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Twelfth Edition

# Child Development

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*Power Point slides prepared by Leonard R. Mendola, Ph.D.  
Touro College*

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## Biological Beginnings Chapter 2 Outline

### The Evolutionary Perspective

- Natural Selection and Adaptive Behavior
- Evolutionary Psychology

### Genetic Foundation of Development

- The Collaborative Gene
- Genes and Chromosomes
- Genetic Principles
- Chromosomal and Gene-Linked Abnormalities

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## Biological Beginnings Chapter 2 Outline (continued)

### Reproductive Challenges and Choices

- Prenatal Diagnostic Tests
- Infertility and Reproductive Technology
- Adoption

### Heredity and Environment Interaction: The Nature-Nurture Debate

- Behavior Genetics
- Heredity-Environment Correlations
- Shared and Non-Shared Environmental Experiences
- The Epigenetic View
- Conclusions about Heredity-Environment Interaction

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## Chapter 2 Preview

- Organisms are not like billiard balls, moved by simple external forces to predictable positions on life's table.
- Environmental experiences and biological foundations work together to make us who we are.

***Our coverage of life's biological beginnings focuses on evolution, genetic foundations, challenges, and choices regarding reproduction, and the interaction of heredity and environment.***

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## The Evolutionary Perspective

### Natural Selection and Adaptive Behavior

- **Natural selection:** evolutionary process by which those individuals of a species that are best adapted are the ones who survive and reproduce
  - Those who do survive and reproduce pass on their characteristics to the next generation.
- **Adaptive behavior:** behavior that promotes an organism's survival in the natural habitat (Enger, 2009)

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## The Evolutionary Perspective (cont.)

### Evolutionary Psychology

- emphasizes the importance of adaptation, reproduction, and "survival of the fittest" in shaping behavior
- "Fit" refers to the ability to bear offspring that survive long enough to bear offspring of their OWN (Rose & Rauser, 2009).

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### The Evolutionary Perspective (cont.)

#### Evolutionary Developmental Psychology

- Views proposed by evolutionary developmental psychologists (Bjorklund & Pellegrini, 2002):
  - extended childhood period evolved because:
    - humans required time to develop a large brain
    - humans required time to learn the complexity of human social societies
  - many evolved psychological mechanisms are domain-specific
  - mechanisms apply only to a specific aspect of a person's makeup (Rubenstein, 2004)
  - evolved mechanisms are not always adaptive in contemporary society

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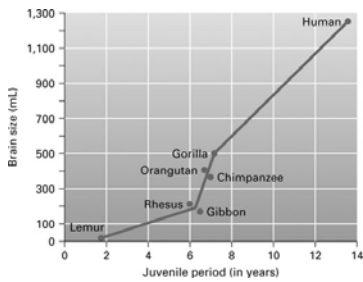
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### The Evolutionary Perspective (cont.)

Humans take longer to become reproductively mature than any other mammal.




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### The Evolutionary Perspective (cont.)

#### Evolutionary Developmental Psychology (continued)

- Evaluating Evolutionary Psychology
  - remains just one theoretical approach
  - has limitations, weaknesses, and critics (Buller, 2005)
  - Bandura (1998):
    - acknowledges important influences of evolution on human adaptation, but rejects "one-sided evolutionism"
    - sees development as *bidirectional*
  - Evolution gave us body structures and biological potentialities, not behavioral dictates.
  - In most domains of human functioning, biology allows a broad range of cultural possibilities (Gould, 1981).

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### Genetic Foundation of Development

#### The Collaborative Gene

##### - Chromosomes

- threadlike structures made up of deoxyribonucleic acid, or DNA
- have double helix shape
- contain genetic information

##### - Genes

- units of hereditary information
- direct cells to reproduce themselves and to assemble proteins
- building blocks of cells
- regulate the body's processes (Hartwell, 2008)
- activity of genes (genetic expression) is affected by their environment (Gottlieb, 2009)

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### Genetic Foundation of Development (cont.)

Genes – The Units of Hereditary Information




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### Genetic Foundation of Development (cont.)

