is a great deal of irrational fear of getting fat, especially by adolescent girls and young adult women. Where is that learned? What role does the media play? What role does the family play? One view is that our society increasingly demands that women be thin to be accepted or appreciated. Girls and women are willing to try to be thin rather than accept the natural dimensions of their bodies. What does it mean psychologically if someone rejects her natural body? Can these people ever really feel okay about themselves? Usually, women who feel tyrannized by their fear of fat have a deep sense of personal rejection; their own bodies are their enemies.

An example of where this tyranny exists is in the women’s sport of gymnastics. Young girls are encouraged/required to maintain a young girl’s (boyish) body shape and avoid developing womanly curves. Yet look at the popularity of gymnastics: it was one of the most watched events at the Summer ’96 Olympics. What is the statement being made when girls are given little-girl-body role models and discouraged from being woman-like?

**Should You Let a Baby Cry?**

Many developmentalists believe that the discomfort caused by listening to a baby cry is an adaptive response that assures the helpless baby will get attention from an adult. However, even the experts disagree on how quickly parents or caregivers should respond to a crying baby. A recent visit to the website www.parentsoup.com produced the following question from a frantic new parent: Which is better for my baby, *Ferberization* or the *attachment* theory? These are modern incarnations of an old dilemma. Ferberization is based on the views of Dr. Richard Ferber in his book *Solving Your Child’s Sleep Problems* and advocates letting babies cry themselves to sleep. Attachment theorists argue that babies cry for adaptive reasons, and that letting them cry stunts their social and emotional development.

**Ferberization: Modern-Day Behaviorism**

The first psychologist to advise new parents on whether to allow babies to cry or not was John B. Watson. Watson argued that when parents respond each time their baby cries, they are rewarding the crying and increasing its occurrence. In other words, they are spoiling their children. To avoid this, Watson advises, treat them:

> . . . as though they were young adults. . . . Let your behavior always be objective and kindly firm. Never hug or kiss them, never let them sit on your lap. . . . Shake hands with them in the morning. . . . In a week’s time, you will find how easy it is to be perfectly objective . . . [yet] kindly. You will be utterly ashamed at the mawkish, sentimental way you have been handling [your child] (1928, 81–82).

Interestingly, a few years later his wife, Rosalie Rayner Watson, wrote the following in *Children* magazine (the precursor to today’s *Parents*):

> One grave reason why I am a very bad mother, behaviorally speaking, is because I am still somewhat on the side of the children. I am afraid the scientists tackled me
too late in life to wholly recondition me. I cannot restrain my affection for the children completely. The respect in which I am the very worst behaviorist is because I too want to break all rules once in awhile (cited in Parents, August, 1996, p. 50).

By the 1940s, Dr. Spock (in his classic Baby and Child Care) was dispensing very similar advice: when babies are fussy and won’t sleep, let them cry it out until they fall asleep. Fifty years later, Dr. Richard Ferber, head of the Center for Pediatric Sleep Disorders at Children’s Hospital in Boston, wrote a best-selling book called Solve Your Child’s Sleep Problems. After studying babies’ sleep habits for years, Ferber says that most healthy babies are sleeping through the night by age 3 months. Babies need to learn that if they cry at night parents will not (a) take them out of the crib, (b) feed them, or (c) play with them. Also, says Ferber, if a baby learns to fall asleep only while being held, rocked, or fed, she’ll insist on those conditions being met night after night. While it’s normal for babies to wake during the night, Ferber continues, it is not knowing how to go back to sleep that is the problem. Instead, advises Ferber, teach her to sleep on her own. Give the baby a pat (not a cuddle) and leave the room. If the crying continues, parents should return and calmly reassure the child. Ferber suggests increasing the intervals between returning to the child’s room by 5 minutes at first, then 10, then 15. Within a week, claims Ferber, the child will be trained to fall asleep on her own.

Many developmentalists disagree with the behaviorist view. John Bowlby (1989) argued that babies’ cries are preprogrammed distress signals that bring caregivers to the baby. The caregivers, too, are programmed to respond to babies’ cries. The adaptive significance of crying ensures that:

- the infant’s basic needs will be met;
- a sense of trust in others will develop; and
- the infant will have sufficient contact with other human beings to form social and emotional attachments.

Mary Ainsworth believes that you cannot respond too much to an infant’s crying in the first year. She found that mothers who responded quickly to their infants when they cried at age 3 months had infants who cried less later on (Bell & Ainsworth, 1972). Other researchers have found that quick, soothing responses to infant’s crying increased subsequent crying (Gewirtz, 1977).

