Domains of individual differences

Intellectual and non intellectual differences

Identifying personality structure

Is it possible to reduce the broad range of individual variation in personality to a limited number of personality traits?

Trait: A particular feature of mind or character; a distinguishing quality; a characteristic; spec. of a culture or social group (OED)

The pronunciation tr *e*i, after mod. French , in the 19th c. considered in England the correct one, is becoming less general; in U.S. tr *e*it is the established one (OED)

Definition of the relevant domain

- Individual differences in personality
  - Personality traits vs. abilities?
  - Traditional personality traits are central tendencies and preferences rather than limits
  - What do you do vs. what can you do

Descriptive Approaches to Personality

- Derived from three approaches to taxonomy construction
  - **Folk Theories**: How ordinary people think about personality – constrained to types and typologies; categorical, not dimensional
  - **Constructive** approach: How verbal **descriptions** of feelings and actions covary; leading to trait dimensions – constrained by interests and ingenuity of investigators
  - **Analytic** approaches : How endorsements of **words** covary, leading to trait dimensions – constrained by the language
- All seek to provide a characterization of kinds of people (a flatterer, extravert, etc.); all are only a first approximation for what a person will do (next)

***

Theophrastus' Folk Theory

The talker	The anxious to please	The hostile man
The chatterer	The toady or the flatterer	The shameless man
The boaster	The coward	The distrustful man
The inventor of news	The superstitious man	The slanderer
The ironical man	The feckless	The skinflint or stingy man
The boor	The tiresome man	The mean man
The arrogant man	The outcast	The avaricious man

Early theoretical taxonomies

- Plato and the requirement for leadership

" ... quick intelligence, memory, sagacity, cleverness, and similar qualities, do not often grow together, and ... persons who possess them and are at the same time high-spirited and magnanimous are not so constituted by nature as to live in an orderly and peaceful and settled manner; they are driven any way by their impulses, and all solid principle goes out of them. ... On the other hand, those stable and steadfast and, it seems, more trustworthy natures, which in a battle are impregnable to fear and immovable, are equally immovable when there is anything to be learned; they are always in a torpid state, and are apt to yawn and go to sleep over any intellectual toil."

Early taxonomies

- Galen (and Hippocrates): "Blood,phlegm, yellow bile and black bile are the particular elements of the nature of man".
- the sanguine, bouyant type; the phlegmatic, sluggish type; the choleric, quick-tempered type; and the melancholic, dejected type

19th Century Taxonomy: Wundt's dimensional structure

<table>
<tr><td colspan="2">Excitable</td><td></td></tr>
<tr><td>Melancholic</td><td>Choleric</td><td rowspan="2">Changeable</td></tr>
<tr><td>Phlegmatic</td><td>Sanguine</td></tr>
</table>

Melancholic

Choleric

Phlegmatic

Sanguine

19th and early 20th century taxonomies

- Freud:
  - Interaction of character and childrearing
- Jung:
  - Orientations and functioning
- McDougall domains of personality

Freud's taxonomy

- Oral
  - Indulgent: oral erotic -- oral passive optimistic, gullible, dependent, manipulative
  - Restrictive: oral sadistic, oral aggressive pessimistic, suspicious, quarrelsome
- Anal
  - Indulgent: anal retentive, anal compulsive stingy, stubborn, punctual, precise, orderly
  - Restrictive: anal aggressive, anal expulsive cruel, destructive, hostile, disorderly
- Phallic
  - Indulgent: phallic-dominant vain, proud, domineering, ambitious, virile
  - Restrictive: phallic-submissive meek, submissive, modest, timid, feminine

Jung

- Orientations:
  - Introverted Extraverted
- Psychological Functioning
  - Thinking/Feeling
  - Judging/Perceiving
  - Sensing/ Intuiting
- (current application- MBTI)

McDougall

- Intellect
- Character
- Temperament
- Disposition
- Temper

Constructive Approach (Rational scale construction)

- Propensities to particular behaviors are captured by verbal descriptions
- Researchers construct items with a view to capturing/predicting phenomena of interest
- Empirical application of item responses to solve specific prediction problems

***

Representative Items
(constructive approach)

Do you like to go to lively parties?

Do you do and say things without stopping to think?

Would you call yourself a nervous person?

Do you like to go to the opera?

***

Analytic Approach (1950 – 1960s)

- Based on factor analysis of endorsement patterns of **words** (e.g., Allport, Cattell, Norman, Goldberg)

- Earliest systematic analyses were Cattell's
  - 18,000 English words intuitively grouped into ≈ 45 pairs of categories or "trait complexes" eventually reduced to 12-14 primary dimensions

- Most ambitious attempt: Warren Norman (1967)
  - selected a subset of about 2,800 from 40,000 English words representing variations between persons or within individuals over time and varying situations . . . encoded in the language

***

The lexical hypothesis

- based on the following rationale: Because they are so socially meaningful, personality attributes tend to acquire lexical representation, and degree of lexical representation is one guide to the importance of a personality dimension. Presumably, those dimensions that are most fundamental will be ubiquitous, and therefore can be derived independently from studies of any language.
  - (Saucier)

Lexical Hypothesis: Allport

- trait terms selected from unabridged dictionary
- 18,000 Allport-Odbert word lists
  - stable traits
  - fluctuating states

Lexical Hypothesis: Cattell

selected words from Allport 4,504

grouped by semantic meaning 171

formed intuitive clusters 36-46

factored rating scales 12-14

Subjects: Univ. Illinois fraternity members

early use of factor analysis formed personality instruments 14-16 self report scales

Representative Trait Complexes

(from Cattell, 1957)

1. *Adaptable*: flexible; accepts changes of plan easily; satisfied with compromises; is not upset, surprised, baffled, or irritated if things are different from what he expected	V s	*Rigid*: insists that things be done the way he has always done them; does not adapt his habits and ways of thinking to those of the group; nonplussed if his routine is upset
2. *Emotional*: excitable; cries a lot (children), laughs a lot, shows affection, anger, all emotions, to excess	V s	*Calm*: stable; shows few signs of emotional excitement of any kind; remains calm, even underreacts, in dispute, danger, social hilarity
3. *Conscientious*: honest; knows what is right and generally does not tell lies or attempt to deceive others; respects others' property	V s	*Unconscientious*: somewhat unscrupulous; not too careful about standards of right and wrong where personal desires are concerned; tells lies and is given to little deceits; does not respect others' property
4. *Conventional*: conforms to accepted standards, ways of acting, thinking, dressing, etc.; does the "proper" thing; seems distressed if he finds he is being different	V s	*Unconventional, Eccentric*: acts differently from others; not concerned about wearing the same clothes as others; has somewhat eccentric interests, attitudes, and ways of behaving; goes his own rather peculiar way

Reanalyses and extensions of Cattell

- Fiske, 1948 - 5 factors
- Tupes and Christal (1958) 5 factors of peer ratings
- Norman (1963) 5 Factors of peer ratings: The "Big 5"
  - 1. Surgency/Extraversion
  - 2. Agreeableness
  - 3. Conscientiousness
  - 4. Emotional Stability versus Emotionality
  - 5. Culture/Openness
- Digman (1985) 5 factors of ratings (teachers + peers)

Five Domains of Personality (1980s-1990s)

Analyses and meta-analyses of constructive and analytic approaches converged on five domains (Costa & McCrae, 1989; Goldberg,1981; John, 1990)