#### Genes and Chromosomes

- are not only collaborative but *enduring*
- get passed from generation to generation and end up in all of the trillion cells in the body

#### Mitosis, Meiosis, and Fertilization

- All cells in the human body, except the sperm & egg, have 46 chromosomes arranged in 23 pairs.
- These cells reproduce by a process called mitosis.

- **Mitosis:** process by which each chromosome in a cell's nucleus duplicates itself and divides

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### Genetic Foundation of Development (cont.)

#### Mitosis, Meiosis, and Fertilization (continued)

- different type of cell division – *meiosis* – forms eggs & sperm (or *gametes*)

- **Meiosis:** process by which cells in the reproductive organs (sperm in males, eggs in females) duplicate their chromosomes, then divide twice, forming 4 cells, each having ½ of the genetic material of the parent cell
  - By the end of meiosis, each egg or sperm has 23 *unpaired* chromosomes.
- **Fertilization:** process in which an egg and a sperm fuse to create a single cell, called the zygote

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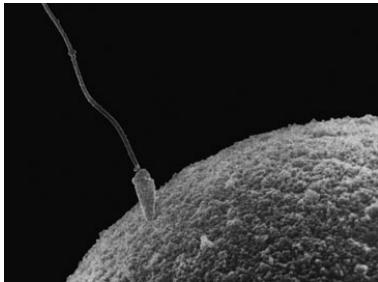
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### Genetic Foundation of Development (cont.)

During fertilization, an egg & a sperm fuse to create a single cell, called a zygote.




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### Genetic Foundation of Development (cont.)

23 Paired Chromosomes of a male and a female

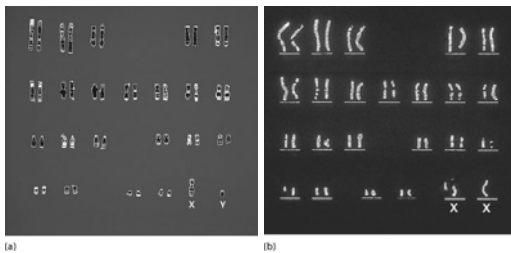


Fig. 2.4

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### Genetic Foundation of Development (cont.)

#### Sources of Viability

- Combining the genes of 2 parents in offspring increases genetic variability in the population.
  - chromosomes in zygote are not exact copies of those in mother's ovaries and father's testes
  - Changes occur during separation and recombination of chromosomes during meiosis.
  - sex differences on 23<sup>rd</sup> pair of chromosomes: XX and XY
  - **Genotype**: person's genetic heritage; actual genetic material
  - **Phenotype**: way an individual's genotype is expressed in observable and measurable characteristics.
  - **Mutated gene**: permanently altered DNA segments

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### Genetic Foundation of Development (cont.)

#### Genetic Principles

- **Dominant-Recessive Genes Principle**
  - the **dominant** gene of a pair exerts its effects, overriding potential influence of the **recessive** gene
  - recessive gene exerts its influence only if the 2 genes of a pair are both recessive

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### Genetic Foundation of Development (cont.)

#### Genetic Principles (continued)

- **Sex-Linked Genes**
  - Most mutated genes are recessive.
  - When a mutated gene is carried on the X chromosome, the result is *X-linked inheritance*.
  - Since males have only one X chromosome, they are more likely than females (who would be carriers) to manifest an X-linked disease.
  - Hemophilia and fragile-X syndrome are examples of X-linked inheritance diseases (Pierce & others, 2009).

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### Genetic Foundation of Development (cont.)

#### Genetic Principles (continued)

##### – Genetic Imprinting

- occurs when genes have differing effects, depending on whether they are inherited from mother or father (Munshi & Duvvari, 2009)
- A chemical process “silences” one member of the gene pair.
- Only a small percentage of human genes appear to undergo imprinting.
- When imprinting goes awry, development is disturbed:
  - Beckwith-Wiedemann syndrome- growth disorder
  - Wilms tumor- a type of cancer (Gropman & Adams, 2009)

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### Genetic Foundation of Development (cont.)