Your students might find this an interesting topic for discussion. Students may even enjoy surveying parents they know about their views on responding to babies’ crying.

Sources:


Class Activities

Newborn Reflexes:

If possible, invite several parents to bring in their babies to illustrate reflexes in the newborn. Make copies of Handout 2-1 that lists both survival and primitive infant reflexes. Your class might try to guess the survival value of each reflex.

Early Childhood Observations

Students often benefit from observing and interacting with preschoolers. This assignment provides an opportunity for both and also facilitates students’ understanding of research. Hand out the accompanying directions (See Handout 2-2) for the assignment and go over it in class. Some students may have access to children on their own. Perhaps others can visit the campus or a nearby childcare center. Be certain that you have made arrangements with the center ahead of time! Also be certain to inform students about politeness, safety, and appropriate behaviors related to visiting a center.

The Nature-Nurture Issue: Lessons from the Pillsbury Doughboy

David B. Miller uses a cooking metaphor to describe the intricate interactions between genetics/biology (nature) and the environment/learning (nurture). In his metaphor, flour represents genes. He takes 4 different food items, which represent 4 different developmental outcomes that all use flour as a base but that have other ingredients that interact with the flour in unique ways.

1. FLOUR + SALT + WATER + FRIED IN SHORTENING = FLOUR TORTILLA
2. FLOUR + SALT + WATER + BAKED WITHOUT SHORTENING = MATZO
3. FLOUR + SALT + WATER + YEAST + BAKING = BREAD
4. FLOUR + SALT + BUTTER + COCOA + SUGAR + BAKING = BROWNIE

Depending on how adventurous you feel you can demonstrate this lesson in a variety of ways. You can bring in an example of each ingredient (e.g., a bag of flour, a box of salt, some water, a can of shortening, a packet of yeast, some butter, a can of cocoa, a bag of sugar, and perhaps a toy oven) and use them as props to create the “developed” results (e.g., tortilla, matzo, bread, and brownie). You could actually mix some of the ingredients and assign students to go home and finish them. Finally, you could assign small groups ahead of time to make the various products and bring them to class; each group must explain how their ingredients relate to real-world human development (i.e., flour = genes, salt = culture, water = health, baking/frying = home environment). Each group must explain their results. Miller suggests that the metaphor of tortilla versus matzo show how similar ingredients (i.e., shared genes of identical twins) can yield different developmental outcomes (i.e., different personalities, intelligence, etc.) due to different environments (i.e., baking versus frying). Additionally, Gallagher’s book is fairly new and represents a journalist’s effort to compile the latest data from geneticists, psychoanalysts, neuroscientists, and primatologists on the role of heredity versus environment. We add it here as a resource for the above discussion.

Sources:


Critical Thinking Exercises


   • What are some ethical considerations relating to the provision of intensive medical care to very-low-birthweight babies?

   • Do you think such interventions should be routine practice? Why or why not?

2. Have students investigate the cost of childbirth in their city. These costs should include prenatal care, the hospital/doctor or midwife charges, and costs of items for the baby, such as clothing, well-baby checkups, and furniture.
Reflective Journal

It’s hard for adults to imagine themselves as little children or what their life was like then (let alone remember), but have your students try. As they do so, ask them to reflect on how those early days might have influenced their development. **Handout 2-6** will provide them with some questions and ideas to help fuel their memories.