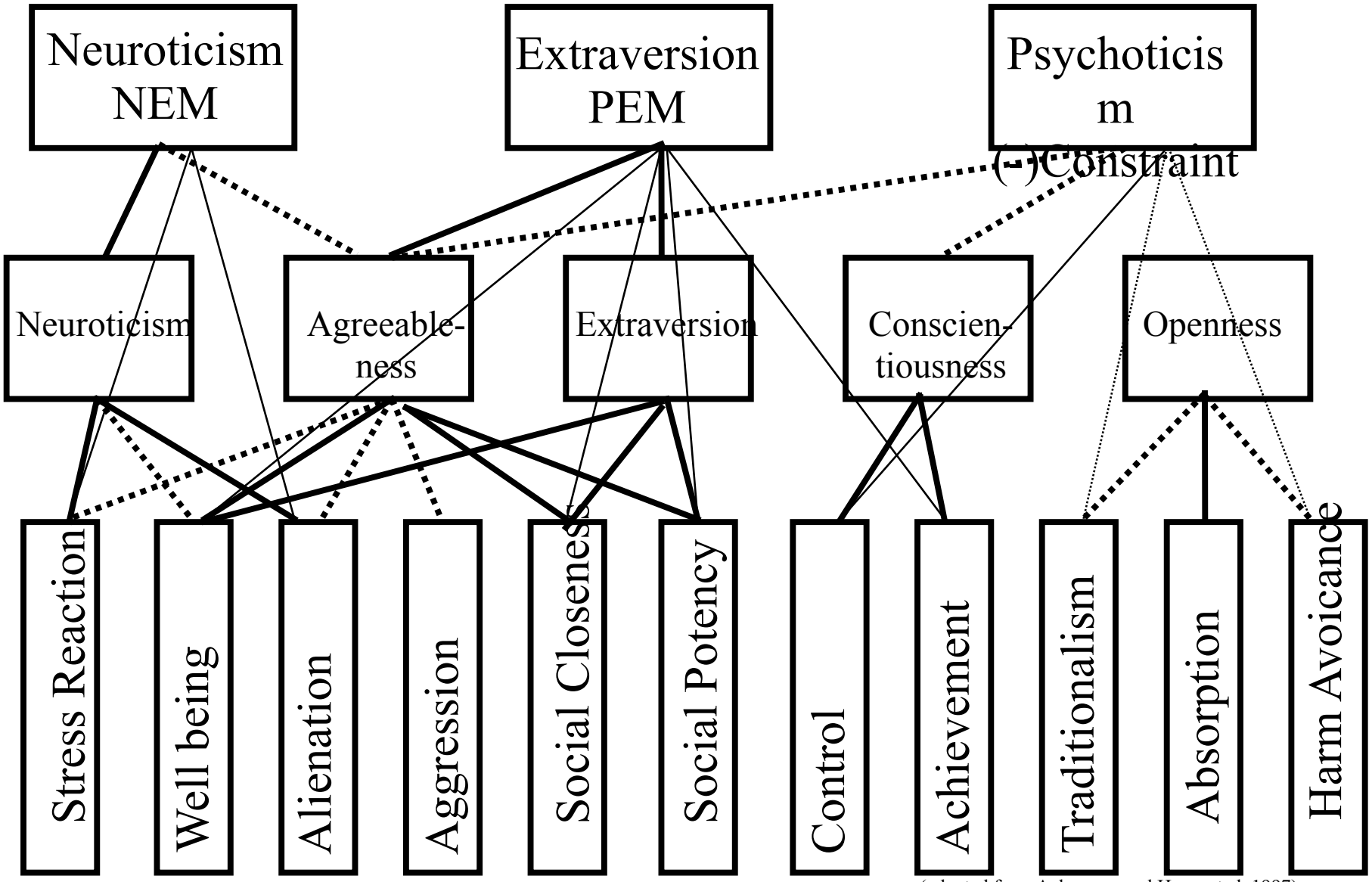
technical domain name	**colloquial domain name**
Extraversion (surgency)	Power
Agreeableness	Affection
Conscientiousness	Work
Neuroticism	Emotionality
Openness	Intellect

***

Representative Trait Words by Domain

extraversion	agreeableness	conscientious	neuroticism	openness
talkative	sympathetic	organized	tense	wide interests
assertive	kind	thorough	anxious	imaginative
active	appreciative	planful	nervous	intelligent
energetic	affectionate	efficient	moody	original
-quiet	-cold	-careless	-stable	-commonplace
-reserved	-unfriendly	-disorderly	-calm	-simple
-shy	-quarrelsome	-frivolous	-contented	-shallow
-silent	-hard-headed	-irresponsible	-unemotional	-unintelligent

The Giant 3, Big 5, Small 11

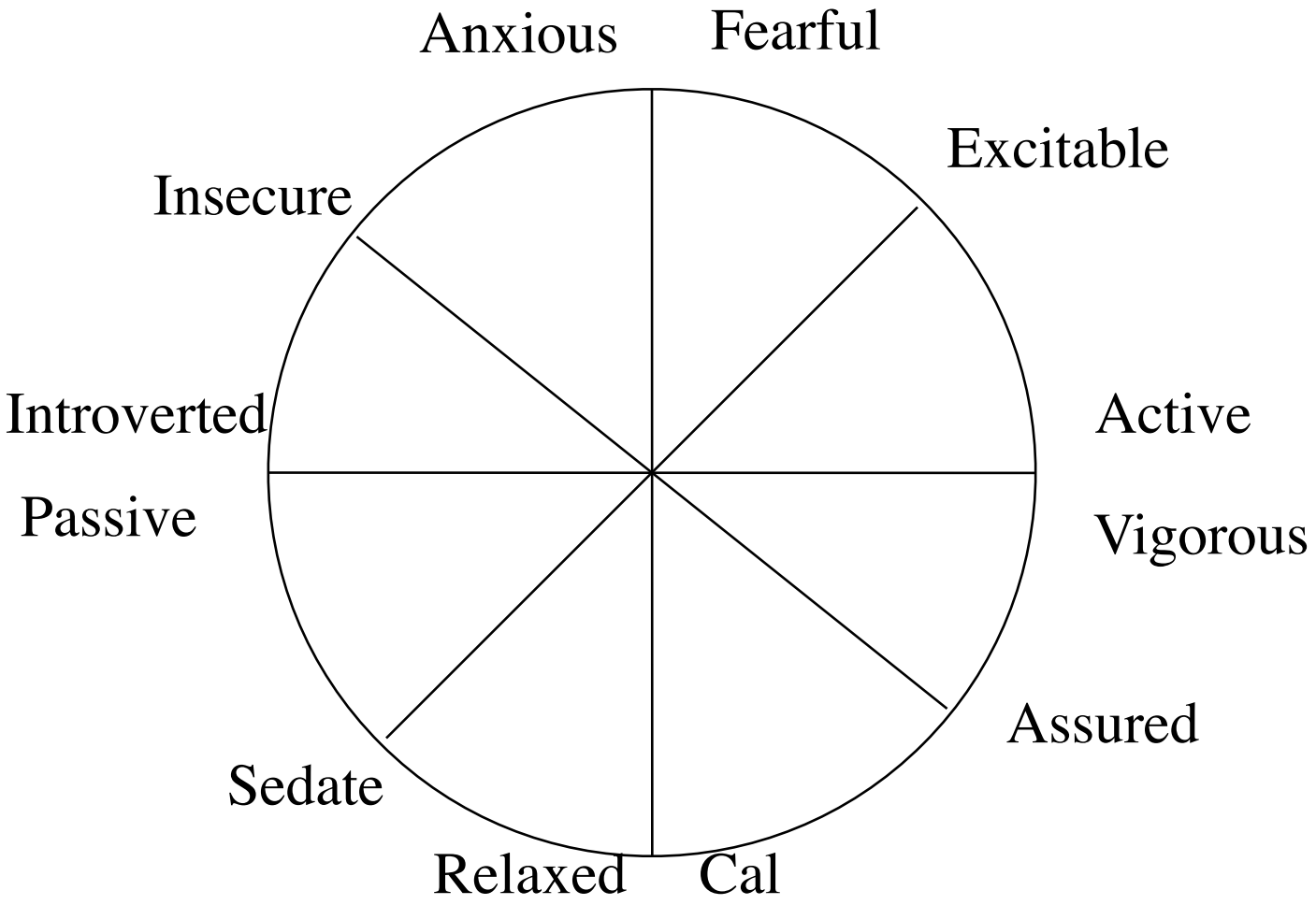


(adapted from Ackerman and Heggestad, 1997)