#### Genetic Principles (continued)

##### – Polygenic Inheritance

- Few characteristics reflect the influence of only a single gene or pair of genes.
- Most are determined by the interaction of many different genes (polygenically determined).

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### Genetic Foundation of Development (cont.)

#### Chromosomal and Gene-Linked Abnormalities

##### – Chromosomal Abnormalities

- Sometimes, when a gamete is formed, the sperm and ovum do not have the normal set of 23 chromosomes.
  - Down syndrome
    - form of mental and motor retardation & abnormalities of physical features caused by presence of extra copy of chromosome 21

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### Genetic Foundation of Development (cont.)

#### Chromosomal and Gene-Linked Abnormalities (continued)

- **Sex-Linked Chromosomal Abnormalities**
  - Klinefelter syndrome
    - males have extra X chromosome, making them XXY instead of XY (Itti & others, 2009)
      - underdeveloped testes
      - enlarged breasts
      - tall (Bojesen & Gravholt, 2009)
  - Fragile x syndrome
    - abnormality in x chromosome
    - mental deficiency is outcome
    - occurs more frequently in males

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### Genetic Foundation of Development (cont.)

#### Chromosomal and Gene-Linked Abnormalities (continued)

- **Sex-Linked Chromosomal Abnormalities**  
(continued)
  - Turner syndrome
    - chromosome disorder in females
    - either an X chromosome is missing or part of one X chromosome is deleted (Kanaka-Gantenbein, 2006)
      - short in stature
      - webbed neck
    - occurs in approximately 1 of every 2,500 live female births
  - XXY syndrome
    - male has extra Y chromosome (Briken & others, 2006)

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### Genetic Foundation of Development (cont.)

#### Chromosomal and Gene-Linked Abnormalities (continued)

- **Gene-Linked Chromosomal Abnormalities**
  - Phenylketonuria (PKU)
    - genetic disorder
    - individual cannot properly metabolize phenylalanine, an amino acid
    - results from recessive gene
    - occurs about once in every 10,000-20,000 live births
    - easily detected
    - treated by diet that prevents excessive accumulation of phenylalanine
    - left untreated, excessive phenylalanine produces mental retardation and hyperactivity
    - has important implication for nature-nurture issue

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## Genetic Foundation of Development (cont.)

### Chromosomal and Gene-Linked Abnormalities (continued)

#### - Gene-Linked Chromosomal Abnormalities

(continued)

- Sickle-cell anemia
  - genetic disorder
  - occurs most often in African Americans
  - impairs body's red blood cells
  - recessive gene causes red blood cell to become a hook-shaped "sickle" that cannot carry oxygen properly
  - about 1 in 400 African American babies is affected
  - 1 in 10 African Americans is a carrier
  - 1 in 20 Latin Americans is a carrier

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## Genetic Foundation of Development (cont.)

### Additional Information About Gene-Linked Chromosomal Abnormalities

Name	Description	Treatment	Incidence
Cystic fibrosis	Glandular dysfunction that interferes with mucus production, breathing and digestion are hampered, resulting in a shortened life span.	Physical and oxygen therapy, synthetic enzymes, and antibiotics; most individuals live to middle age.	1 in 2,000 births
Diabetes	Body does not produce enough insulin, which causes abnormal metabolism of sugar.	Early onset can be fatal unless treated with insulin.	1 in 2,000 births
Hemophilia	Delayed blood clotting causes internal and external bleeding.	Blood transfusions/injections can reduce or prevent damage due to internal bleeding.	1 in 10,000 males
Huntington disease	Central nervous system deteriorates, producing problems in muscle coordination and mental deterioration.	Does not usually appear until age 35 or older; death likely 15 to 20 years after symptoms appear.	1 in 20,000 births
Phenylketonuria (PKU)	Metabolic disorder that, left untreated, causes mental retardation.	Special diet can result in average intelligence and normal life span.	1 in 10,000 to 1 in 20,000 births
Sickle cell anemia	Blood disorder that limits the body's oxygen supply; it can cause joint swelling, as well as heart and kidney failure.	Painkillers, medication for pain, antibiotics, and blood transfusions.	1 in 400 African American children (lower among other groups)
Talipes bilialis	Neural tube disorder that causes brain and spine abnormalities.	Corrective surgery at birth, orthopedic devices, and physical/medical therapy.	2 in 1,000 births
Tay Sachs disease	Deterioration of mental and physical development caused by an accumulation of lipids in the nervous system.	Medication and special diet are used, but death is likely by 5 years of age.	One in 30 American Jews is a carrier.