See also **Handout 2-7**
### Infant Reflexes

<table>
<thead>
<tr>
<th>Survival Reflexes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breathing</strong></td>
<td>Infants reflexively inhale to obtain oxygen and expel carbon dioxide.</td>
</tr>
<tr>
<td><strong>Rooting</strong></td>
<td>If you touch an infant’s cheek, the infant will turn its head toward the stimulus and open its mouth as if expecting a nipple.</td>
</tr>
<tr>
<td><strong>Sucking</strong></td>
<td>If you touch or otherwise stimulate an infant’s mouth, the infant will respond by sucking and making rhythmic movements with the mouth and tongue.</td>
</tr>
<tr>
<td><strong>Pupillary</strong></td>
<td>The pupils of infants’ eyes narrow when in bright light and when going to sleep, and widen when in dim light and when waking up.</td>
</tr>
<tr>
<td><strong>Eye-blink</strong></td>
<td>Infants blink in response to an object moving quickly toward their eyes or to a puff of air.</td>
</tr>
<tr>
<td><strong>Primitive Reflexes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Moro (startle)</strong></td>
<td>When infants are startled by loud sounds or by being suddenly dropped a few inches, they will first spread their arms and stretch out their fingers, then bring their arms back to their body and clench their fingers.</td>
</tr>
<tr>
<td><strong>Palmar</strong></td>
<td>When an infant’s palm is stimulated, the infant will grasp tightly and increase the strength of the grasp as the object is pulled away.</td>
</tr>
<tr>
<td><strong>Plantar</strong></td>
<td>When an object or a finger is placed on the sole of an infant’s foot near the toes, the infant responds by trying to flex the foot.</td>
</tr>
<tr>
<td><strong>Babinski</strong></td>
<td>If you stroke the sole of an infant’s foot from heel to toes, the infant will spread the small toes and raise the large one.</td>
</tr>
<tr>
<td><strong>Stepping</strong></td>
<td>When infants are held upright with their feet against a flat surface and are moved forward, they appear to walk in a coordinated way.</td>
</tr>
<tr>
<td><strong>Swimming</strong></td>
<td>Infants will attempt to swim in a coordinated way if placed in water in a prone position.</td>
</tr>
<tr>
<td><strong>Tonic neck</strong></td>
<td>When infants’ heads are turned to one side, they will extend the arm and leg on that side and flex the arm and leg on the opposite side, as if in a fencing position.</td>
</tr>
</tbody>
</table>

Early Childhood Observation Assignment

The purpose of this assignment is to give you an opportunity to better understand early childhood development by observing and interacting with someone in this age group. The assignment consists of three loosely defined tasks—one related to each of the domains of development (physical, cognitive, and psychosocial).

In short, you will be like a researcher, gathering insight into the developing child through observation and interviews. For each of the areas, define and state your purpose. Identify your subject(s) or the participants in your observation. You do not need to have the same subject(s) for each area. Develop strategies to gather your data (e.g., interview questions, props, observation guidelines). Briefly write up your results, and relate this to information, concepts, or theories discussed in the text.

First, address the physical abilities or motor development of a preschooler. You might want to observe his or her activity for an identified amount of time—perhaps 3 intervals of 2 minutes—and precisely record EVERYTHING the child does. You might ask the child to perform a few tricks like standing on one foot, jumping on one foot, holding a crayon or cutting paper; you might compare these across ages or between boys and girls.

Second, explore the cognitive abilities of the young child. You might use Piaget’s model or information-processing theory. You could test children’s conservation skills by asking them some “why” questions to see if their answers are egocentric or if they use animism. You might test their memory by asking them to repeat a list of words and/or then ask them how they remember; teach them to use rehearsal and see whether there’s a difference.

Third, examine an area of social development. Here you may observe a group of children playing and note, describe, and/or time the types of play they engage in. You may ask a child to describe him- or herself and interpret his or her response in terms of the literature on self development. Try to observe boy/girl play, toys, or socialization in terms of gender role development, or interview a child about various roles and what their job is: Why? What if Dads did this and Moms did this?

NOTE: You are free to arrange and organize your observations, results, and interpretations as you see fit. I will evaluate you on the clarity of your stated purpose, the appropriateness of your data collection (i.e., are you addressing your purpose), the logic behind your summaries and interpretations, and the degree to which you integrate and refer to the information, concepts, or theories discussed in the text. You might want to use an outline form to write up your report. For example:

**Physical Development**

**Purpose:** To examine fine and gross motor skills and note any age or gender differences, to evaluate these and comment in terms of motor skill development.

**Participants:** 3-year-old, 4-year-old, and 5-year-old females; 3-year-old, 4-year-old, and 5-year-old males.

**Setting:** All were at the daycare center. It was mid-afternoon, and the children were outside in free play.
**Procedure:** Asked the children to do a number of motor tasks (e.g., hop on one foot, skip).

<table>
<thead>
<tr>
<th>Age</th>
<th>Task</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-M</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reflective Journal Exercise

It’s hard for grownups to imagine themselves as little children or what their life was like then (let alone remember). Write an essay titled “When I Was a Preschooler.” Listed below are a number of questions to help you recreate your life as a preschooler. You might have to ask a parent or relative for some of the answers. Feel free to include other relevant information or stories about yourself. As you reflect back or find out about your life as a young child, consider how those early days might have influenced your development.

1. Where did your family live when you were a preschooler? Who was living in the house? Did you share a bedroom? With whom? Did you have a “going to bed” routine? Can you describe it?