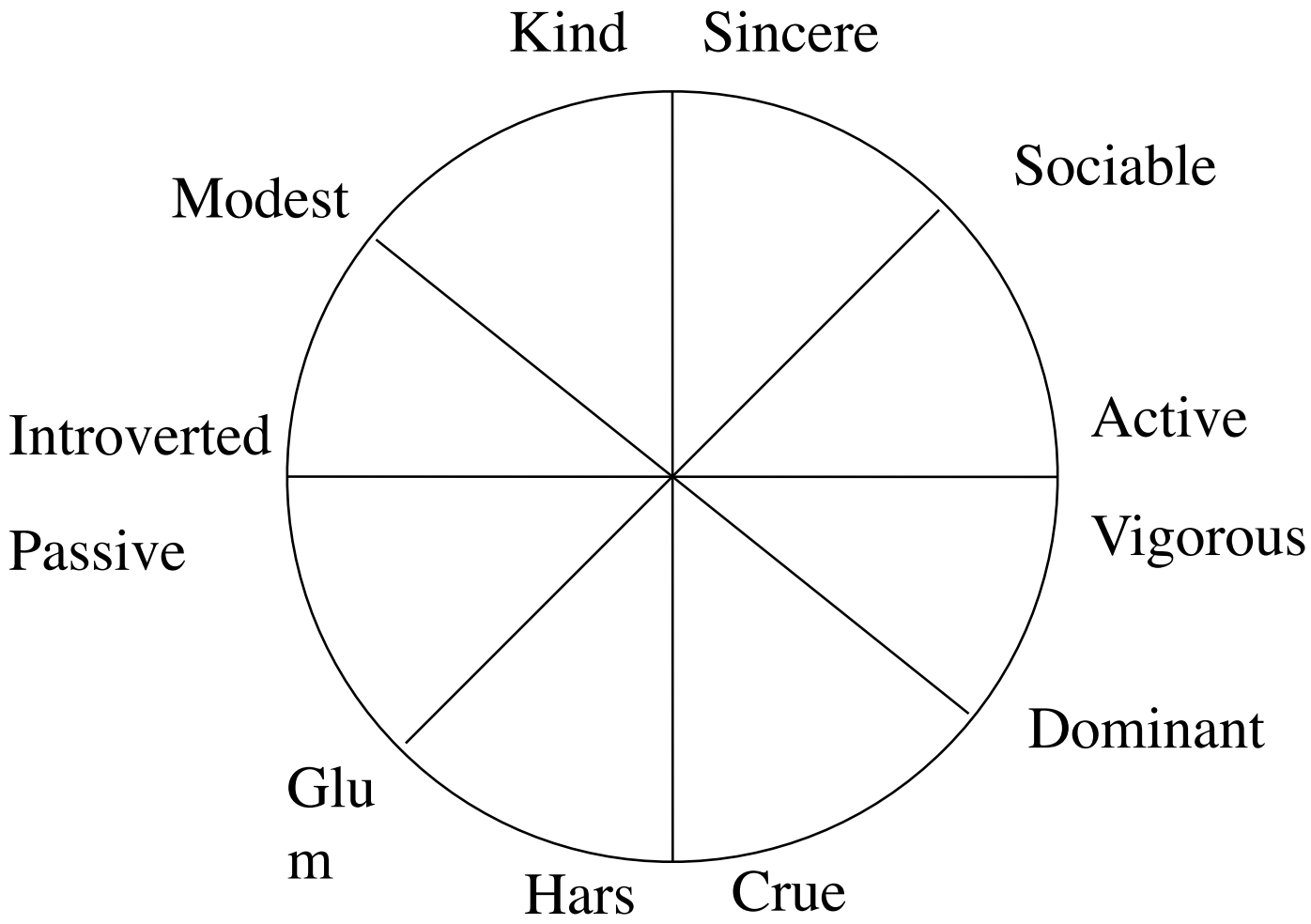
Circumplex of Big 5 dimensions (Abridged Big 5 Circumplex)

- Pair wise ordering of dimensions
  - Agreeableness x Extraversion (interpersonal circumplex of Wiggins)
  - Neuroticism x Extraversion (affective circumplex)
  - Neuroticism x Conscientiousness (the personality disorders?)
  - Agreeableness x Conscientiousness (psychoticism?)
- Comparisons of Self/Other and Positive/Negative Affect

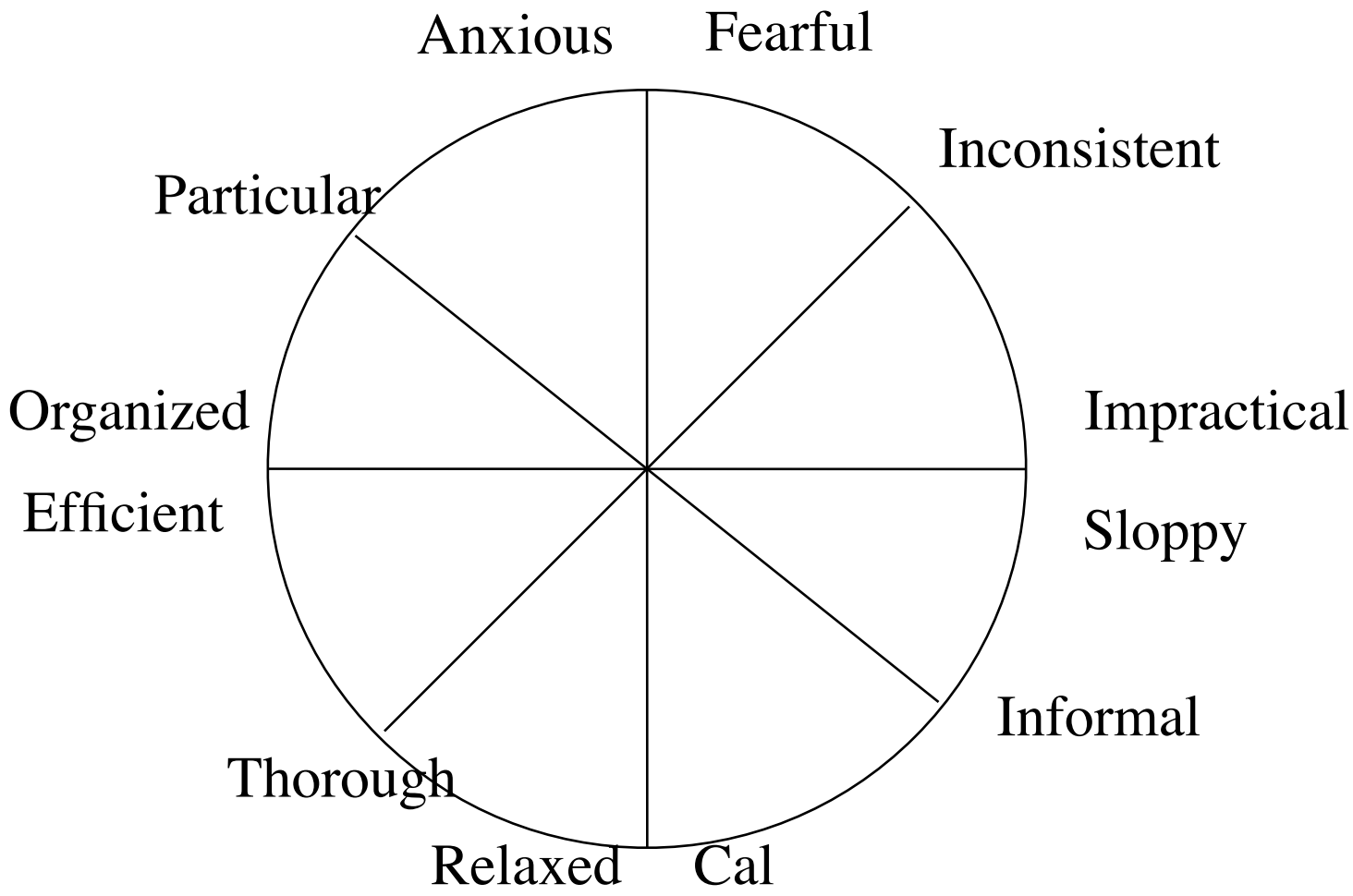
Neuroticism x Extraversion Affective Circumplex (S^+/S^-)