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## Reproductive Challenges and Choices

### Prenatal Diagnostic Tests

A number of tests can indicate whether a fetus is developing normally:

- Ultrasound sonography
- Fetal MRI
- Chorionic villus sampling
- Amniocentesis
- Maternal blood screening (Karpin & Bennett, 2006)

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**Reproductive Challenges and Choices (cont.)**

**Prenatal Diagnostic Tests** (continued)

**– Ultrasound sonography**

- High-frequency sound waves are directed into pregnant woman’s abdomen.
- Sounds are transformed into a visual representation of the fetus’s inner structures.
- can detect many structural abnormalities
- virtually no risk to woman or fetus

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**Reproductive Challenges and Choices (cont.)**

**Prenatal Diagnostic Tests** (continued)

**- Fetal MRI**

- MRI stands for Magnetic Resonance Imaging
- generates detailed images of body’s organs and structures
- provides more detailed images than ultrasound

**- Chorionic villus sampling**

- small sample of the placenta (the vascular organ that links the fetus to the mother’s uterus) is removed
- diagnosis takes about 10 days
- small risk of limb deformity when CVS is used

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**Reproductive Challenges and Choices (cont.)**

**Prenatal Diagnostic Tests** (continued)

**– Amniocentesis**

- may be performed between 15<sup>th</sup> and 18<sup>th</sup> week of pregnancy
- sample of amniotic fluid is withdrawn and tested for chromosomal or metabolic disorders (Nagel & others, 2009)
- brings small risk of miscarriage; about 1 in every 200-300 miscarriages after amniocentesis
- may raise difficult issues for parents about whether to abort if birth defects are present (Quadrelli, 2009)

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**Reproductive Challenges and Choices (cont.)**

**Prenatal Diagnostic Tests** (continued)

– **Maternal blood screening**

- Identifies pregnancies that have elevated risk for birth defects, such as spina bifida and Down syndrome (Palomaki & others, 2006)
- *Triple screen*: blood test that measures 3 substances in mother's blood

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**Reproductive Challenges and Choices (cont.)**

**Infertility and Reproductive Technology**

- **Infertility**: defined as inability to conceive after 12 months of regular intercourse without contraception
- approximately 10-15% of couples in U.S. experience infertility
- cause can rest with woman or man
- more than 2 million couples seek help every year
- surgery may correct cause
- hormone-based drugs improve probability of having a child
- about 40,000 try high-tech assisted reproduction

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**Reproductive Challenges and Choices (cont.)**

**Infertility and Reproductive Technology**

(continued)

High-tech assisted reproduction methods:

- **In Vitro fertilization (IVF)**
  - eggs and sperms are combined in laboratory dish
- **Gamete intrafallopian transfer (GIFT)**
  - eggs and sperms are directly inserted into fallopian tube
- **Zygote intrafallopian transfer (ZIFT)**
  - 2-step procedure:
    - eggs are fertilized in lab
    - eggs are transferred into fallopian tube

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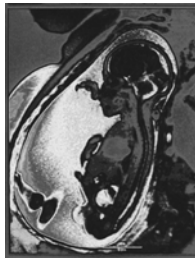
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### Reproductive Challenges and Choices (cont.)

Research in Child Development  
The Social Adjustment Inventory for Children and Adolescence



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### Reproductive Challenges and Choices (cont.)

#### Adoption

- the social and legal process by which a parent-child relationship is established between persons unrelated at birth

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### Reproductive Challenges and Choices (cont.)