2. What was your favorite toy? Story? Game?

3. Describe one of your preschool birthdays. Who was there? What presents did you get?

4. Recreate an early Christmas or holiday. Do any of the family traditions still occur today? If you have children, do you carry on these traditions for Christmas or another holiday in similar fashion?

5. Did your mother work? Did you go to preschool or have a babysitter? When did you first write your name? Is there a copy of it somewhere?

6. Do you recall any special event, pleasant or traumatic, that happened to you or in your family between 2 and 6 years of age? How might this have affected your later development?

7. Who was your closest friend? Describe a common activity you played.

8. What was your health like? Any serious illnesses? Did you have any food preferences?

9. Ask someone to describe your personality and some of your typical behaviors.

10. Try to describe your earliest memory.
### DOMINANT AND RECESSIVE CHARACTERISTICS

Characteristics in the left-hand column dominate over those characteristics listed in the right-hand column.

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>DOMINANT TRAITS</th>
<th>RECESSIVE TRAITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>eye coloring</td>
<td>brown eyes</td>
<td>grey, green, hazel, blue eyes</td>
</tr>
<tr>
<td>vision</td>
<td>farsightedness</td>
<td>normal vision</td>
</tr>
<tr>
<td></td>
<td>normal vision</td>
<td>nearsightedness</td>
</tr>
<tr>
<td></td>
<td>normal vision</td>
<td>night blindness</td>
</tr>
<tr>
<td></td>
<td>normal vision</td>
<td>color blindness*</td>
</tr>
<tr>
<td>hair</td>
<td>dark hair</td>
<td>blonde, light, red hair</td>
</tr>
<tr>
<td></td>
<td>nonred hair</td>
<td>red hair</td>
</tr>
<tr>
<td></td>
<td>curly hair</td>
<td>straight hair</td>
</tr>
<tr>
<td></td>
<td>full head of hair</td>
<td>baldness*</td>
</tr>
<tr>
<td></td>
<td>widow’s peak</td>
<td>normal hairline</td>
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<tr>
<td>facial features</td>
<td>dimples</td>
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</tr>
<tr>
<td></td>
<td>unattached earlobes</td>
<td>attached earlobes</td>
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<tr>
<td></td>
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<td>no freckles</td>
</tr>
<tr>
<td></td>
<td>broad lips</td>
<td>thin lips</td>
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<td>appendages</td>
<td>normal number</td>
<td>extra digits</td>
</tr>
<tr>
<td></td>
<td>normal digits</td>
<td>fused digits</td>
</tr>
<tr>
<td></td>
<td>normal digits</td>
<td>short digits</td>
</tr>
<tr>
<td></td>
<td>normal joints</td>
<td>fingers lack 1 joint</td>
</tr>
<tr>
<td></td>
<td>normal proportion</td>
<td>limb dwarfing</td>
</tr>
<tr>
<td></td>
<td>normal thumb</td>
<td>clubbed thumb</td>
</tr>
<tr>
<td></td>
<td>normal joints</td>
<td>double-jointedness</td>
</tr>
<tr>
<td>other</td>
<td>immunity to poison</td>
<td>susceptibility to poison ivy</td>
</tr>
<tr>
<td></td>
<td>poison ivy</td>
<td>albinism</td>
</tr>
<tr>
<td></td>
<td>normal pigmented skin</td>
<td>hemophilia*</td>
</tr>
<tr>
<td></td>
<td>normal blood clotting</td>
<td>congenital deafness</td>
</tr>
<tr>
<td></td>
<td>normal hearing</td>
<td>deaf mutism</td>
</tr>
<tr>
<td></td>
<td>normal hearing and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>speaking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal; no PKU</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>phenylketonuria (PKU)</td>
</tr>
</tbody>
</table>

*sex-linked characteristic

**Source:**
POSSIBLE TERATOGENS

This list of suspected teratogens contains many common items. Most babies are born without defects, so the placenta may be an effective barrier. Additionally, the timing of the exposure to a teratogen is critical to its impact on prenatal development. Overall, more damage is likely early in the pregnancy when organ systems are developing.