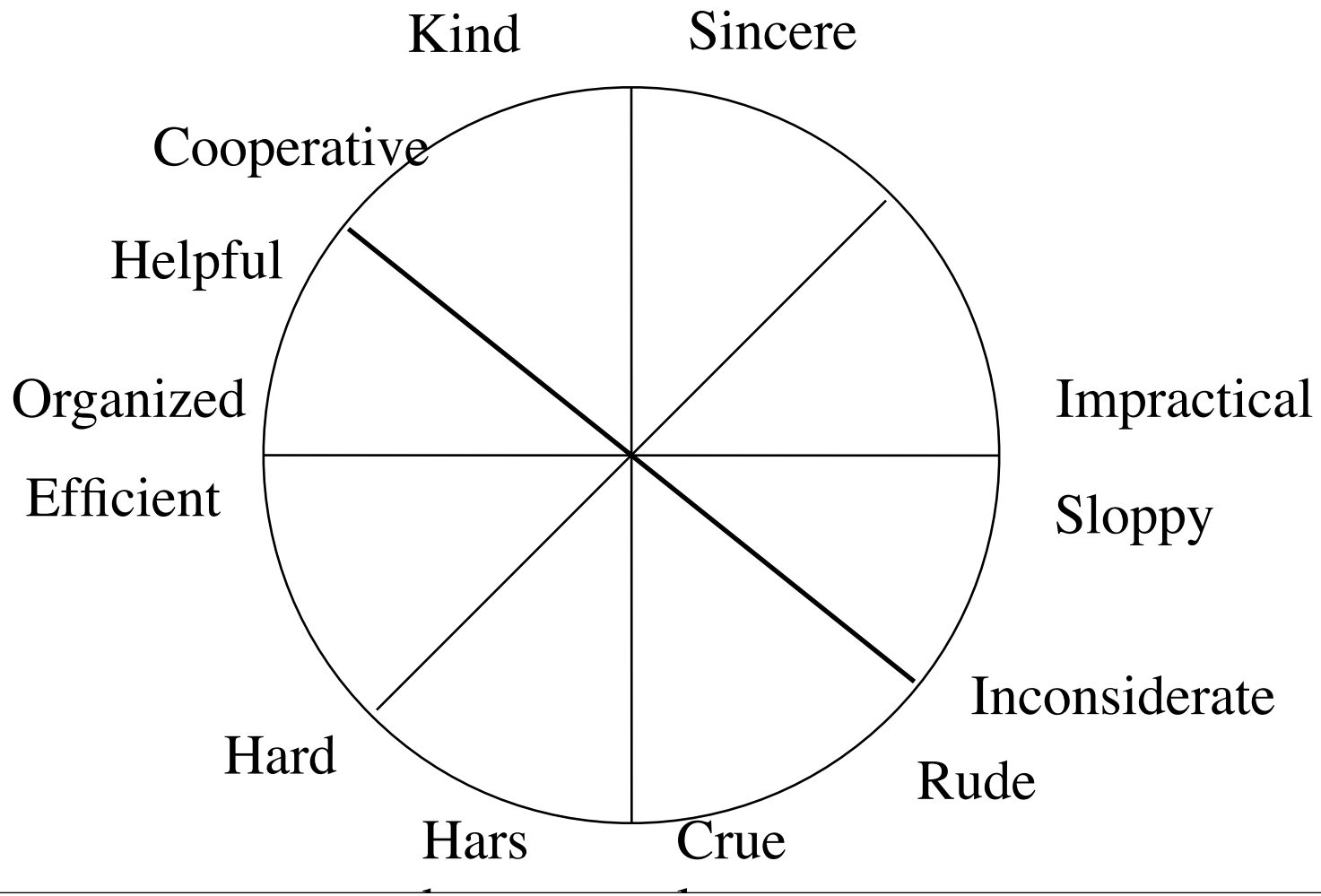
Agreeableness x Extraversion Interpersonal Circumplex (S^+/O^+)



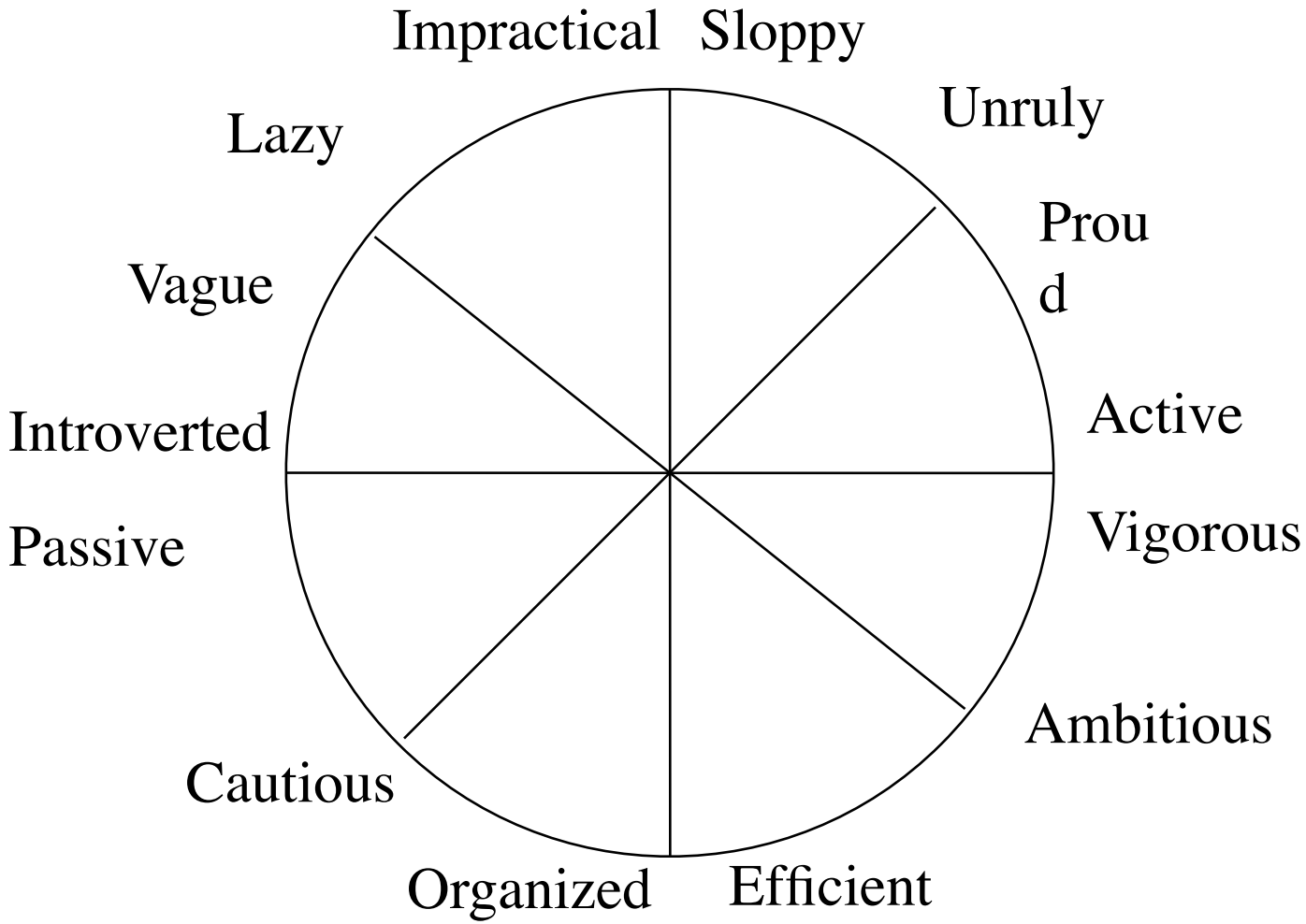
Neuroticism x Conscientiousness (S^-/O^-) : The personality Disorders?



Agreeableness x Conscientiousness (O^+/O^-): Eysenck's P scale = O^+ vs. O^-)?



Conscientiousness x Extraversion Circumplex (S^{+}/O^{-})



But is Big 5 structure of what people say, not what people do

- Is this the psychology of the stranger?
- Is it merely dimensions of semantic lexicon
- Are personality traits mere delusions?
- (The need for validity studies)

Passini and Norman

- Structure of strangers
  - Undergraduates rating other (unknown) undergraduates on 20 paragraph descriptors
  - Big 5 structure emerges
  - Is the structure of personality traits merely the structure of the lexicon, not of people?
- See also Mulaik structure of ratings of adjectives

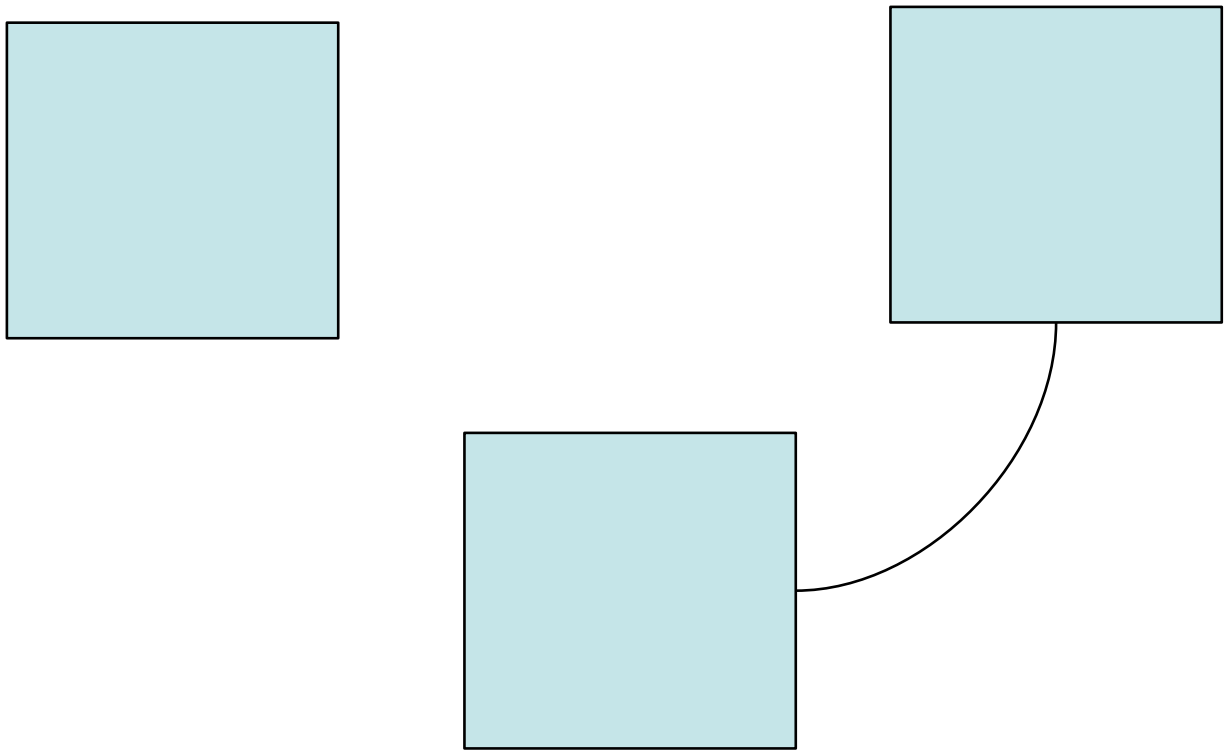
Shweder and D'Andrande (1980)

