

# Psych 3102

## Introduction to Behavior Genetics

### Lecture 23

#### Genetics of personality

### Definitions of personality

- DSMIV - personality traits are enduring patterns of perceiving, relating to , and thinking about the environment and oneself
- behavior geneticists – personality traits are relatively enduring individual differences in behavior that are stable across time and across situations

- what causes these individual differences?
  - the situation the person is in? (environment)
  - the nature of the person themselves? (genetics)

or both?



**The four basic personality types**

## Aims of research

- are personality traits influenced by genes?
- what kinds of environmental effects are important?
  - family-rearing environment    parental behavior    discipline style
  - do these variables produce family similarities? (shared e)
  - or do they produce differences between family members? (non-shared e)
- are the influences the same in each sex?
  - sex-limitation    influences in males are different from in females
- how stable is personality over time and what influences any changes – genes and/or environment?
- do we use personality traits in choosing partners?
  - assortative mating    consistently choosing partners on the basis of similarity
- is there any correlation between different personality traits?
- is personality related to fitness?
- why do some people develop personality disorders?

## Measurement of personality

- have to be able to describe personality so that it can be measured
  - reduce it to a parsimonious set of traits/dimensions
  - still describe large part of variation present
  - cross-cultural set of measurements

## Main accounts of personality

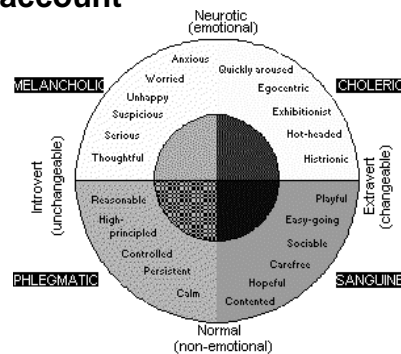
### 1. Eysenck's 3-dimensional account

extraversion (E)

neuroticism (N)

psychoticism (P)

E and N are most reliably  
measured  
most studied  
most heritable





### Clinical findings:

<u>Age 3</u>	<u>Age 15 and 26</u>
undercontrolled	increased risk of CD, ADD ASP 10%(3%prevalence) by age 26, 28% alcohol dependency risk (10%baseline) increased risk of criminality increased risk of partner violence 8% suicide risk (1% prevalence)
inhibited	30% affected by an anxiety disorder (1% prevalence) 5% suicide risk increased risk of depression with early onset, recurrence
well-adjusted	prevalence rate

### Animal studies on personality

- long history
  - Darwin: evidence for genetic influence from successful selective breeding of dogs for personality traits  
tastes habits temper courage
  - mice successfully bred for open field emotionality
- many species show individual differences in spite of very similar rearing environments (Bouchard & Loehlin review, 2001)
- genetic influence on personality traits indicated
- have human personality traits evolved from those found in other animals?
- have personality traits been subject to natural selection?

## Human studies

- large individual differences relative to other effects

sex differences previously viewed as large and important  
neuroticism agreeableness openness

for neuroticism: correlation of 0.14 between sex and trait  
2% of variance for neuroticism is predicted by sex  
61% of variance is stable over time  
so, individual differences play a role 30 times greater  
than sex differences

### Assortative mating

- measured by looking at spousal correlations for personality measures
- correlations are very modest, many are zero

mean correlation for 10 MPQ scales,  $n = 583$  0.13

spousal correlations for E and N = 0

largest correlations found for social attitudes and values  
antisocial personality

- having similar personality traits is not a reason for choice of partner

### Spousal correlations for MPQ scales

Scale	Spousal correlation	rMZ twins (reared apart)	$h^2$
well-being	-0.02	0.48	
social potency	-0.20	0.56	
achievement	-0.02	0.36	
social closeness	0.12	0.29	
stress reaction	-0.04	0.61	
alienation	0.54	0.48	
aggression	0.01	0.46	
control	0.05	0.50	
harm avoidance	0.06	0.49	
traditionalism	0.42	0.53	

### Genetic studies of personality in humans

First large influential study: Loehlin & Nichols (1976)

- 800 pairs of adolescent twins assessed for various personality traits

2 major conclusions:

1. almost all traits showed similar moderate heritability
2. non-shared environment accounted for almost all of the remaining variation (ie. very little shared environment)

see Table III in handout – broad heritabilities for Big Five factors, more recent studies

NEAD study – genetic, shared e and non-shared e components of variance for various measures

NEAD = Non-shared Environment and Adolescent Development

## Extraversion and neuroticism

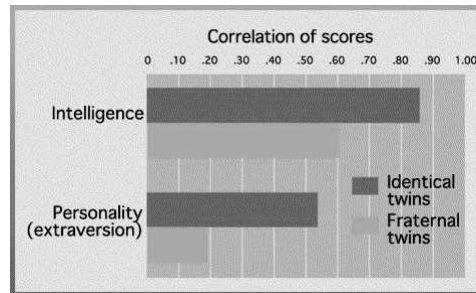
extraversion sociability, impulsiveness, liveliness

neuroticism emotional stability, moodiness, anxiousness, irritability

Most studied of all personality traits

Measured most often by use of Eysenck questionnaire and its variants

Look at handout – 5 large, recent twin studies carried out in 5 different countries, total sample size = 24,000 twin pairs



## Extraversion and neuroticism – summary of data from twin, family and adoption studies

Relationship	Correlation	
	Extraversion	Neuroticism
MZ raised together	0.51	0.46
DZ raised together	0.18	0.20
MZ raised apart	0.38	0.38
DZ raised apart	0.05	0.23
Parent/offspring	0.16	0.13
Adopted parent/offspring	0.01	0.05
Siblings	0.20	0.09
Adoptive siblings	-0.07	0.11
Genetic component	larger	smaller
Non-additive genes	present	absent
Shared environment	little	more?
Non-shared environment	large	large

Heritability estimates	E = 49%
	N = 41%
Non-shared environment	> 50%
Shared environment	< 10%

For other personality measures  $h^2 = 30 - 50\%$

Do self-report questionnaires inflate genetic component?

rating by peers: peer/peer consistency 63%  
peer/self consistency 55%

however, same genetic component seen from peer ratings  
rater bias : ratings by parents show contrast effects  
higher correlations for MZ twins  
lower correlations for DZ compared to ratings by self ,  
peers, observers

### Genes for personality traits

- genes involved with neurotransmitters make most promising candidates  
synthesis of neurotransmitters receptors transporters  
monoamines : dopamine serotonin norepinephrin

Animal models mice

emotionality (neuroticism): 3 loci, additive effects

aggression: knock-out gene method: nitric oxide synthase  
serotonin receptor(5-HTR)

Humans

novelty-seeking: replicated marker studies

dopamine receptor (DRD4) - longer repeat allele increases level of  
novelty-seeking (10% of heritable variance, 4% of total variance for trait)

harm-avoidance: several QTLs, 38% of trait variance

anxiety: replicated QTL studies

serotonin transporter (5-HTT) reduced re-uptake increases level of  
anxiety

anti-social personality: MAOA/maltreatment G x E interaction