DISEASES

<table>
<thead>
<tr>
<th>Disease 1</th>
<th>Disease 2</th>
<th>Disease 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>chlamydia</td>
<td>pneumonia</td>
<td>gonorrhea</td>
</tr>
<tr>
<td>rubella (German measles)</td>
<td>herpes</td>
<td>scarlet fever</td>
</tr>
<tr>
<td>HIV</td>
<td>syphilis</td>
<td>mumps</td>
</tr>
<tr>
<td>toxoplasmosis</td>
<td>tuberculosis</td>
<td>influenza</td>
</tr>
</tbody>
</table>

DRUGS

<table>
<thead>
<tr>
<th>Drug 1</th>
<th>Drug 2</th>
<th>Drug 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accutane</td>
<td>hexachlorophene</td>
<td>alcohol</td>
</tr>
<tr>
<td>iodides</td>
<td>amphetamines</td>
<td>lithium</td>
</tr>
<tr>
<td>antibiotics</td>
<td>LSD</td>
<td>anti-cancer drugs</td>
</tr>
<tr>
<td>opiates</td>
<td>anticoagulant drugs</td>
<td>quinine</td>
</tr>
<tr>
<td>aspirin</td>
<td>sedatives</td>
<td>barbiturates</td>
</tr>
<tr>
<td>smallpox vaccination</td>
<td>caffeine</td>
<td>thalidomide</td>
</tr>
<tr>
<td>nicotine</td>
<td>tranquilizers</td>
<td>cocaine</td>
</tr>
<tr>
<td>vitamins in excess</td>
<td>diethylstilbestrol (DES)</td>
<td>marijuana</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL FACTORS

<table>
<thead>
<tr>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>cadmium</td>
<td>mercury</td>
<td>cat feces</td>
</tr>
<tr>
<td>nickel</td>
<td>fumes from paints, solvents, glues, dry-cleaning fluids</td>
<td>pesticides</td>
</tr>
<tr>
<td>insecticides</td>
<td>radiation (X-rays, video display terminals)</td>
<td>herbicides</td>
</tr>
<tr>
<td>manganese</td>
<td>polychlorinated biphenyls (PCBs)</td>
<td>lead</td>
</tr>
<tr>
<td>hair dyes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NONINFECTIOUS MATERNAL CONDITIONS

<table>
<thead>
<tr>
<th>Condition 1</th>
<th>Condition 2</th>
<th>Condition 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>alcoholism</td>
<td>chemical dependency</td>
<td>phenylketonuria</td>
</tr>
<tr>
<td>Rh factor</td>
<td>anemia</td>
<td>stress</td>
</tr>
<tr>
<td>diabetes mellitus</td>
<td>young/older mother</td>
<td></td>
</tr>
</tbody>
</table>

Handout 2-6

Reflective Journal Exercise

You may (a) consult with your parents about your own birth, (b) interview a new parent about her birth experience, or (c) consider the birth(s) of your own child(ren). Please discuss the following in your journal:

1. Describe the events leading up to the delivery. Where did the delivery take place? Who was present? Was any medication used? Was the birth experience as you expected it to be?

2. What was your initial reaction to the newborn? How soon were you able to hold the baby? When did you name the child? If you stayed in a hospital, describe your experience after the birth.

3. What were the first weeks at home like? What problems did you experience? How was having a baby different than you expected? Describe a typical day at home during the first weeks after the baby was born.
Handout 2-7

Journal Exercise

If possible, interview your mother and father (if this is not possible, try an aunt, or uncle, or grandparent) about your own prenatal development. Use the following questions to get started.

Was this a planned pregnancy?
Was this your first baby?
How did you find out you were pregnant?
How did you feel?
Were you working?
When did you see a doctor?
Did you take vitamins?
When did you start feeling the baby?
When did you begin wearing maternity clothes?
What changes did your body go through?
What are some of the strongest memories you have of this pregnancy?
Did you have any prenatal tests?
How did your lifestyle change?
Did you smoke? Drink alcohol? Drink coffee or tea? Take any drugs?
Did you know the sex of the baby before the birth? Did you have a preference for a boy or a girl? How did you feel when you found out the sex of your baby?

When did you decide on a name for the baby?

Did you attend any special classes or workshops about childbirth, nursing, etc.?

Did you know of any preexisting conditions?

Where were you living?

Were there any features/characteristics you were hoping the baby would have? Were there any you were hoping the baby would not have?

How much of your spouse’s medical history did you know? In retrospect, how important would that have been?

What role/expectations did you have for this child?

What influenced your decision to have a child at this time?

Did you have any trouble conceiving? Did you expect to have any trouble getting pregnant?

Now, reflect on what you learned. How do you think your own pregnancy (or your wife’s) will be (was) the same as or different than your mother’s?