- Method:
  - ratings taken of behavior at time it occurs ("on line")
  - ratings done from memory semantic
  - judgments of similarity of trait words
- Analysis
  - Compare(correlate) the correlation matrices from the three procedures

Comparisons of Correlational Structures

On line ratings

Memory based ratings



Semantic similarity ratings

Shweder and D'Andrande

- Results
  - structure of "on line measures" not the same as memory based
  - structure of memory based equivalent to semantic structure
- Implication: structure of personality ratings is in mind of beholder, not in the behavior of target
- But: "on line" measures were forced choice!

Romer and Revelle (1984)

- Conceptual replication of Shweder's "on line ratings”
- Varied "on line ratings"
  - forced choice (ala Shweder)
    - which trait does this behavior represent

  complete rating of all traits

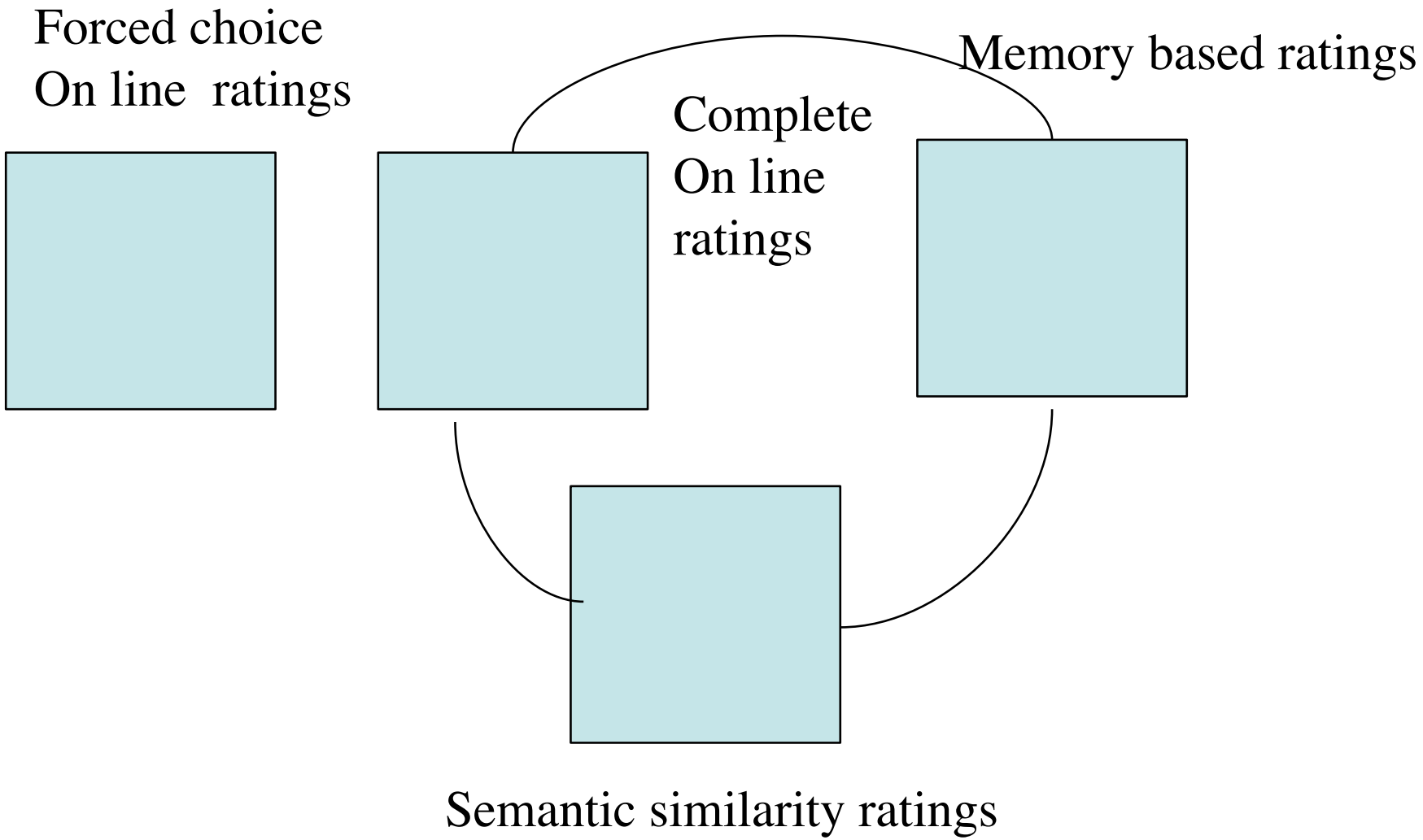
  how X is this behavior Y?

structure of "on line ratings" depends upon method

forced choice categories do not correlate

on line ratings of traits match memory based

Comparisons of Structures



Norman and Goldberg (1966) Construct validity of structure

- Comparison of interrater agreement as rater-ratee interaction increases
- Levels of interaction
  - Unknown (empty chair- Monte Carlo simulation)
  - Minimal acquaintance (Passini and Norman)
  - ROTC members
  - Fraternity juniors and Seniors
  - Peace Corp Trainees
- Structures remain the same across groups, but interrater agreement increases

Self and Peer ratings

- Observability of traits
  - Some traits more open to others
    - Extraversion, Agreeableness
  - Some less open
    - Emotional stability
    - Conscientiousness

Additional construct validity studies

- If traits have basis in behavior of targets, not in the eye of the beholder, then they should show trans-situational consistency
- Consistency over long period of time
- Consistency across situations
- Consistency across degree of genetic relationship