#### Diversity in Children's Development

The Increased Diversity of Adopted Children and Adoptive Parents

- Until the 1960s, most U.S. adopted children were healthy, European American infants, adopted within a few days or weeks after birth.
- In recent decades, an increasing number of unmarried U.S. mothers have decided to keep their babies, and the number of unwanted births has decreased.
- The number of healthy European American infants has dropped dramatically.
- Increasingly, U.S. couples have adopted children who were from other countries and in foster care.

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**Reproductive Challenges and Choices (cont.)**

**Diversity in Children’s Development** (continued)

**The Increased Diversity of Adopted Children & Adoptive Parents** (continued)

- The last several decades of the 20<sup>th</sup> century have characterized adoptive parents as:
  - middle-upper socioeconomic status
  - married, infertile, European American couples
  - usually in their 30s and 40s
  - free of any disability
- Today, many adoption agencies:
  - screen as many applicants as possible
  - have no income requirements

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**Reproductive Challenges and Choices (cont.)**

**Diversity in Children’s Development** (continued)

**The Increased Diversity of Adopted Children & Adoptive Parents** (continued)

- Many agencies now permit single adults, older adults, and gay and lesbian adults to adopt (Matthews & Cramer, 2006).
- The changes in adoption practice over the last several decades make it difficult to generalize about the average adopted child.

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**Reproductive Challenges and Choices (cont.)**

**Diversity in Children’s Development** (continued)

**The Increased Diversity of Adopted Children & Adoptive Parents** (continued)

- How do adopted children fare after they are adopted?
  - Children who are adopted very early in their lives are more likely to have positive outcomes than children adopted later in life.
  - In general, adopted children and adolescents are more likely to experience psychological and school-related problems than non-adopted children (Brodzinsky, Lang, & Smith, 1995).
  - Adopted children are more likely to have a learning disability than non-adopted children (Altarac & Saroha, 2009).
  - Research that contrasts adopted and non-adopted adolescents has also found positive characteristics among the adopted adolescents (Sharma, McGue, & Benson, 1996).

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**Reproductive Challenges and Choices (cont.)**

**Diversity in Children’s Development** (continued)

The Increased Diversity of Adopted Children & Adoptive Parents (continued)

- How do adopted children fare after they are adopted? (continued)

- The vast majority of adopted children (including those adopted at older ages, trans-racially, and across national borders) adjust effectively, and their parents report considerable satisfaction with their decision to adopt (Brodzinsky & Pinderhughes, 2002).

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**Reproductive Challenges and Choices (cont.)**

**Caring for Children**

**Parenting Adopted Children**

- No different from parenting biological children:

- Be supportive and caring.
- Be involved and monitor the child’s behavior.
- Be a good communicator.
- Help the child to learn to develop self-control.

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**Reproductive Challenges and Choices (cont.)**

**Caring for Children** (continued)

**Parenting Adopted Children** (continued)

- Parents of adopted children face some unique circumstances:

- Recognize the differences involved in adoptive family life.
- Communicate about these differences.
- Show respect for the birth family.
- Support the child’s search for self and identity.

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### Reproductive Challenges and Choices (cont.)

#### Caring for Children (continued)

##### Parenting Adopted Children

- Brodzinsky and Pinderhughes (2002, pp. 288-292) discussed how to handle some of the challenges that parents face at different points in development:
  - Infancy
    - few differences in the attachment that infants form
  - Early Childhood
    - Many children begin to ask where they came from.
    - Talk in simple ways to children about their adoption status.
    - Some parents decide not to tell.
    - Secrecy may create psychological risks.

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### Reproductive Challenges and Choices (cont.)

#### Caring for Children (continued)

##### Parenting Adopted Children (continued)

- Brodzinsky and Pinderhughes (2002, pp. 288-292) discussed how to handle some of the challenges that parents face at different points in development (continued):
  - Middle and Late Childhood
    - express much more curiosity about their origins
    - may become more ambivalent about being adopted; this is normal.
    - Problems may come from the desire of adoptive parents to make life too perfect.

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### Reproductive Challenges and Choices (cont.)

