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 largely 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?

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

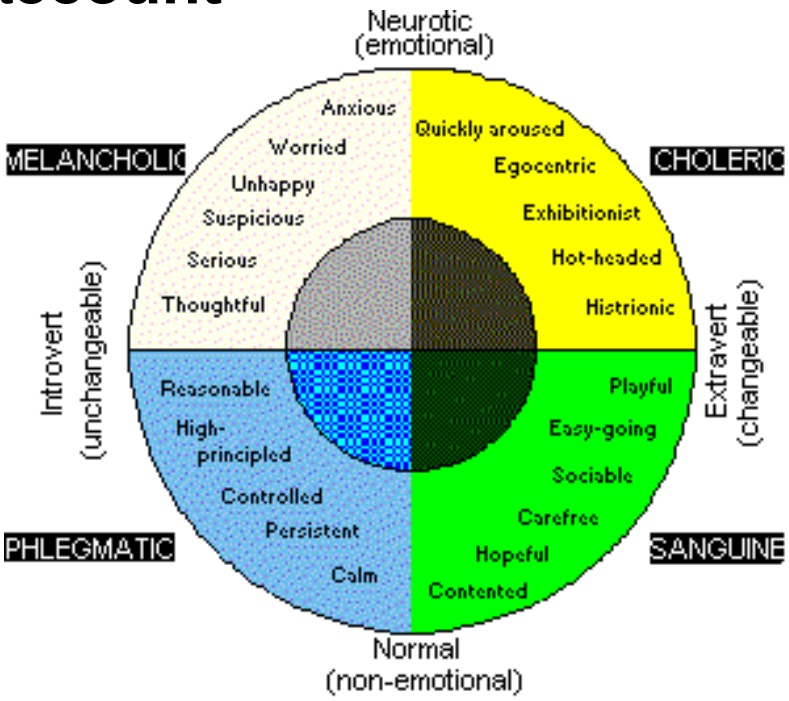
Main accounts of personality

1. Eysenck's 3-dimensional account

extraversion (E)

neuroticism (N)

psychoticism (P)



E and N are most reliably measured

most studied

most heritable

2. Five-factor model

extraversion neuroticism agreeableness conscientiousness openness to experience

- 'universal' replicated in over 50 cultures

- independent traits, little or no correlation between traits
- based on convenience of description, not on distinct biology
- heritabilities, based on twin studies, in range 0.3 – 0.5
- most of rest of variation = e^2 little evidence for c^2

3. Tellegen's Multidimensional Personality Questionnaire

- hierarchical organization

  assumes some sharing of influences (correlation between traits)

4. Cloninger's 7-dimensional account

- based on neurobiological data

  each dimension maps to specific brain network

- each dimension has distinct genetic variance

  specific and different genes influence each dimension

Development of personality

- how stable is personality over the course of development?
- is early temperament predictive of later personality?
- can early measurements of temperament predict risks for psychopathology is later life?

Caspi (2001)

-longitudinal study, all children born in Dunedin, NZ, 1972 to current

- 90 minute interview at age 3:

Temperament of each child classified as one of 5 types:

undercontrolled (impulsive, negative affect)

inhibited (extremely shy) confident (no negative affect)

reserved (introverted, not as shy) well-adjusted

- all interviewed again as adolescents (age 15) and adults (age 26)
- ratings for MPQ and 5-factor scale obtained

Age 3	Age 15 and 26
undercontrolled	higher for negative emotionality and neuroticism
	lower for constraint
inhibited	higher for constraint
	lower for positive emotionality, extraversion
well-adjusted	average on all scores

Clinical findings:

Age 3	Age 15 and 26
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 except for social attitudes, antisocial behavior

Spousal correlations for MPQ scales

Scale	Spousal correlation	rMZ twins (reared apart)	
well-being	-0.02	0.48	h^2
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 heritablility
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

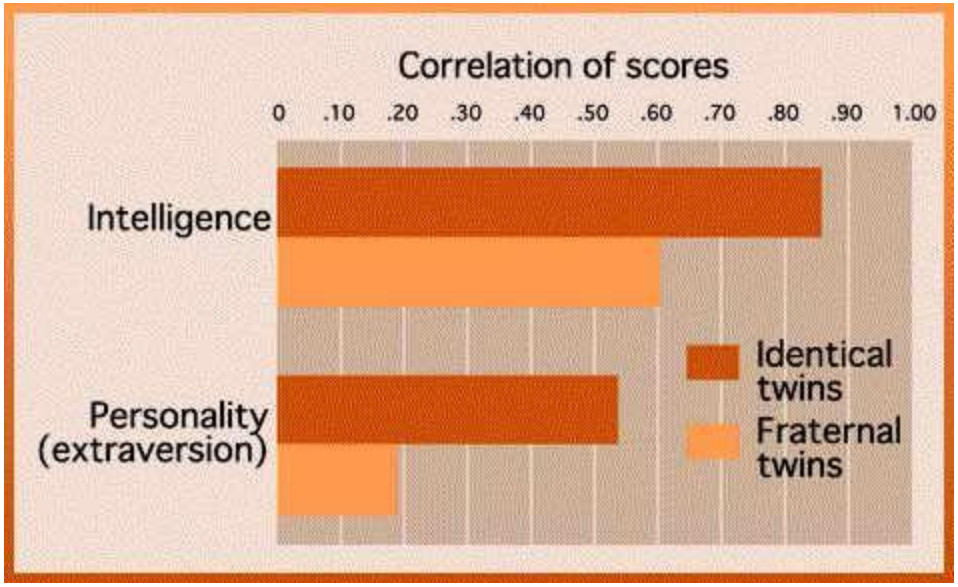
extraversion sociability, impulsiveness, liveliness

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
Adoptive 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): several loci, additive effects

aggression: knock-out gene method: nitric oxide synthase

serotonin receptor(5-HTR)

Humans

no individual genes identified for certain

possible associations: DRD4 novelty-seeking, 5HTTLPR neuroticism

genetically informative collections of SNPs have been identified:

using collections of SNPs identified as possibly being associated with the 5 factor model traits, molecular personality scales were developed that correlated with the 4 of the 5 traits (not E)

McCrae et al 2010