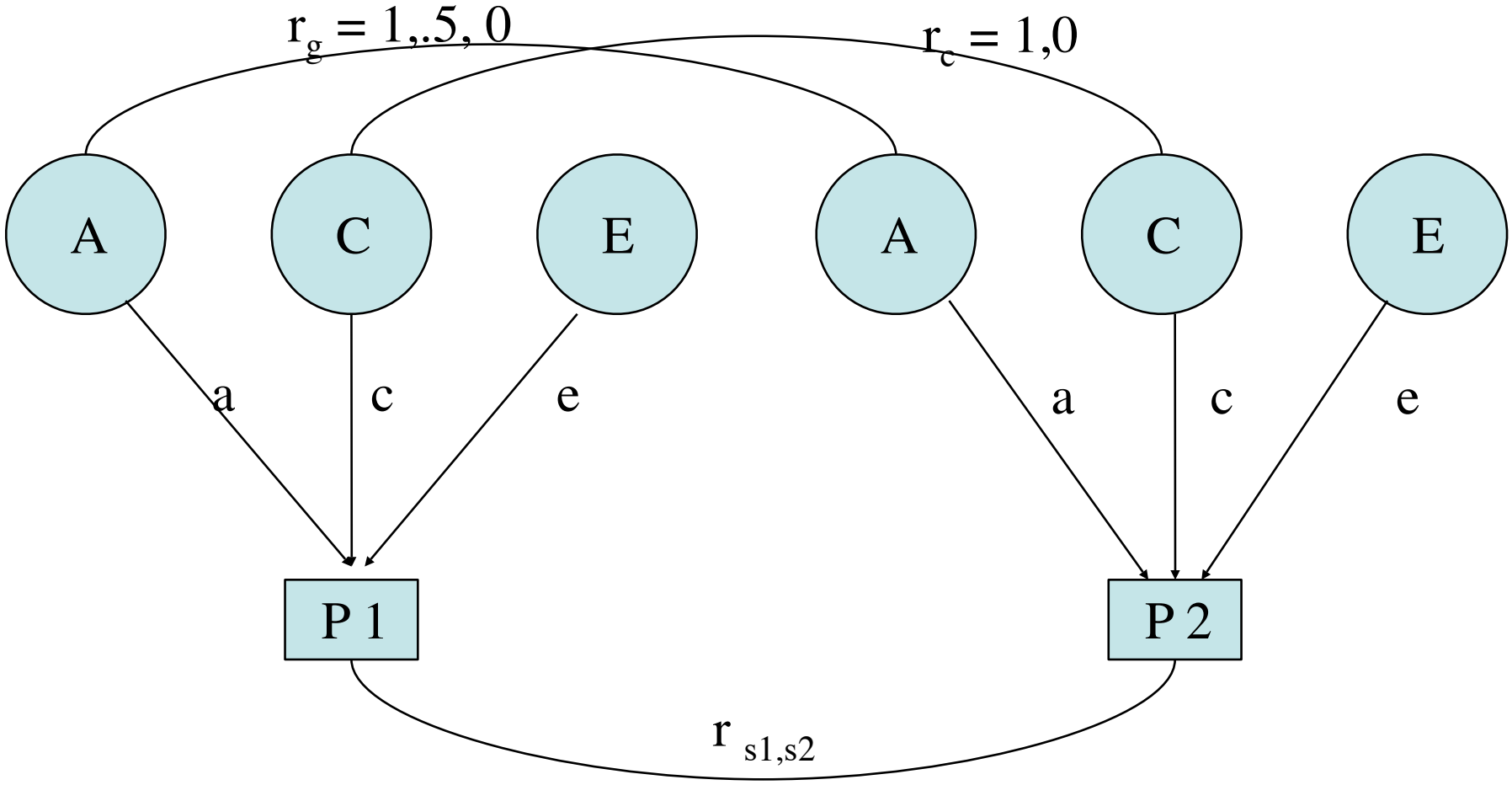
Descriptive vs. Causal Structure

- Descriptive: the Big 5
- Integration of causal theories of
  - Affect
  - Cognition
  - Desires/Goals
  - Behavior

Estimating the genetics of personality

- Structural equation modeling applied to phenotypic correlations with known genetic pathways.
- Estimate both measurement model as well as strength of pathways

Estimating the Genetics of Personality



A = additive genetic variance
C = Common family environment
E = Unique environment

r_g = 1 for MZ, .5 for DZ, sibs

r_c = 1 for together, 0

Personality and Genetics

Trait	Narrow heritability	Broad heritability	Shared Environment
Extraversion	.36	.49	.00
Neuroticism	.28	.39	.09
Agreeableness	.28	.38	.04
Conscientiousness	.31	.41	.05
Openness	.46	.45	.05
IQ	.50	.75	.04

McGue and Bouchard, ARN, 1998

Personality and Genetics

Occupational interest	Narrow heritability	Broad heritability[a]	Shared Environment
Realistic	.36	.41	.12
Investigative	.36	.66	.10
Artistic	.39	.50	.12
Social	.38	.52	.08
Enterprising	.31	.50	.11
Conventional	.38	.38	.11

[a] estimated from MZ apart correlation

McGue and Bouchard, ARN, 1998

Personality and Genetics

Psychiatric illness	Broad heritability	Shared Environment
Schizophrenia	.80	No
Major Depression	.37	No
Panic disorder	.30-.40	No
Generalized Anx	.30	Small, females
Phobias	.2-.4	No
Alcoholism	.50-.60	Yes

Bouchard, CDPS, 2004

Personality and Genetics

Social Attitudes	Broad heritability	Shared Environment
Conservatism		
Under age 20	0	Yes
Over age 20	.45-.65	Yes, females
Right Wing Auth	.50-.64	.0-.16
Religiousness (adult)	.30-.45	.2-.4
Specific religion	0	NA

Bouchard, CDPS, 2004

Heritability: misconceptions

- High heritability => Constancy: but
  - Heritability changes by changing the environment
  - Reducing environmental variation increases the heritability
    - Herrnstein's paradox: higher heritabilities imply more equal environments
    - Low heritability => high environmental inequality

Cognitive and non-cognitive aspects of personality

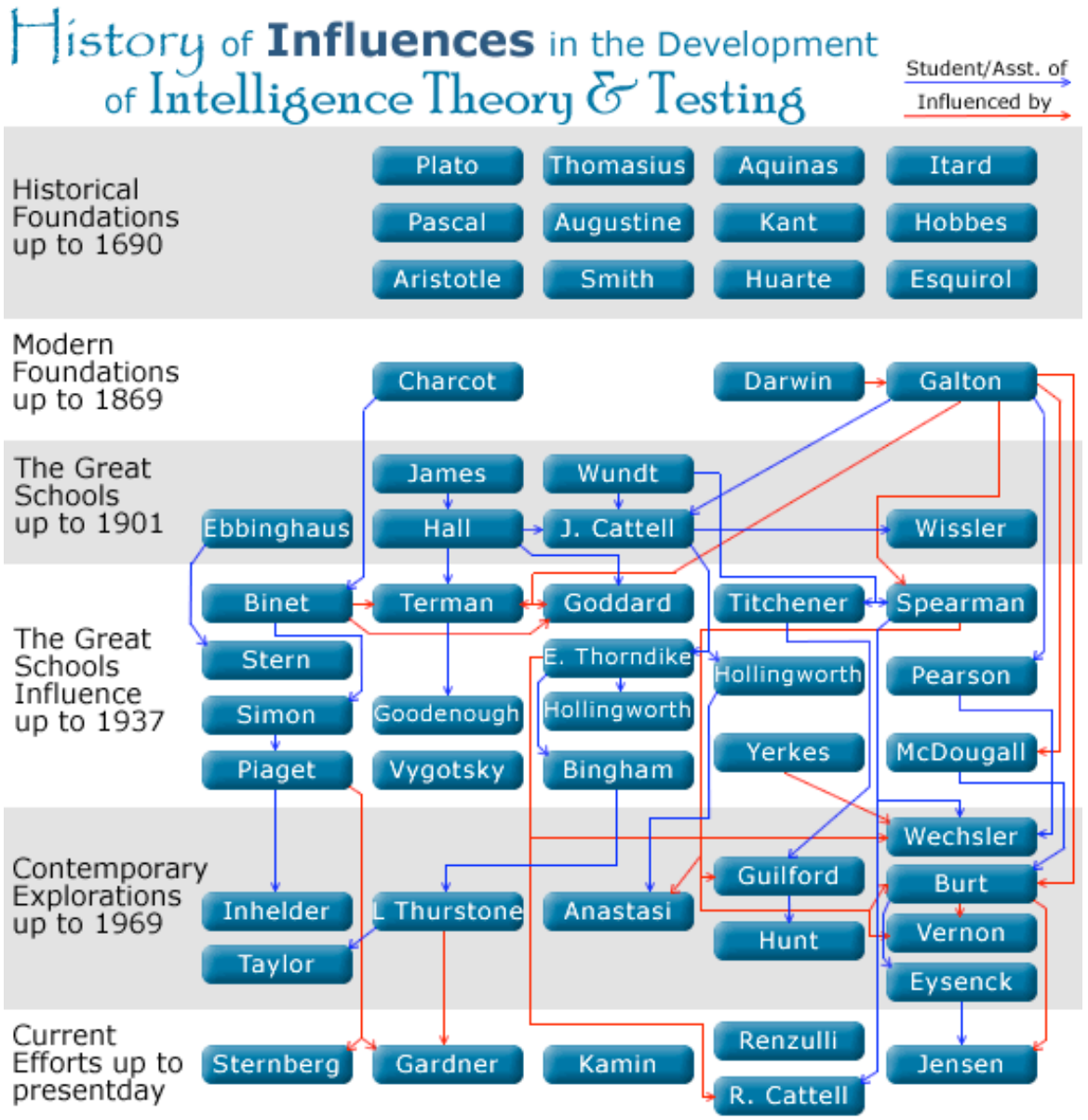
- Traditional personality variables are central tendencies of behavior: what do you like to do, how do you normally feel
- Cognitive Ability measures are limit measures: how much can you do, what are the limits of performance

Studies of Cognitive Skill

- Individual Differences approach to the study of intelligence
- Experimental/Cognitive Psychology approach to the study of task components

Cognitive Ability and Cognitive Psychology

- Ability studies emphasize individual differences and shared variance between divergent tests
  - Little emphasis upon cognitive processes
- Traditional cognitive psychology emphasizes development of processes and distinctions between processes
  - Little emphasis upon individual differences