#### Caring for Children (continued)

##### Parenting Adopted Children (continued)

- Brodzinsky and Pinderhughes (2002, pp. 288-292) discussed how to handle some of the challenges that parents face at different points in development (continued):
  - Adolescence
    - likely to develop more abstract and logical thinking
    - focus their attention on their bodies
    - search for an identity
    - may become "preoccupied with the lack of physical resemblance between themselves and others in the family" (p. 291)

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**Heredity and Environment Interaction:  
The Nature – Nurture Debate**

**Behavior Genetics**

- seeks to discover influence of heredity and environment on individual differences in human traits and development (Bishop & others, 2006)
- To study the link between heredity and behavior, geneticists often use twin studies or adoption studies.

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**Heredity and Environment Interaction:  
The Nature – Nurture Debate (cont.)**

**Behavior Genetics** (continued)

**- Twin study**

- compares the behavioral similarity of identical (monozygotic) twins with the behavioral similarity of fraternal (dizygotic) twins
- **Identical twins** develop from a single fertilized egg that splits into two genetically identical replicas.
- **Fraternal twins** develop from separate eggs and separate sperm with no more genetic similarity than ordinary siblings.

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**Heredity and Environment Interaction:  
The Nature – Nurture Debate (cont.)**

**Behavior Genetics** (continued)

**- Adoption study**

- Investigators seek to discover whether the behavior or psychological characteristics of adopted children are more like their adoptive parents (nurture) or their biological parents (nature).

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### Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)

#### Heredity-Environment Correlations

- Individuals' genes may influence the types of environments to which they are exposed.
- Individuals "inherit" environments that may be related or linked to genetic "propensities" (Plomin & other, 2003).

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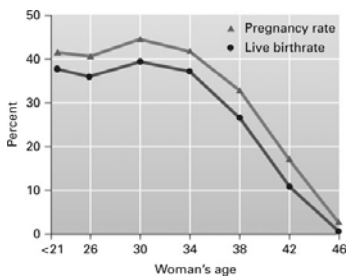
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### Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)

#### Heredity-Environment Correlations

3 Ways that heredity and environment are correlated.




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### Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)

#### Heredity-Environment Correlations (continued)

- **Passive genotype-environment correlations**
  - occur because biological parents provide a rearing environment for the child
- **Evocative genotype-environment correlations**
  - occur because a child's characteristics elicit certain types of environments
- **Active (niche-picking) genotype-environment correlations**
  - occur when children seek out environments they find compatible and stimulating

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### Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)

#### Shared and Non-Shared Environmental Experiences

- Shared environmental experiences may include:

- parents' personalities
- intellectual orientation
- family's socioeconomic status
- neighborhood

- Non-Shared environmental experiences may include

- the child's unique experiences
  - within the family and outside the family

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### Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)

#### The Epigenetic View

- Development is the result of an ongoing, bi-directional interchange between heredity and the environment.

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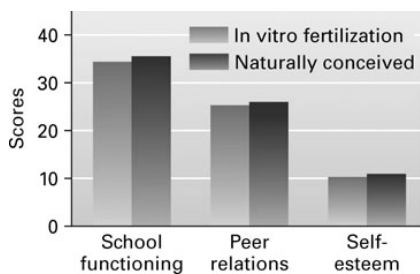
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### Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)

A Comparison of the Heredity-Environment Correlation and Epigenetic Views of Development




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### **Heredity and Environment Interaction: The Nature – Nurture Debate (cont.)**

#### **Conclusions about Heredity and Environment Interaction**

- The relative contributions of heredity and environment are not additive.
- The emerging view is that complex behaviors have some *genetic loading* that gives people a propensity for a particular developmental trajectory (Gatz & others, 2006).
- Development requires an environment that is complex.
- The interaction of heredity and environment is extensive.
- Much remains to be discovered about the specific ways that heredity and environment interact to influence development.

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### **E-LEARNING TOOLS**

To help you master the material in this chapter, visit the Online Learning Center for Child Development, twelfth edition at:

<http://www.mhhe.com/santrockcd12>

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