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?
**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. Goldberg’s “Big 5”
extraversion    neuroticism    agreeableness    conscientiousness
openness to experience
- 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 in 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

<table>
<thead>
<tr>
<th>Age 3</th>
<th>Age 15 and 26</th>
</tr>
</thead>
<tbody>
<tr>
<td>undercontrolled</td>
<td>higher for negative emotionality and neuroticism</td>
</tr>
<tr>
<td>inhibited</td>
<td>lower for constraint</td>
</tr>
<tr>
<td>well-adjusted</td>
<td>higher for constraint</td>
</tr>
<tr>
<td></td>
<td>lower for positive emotionality, extraversion</td>
</tr>
<tr>
<td></td>
<td>average on all scores</td>
</tr>
</tbody>
</table>
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
Spousal correlations for MPQ scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Spousal correlation</th>
<th>rMZ twins (reared apart)</th>
</tr>
</thead>
<tbody>
<tr>
<td>well-being</td>
<td>-0.02</td>
<td>0.48</td>
</tr>
<tr>
<td>social potency</td>
<td>-0.20</td>
<td>0.56</td>
</tr>
<tr>
<td>achievement</td>
<td>-0.02</td>
<td>0.36</td>
</tr>
<tr>
<td>social closeness</td>
<td>0.12</td>
<td>0.29</td>
</tr>
<tr>
<td>stress reaction</td>
<td>-0.04</td>
<td>0.61</td>
</tr>
<tr>
<td>alienation</td>
<td>0.54</td>
<td>0.48</td>
</tr>
<tr>
<td>aggression</td>
<td>0.01</td>
<td>0.46</td>
</tr>
<tr>
<td>control</td>
<td>0.05</td>
<td>0.50</td>
</tr>
<tr>
<td>harm avoidance</td>
<td>0.06</td>
<td>0.49</td>
</tr>
<tr>
<td>traditionalism</td>
<td>0.42</td>
<td>0.53</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Extraversion</th>
<th>Neuroticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>MZ raised together</td>
<td>0.51</td>
<td>0.46</td>
</tr>
<tr>
<td>DZ raised together</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>MZ raised apart</td>
<td>0.38</td>
<td>0.38</td>
</tr>
<tr>
<td>DZ raised apart</td>
<td>0.05</td>
<td>0.23</td>
</tr>
<tr>
<td>Parent/offspring</td>
<td>0.16</td>
<td>0.13</td>
</tr>
<tr>
<td>Adopted parent/offspring</td>
<td>0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>Siblings</td>
<td>0.20</td>
<td>0.09</td>
</tr>
<tr>
<td>Adoptive siblings</td>
<td>-0.07</td>
<td>0.11</td>
</tr>
</tbody>
</table>

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