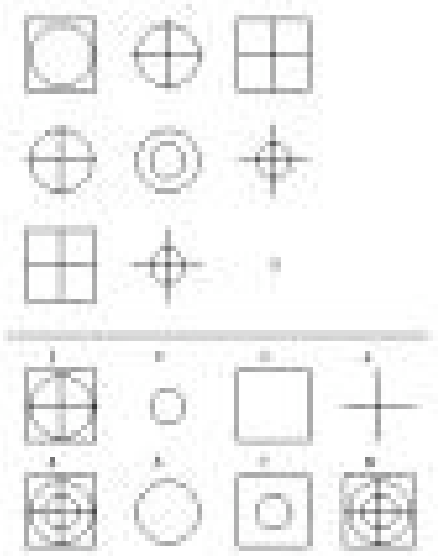


http://www.indiana.edu/~intell/map.shtml

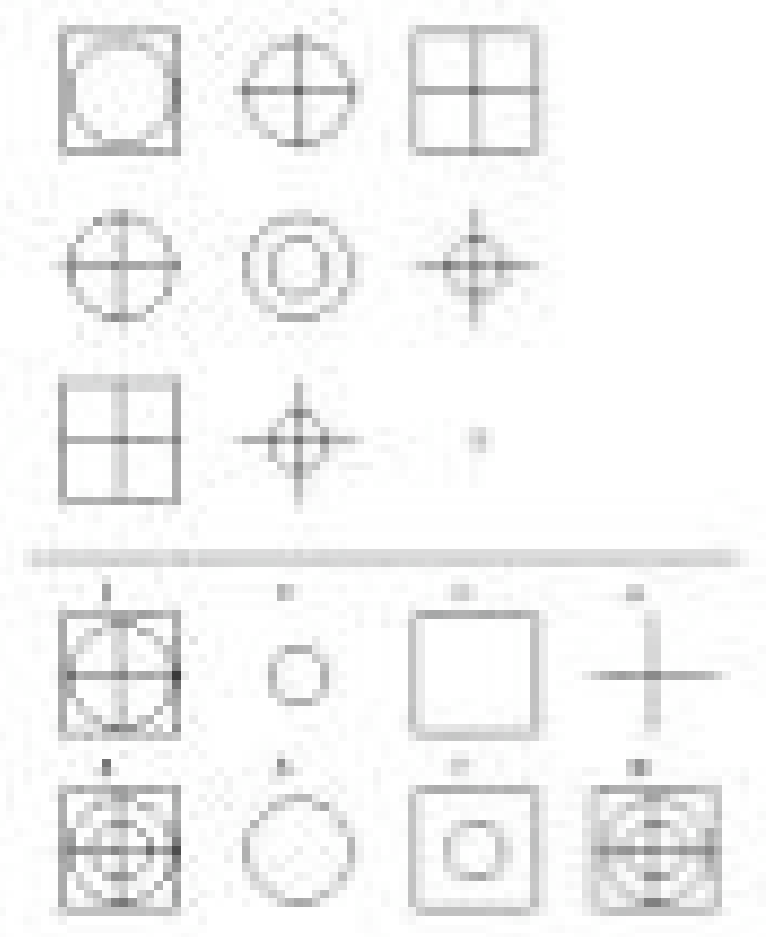
Conventional measures of ability

- Wechsler Adult Intelligence Scales
  - Verbal and Performance subscales
- Raven's Progressive Matrices
  abstract reasoning (culture fair?)
- SAT/ACT
  - How much has been learned in 12 years of schooling
  - Vocabulary/quantitative skills

Raven's Progressive Matrices
Which one best completes the form?

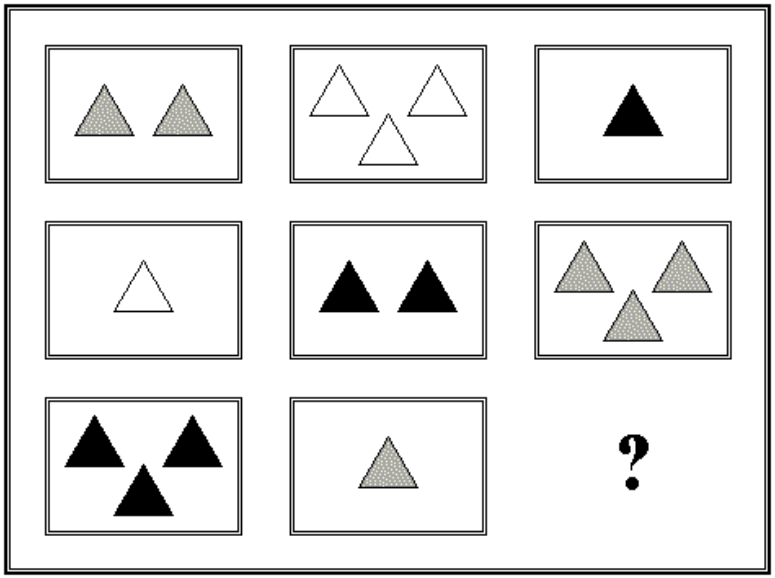


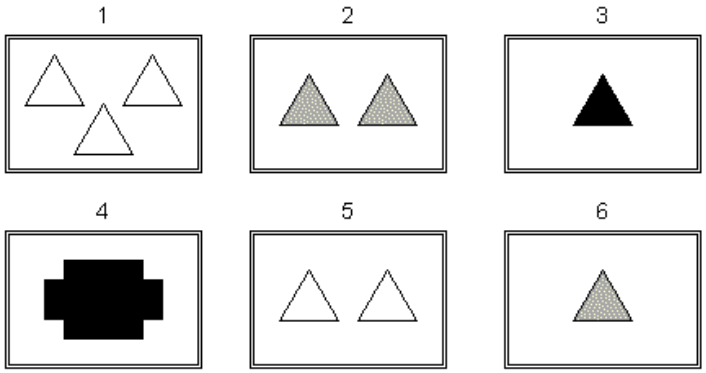
Raven's Progressive Matrices
Which one best completes the form?



