

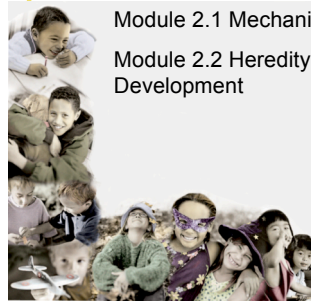
Genetic bases of development

IIE 366: Developmental
Psychology
Greg Francis
Lecture 05

Chapter 2: Genetic Bases of Child Development

Module 2.1 Mechanisms of Heredity

Module 2.2 Heredity, Environment, and
Development



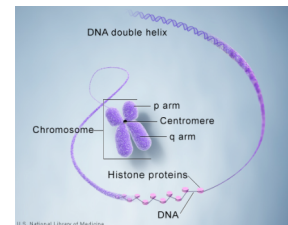
Children and Their Development, 4/e by Robert Kail

2.1 Mechanisms of Heredity

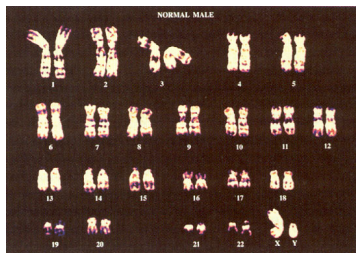
The Biology of Heredity
Single Gene Inheritance
Genetic Disorders

2.1 The Biology of Heredity

- The first 22 pairs of chromosomes are *autosomes* (about the same size)
- The 23rd pair is the *sex chromosomes*
 - Can vary in size

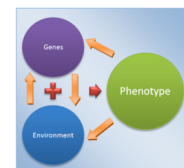


The Biology of Heredity



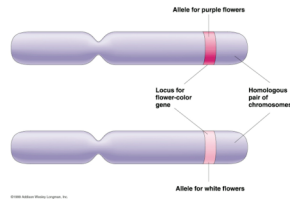
2.1 The Biology of Heredity

- Genotype* is one's complete set of genes
- Phenotype* is one's physical, behavioral, and psychological features
 - The expression of genes
 - Environmental influences



2.1 Single Gene Inheritance

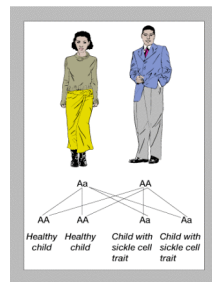
- A *gene* is a group of DNA bases that provide biochemical instructions for producing amino acids, proteins, and enzymes
- Alleles* are different forms of genes



2.1 Single Gene Inheritance

- Pairs of alleles can be either
 - homozygous* (same alleles in the pair of chromosomes)
 - heterozygous* (different alleles in the pair of chromosomes)
- Dominant* allele: its chemical instructions are followed
- Recessive* allele: its chemical instructions are ignored
- Incomplete dominance*: one allele doesn't dominate the other completely

Sickle Cell Trait: An Example of Incomplete Dominance



2.1: Single Gene Inheritance

2.1 Genetic Disorders: Inherited disorders

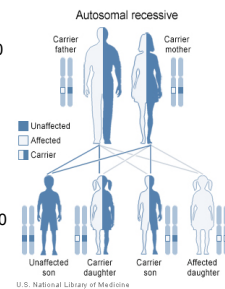
- Many disorders are triggered when a child inherits two recessive alleles
- Examples include cystic fibrosis, PKU, albinism, and Tay-sachs disease
- Most inherited disorders are very rare

2.1 Genetic Disorders: Inherited disorders

- Tay-sachs disease
 - No cure
 - Normal at birth
 - Deterioration of the central nervous system
 - Death by age 4
 - Absence of an enzyme called Hex A
 - > leads to build up of GM2 in the brain

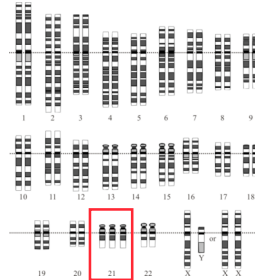
Disorder versus carrier

- Tay-sachs disease
 - European Jews: 1 in 3000 births have the disorder
- More people carry one of the alleles
 - European Jews: 1 in 30
 - Most non-Jewish Caucasians: 1 in 300
 - French-Canadians: 1 in 30
 - Irish: 1 in 41



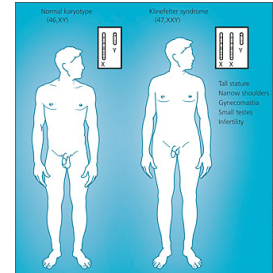
2.1 Genetic Disorders: Abnormal number of chromosomes

- Some people are born with too many, too few, or damaged chromosomes
- People with Down Syndrome usually have an extra 21st chromosome



2.1 Genetic Disorders: Abnormal number of chromosomes

- A number of disorders (e.g., Turner's Syndrome, Klinefelter's Syndrome, XYY complement, XXX Syndrome) are caused by missing or extra sex chromosomes



2.2 Heredity, Environment, and Development

Behavioral Genetics
Paths From Genes to Behavior

2.2 Behavioral Genetics

- We need to be careful to remember that what we identify as behavioral characteristics do not necessarily correspond directly to genetic behaviors
 - Genes deal with enzymes, proteins, and amino acids

2.2 Behavioral Genetics

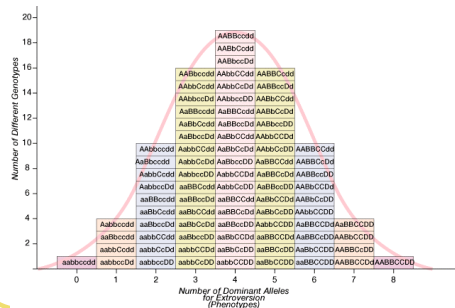
- Some genes exhibit *pleiotropy*
 - A single gene is often related to several different behaviors or traits
- Albinos lack pigment in their skin and have a high frequency of crossed eyes



2.2 Behavioral Genetics

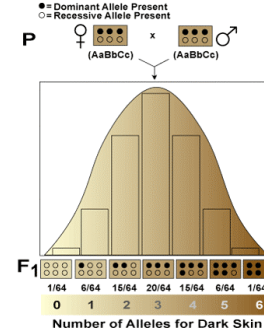
- Many behavioral genotypes reflect *polygenic inheritance*, which involves many genes
- This explains why there can be so many variations of a trait

An Example of Polygenic Inheritance



2.2: Behavioral Genetics

An Example of Polygenic Inheritance



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2.2: Behavioral Genetics

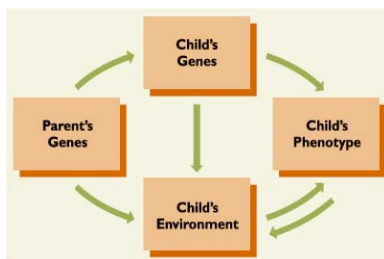
2.2 Behavioral Genetics

- Behavioral geneticists rely upon twin studies and adoption studies
- Cognitive abilities, psychological disorders, substance abuse, and personality are all affected by heredity

2.2 Paths From Genes to Behavior

- The behavioral consequences of genetic instructions depend on the environment in which those instructions develop
- Heredity and environment interact dynamically throughout development.
- Genes can influence the kind of environment to which a child is exposed
- Environmental influences typically make children within a family different.

The Relation Between Genes and Environment



2.2 Paths From Genes to Behavior

Next time

- Nature versus nurture
- Reaction range
- Families
- Social policy