

Psych 3102

Introduction to Behavior Genetics

LECTURE 1

INTRODUCTION

- Syllabus
- Homework
- Introduction to the course

What biology background do you have?

What do you know all ready?

Genetic testing

In vitro fertilization

Pre-implantation genetic diagnosis

Gene therapy

Most human disorders are caused by single-gene mutations?

Variation in all human behaviors is at least partly influenced by genes?

IQ personality psychopathology eating behavior addictions

- large effects of single genes? few genes? many genes?

Introduction

- Study of how genes influence behavior

- recent recognition

behavior genetics dates from ~1960 as distinct discipline

- individual differences within species

- **quantitative genetics**

- twin, family, adoption studies

- empirical knowledge

- genetic and environmental effects

- **molecular genetics**

- positional cloning of genes
- therapeutic uses

- **population genetics**

- allele frequencies, differences between populations
- evolutionary aspects

psychopathologies

cognitive disabilities

personality

- Recent developments
 - health psychology (behavioral medicine)
 - aging
 - evolutionary psychology



USE OF TWIN STUDIES

monozygotic identical twins share 100% genes

dizygotic fraternal twins share 50% genes

Why are twins so useful?

- differences between members of MZ twin pair due to unique (individual-specific, non-shared) environment only
- differences between members of DZ twin pair due to genes and environment
- similarities due to shared genes and shared environment

Other genetically identical populations:

clones

inbred lines (strains) rats mice fruit flies



Need measurements of differences and similarities between family members

- **variance** how variable the trait measurements are
- **covariance** how similar the variation is between 2 sets of variables (a measure of shared variance)
- **correlation** standardized measure of covariance
- **concordance** measure of shared phenotype between pairs of relatives

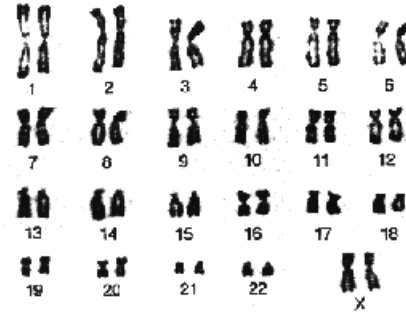
What have we got so far?

Alzheimer disease (AD)

- age-related decline, memory loss, confusion
- 1 in 5 who reach 80 years
- early-onset cases
 - runs in families
 - data suggests single gene(s)
 - genes found (ApoE gene on chromosome 14 first in 1992)
- late-onset cases (more common)
 - tendency in some families
 - MZ concordance 60%
 - DZ concordance 30%
 - predisposing genes found (increase risk only)

finding specific genes that increase risk has greatly increased knowledge of etiology of AD

Common causes of mental impairment



- Down syndrome (trisomy 21)
 - single most common genetic cause of mental retardation
- Fragile-X syndrome
 - second single most common genetic cause
- Microdeletions
 - recently-discovered common genetic causes of mental retardation

Disorders once thought to be environmentally-caused

- Schizophrenia

MZ twins 45% concordance

DZ twins 17% concordance

prevalence 1%

- Autism

MZ concordance 60%

DZ concordance 10%

prevalence 0.06% (DSMIV criteria for disorder, not spectrum)

Normal variation

Traits studied:

BMI, cognitive abilities, personality traits
school achievement, self-esteem, drug use

How might genes influence these traits?

Do genes influence development of these traits?

Does gene influence change over time?

How does the environment interact with genes to influence these traits?

nature/nurture debate
essays in late 1600's

raging since John Locke's