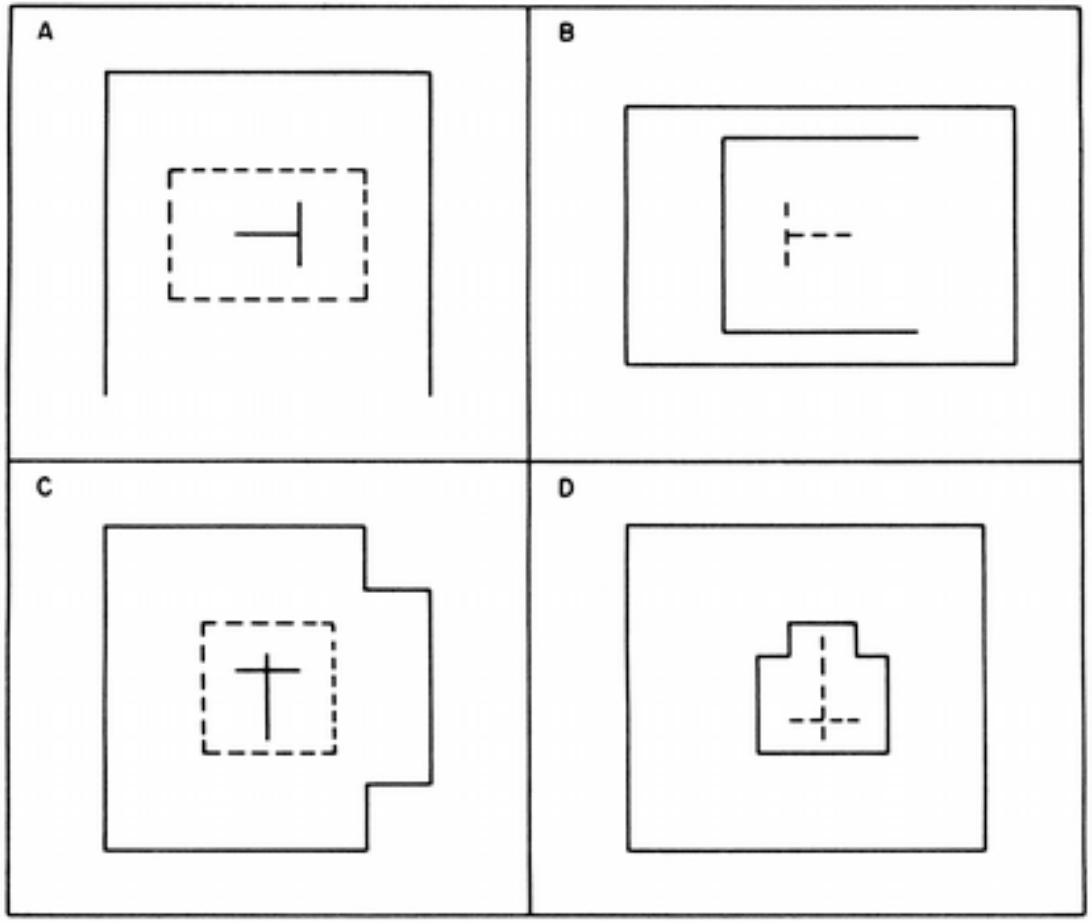
Item similar to Raven's

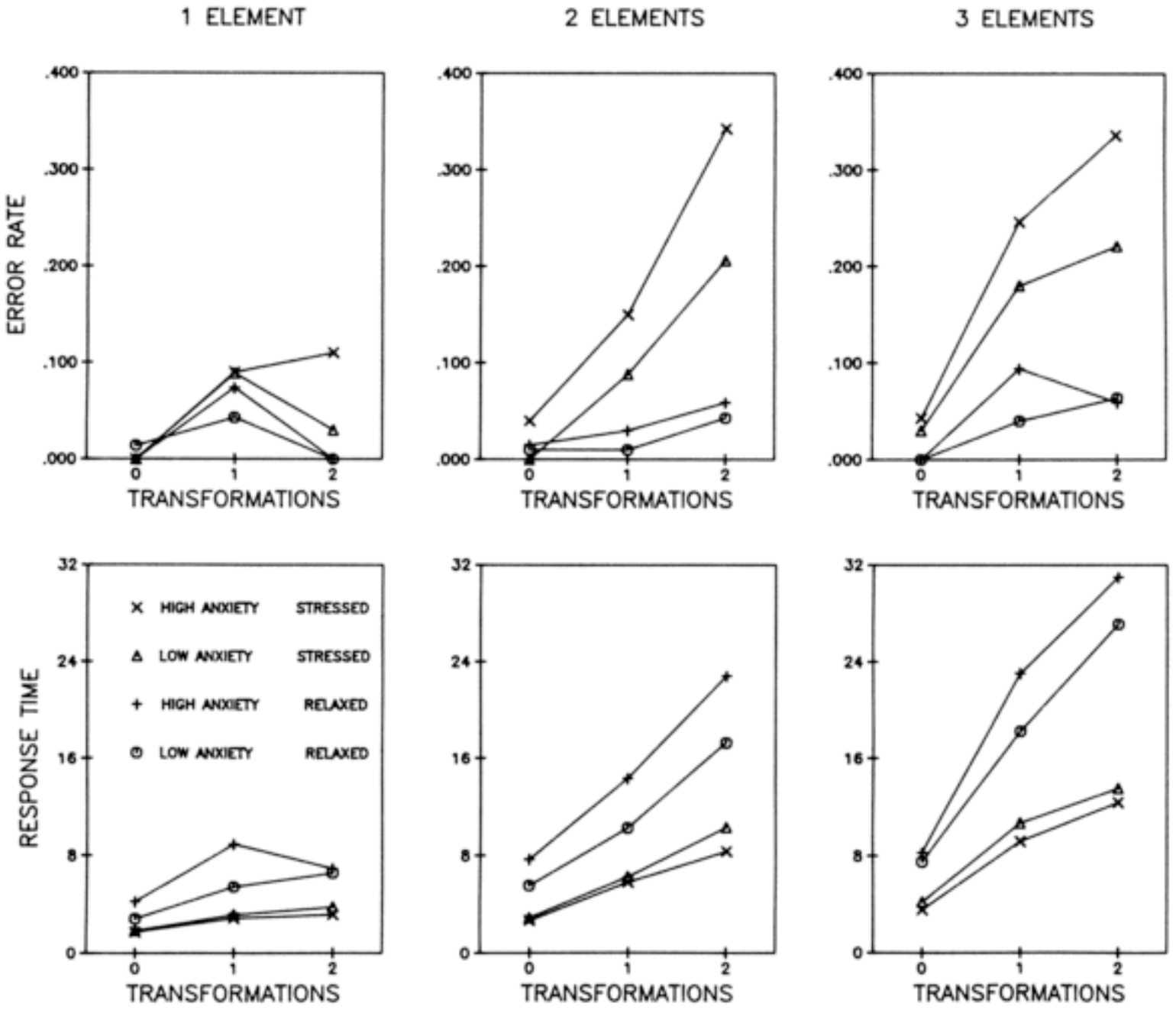
Which answer fits in the missing space to complete the pattern?





Leon and Revelle- analogies Transformations and Elements




1 ELEMENT
2 ELEMENTS
3 ELEMENTS
ERROR RATE
.400
.300
.200
.100
.000
0
1
2
TRANSFORMATIONS
RESPONSE TIME
32
24
16
8
0
HIGH ANXIETY STRESSED
LOW ANXIETY STRESSED
HIGH ANXIETY RELAXED
LOW ANXIETY RELAXED

Wechsler Intelligence Test

- **Verbal scales:**
  - Information
  - Comprehension:
  - Digit Span
  - Similarities
  - Arrangement
  - Vocabulary
  - Arithmetic

Performance Scales

Object Assembly

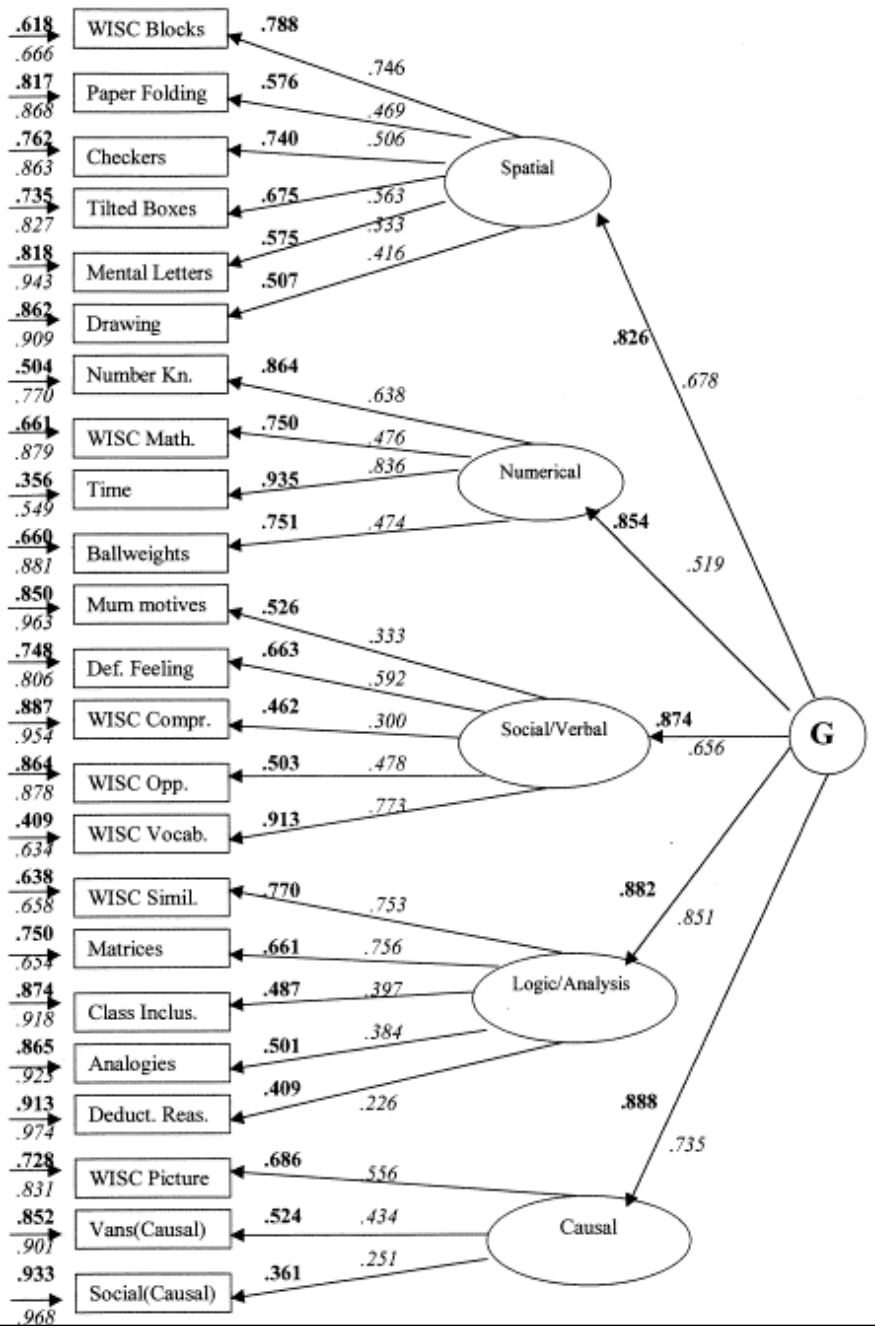
Block Design

Digit Symbol/Coding

Picture

Picture Concepts

Picture Completion

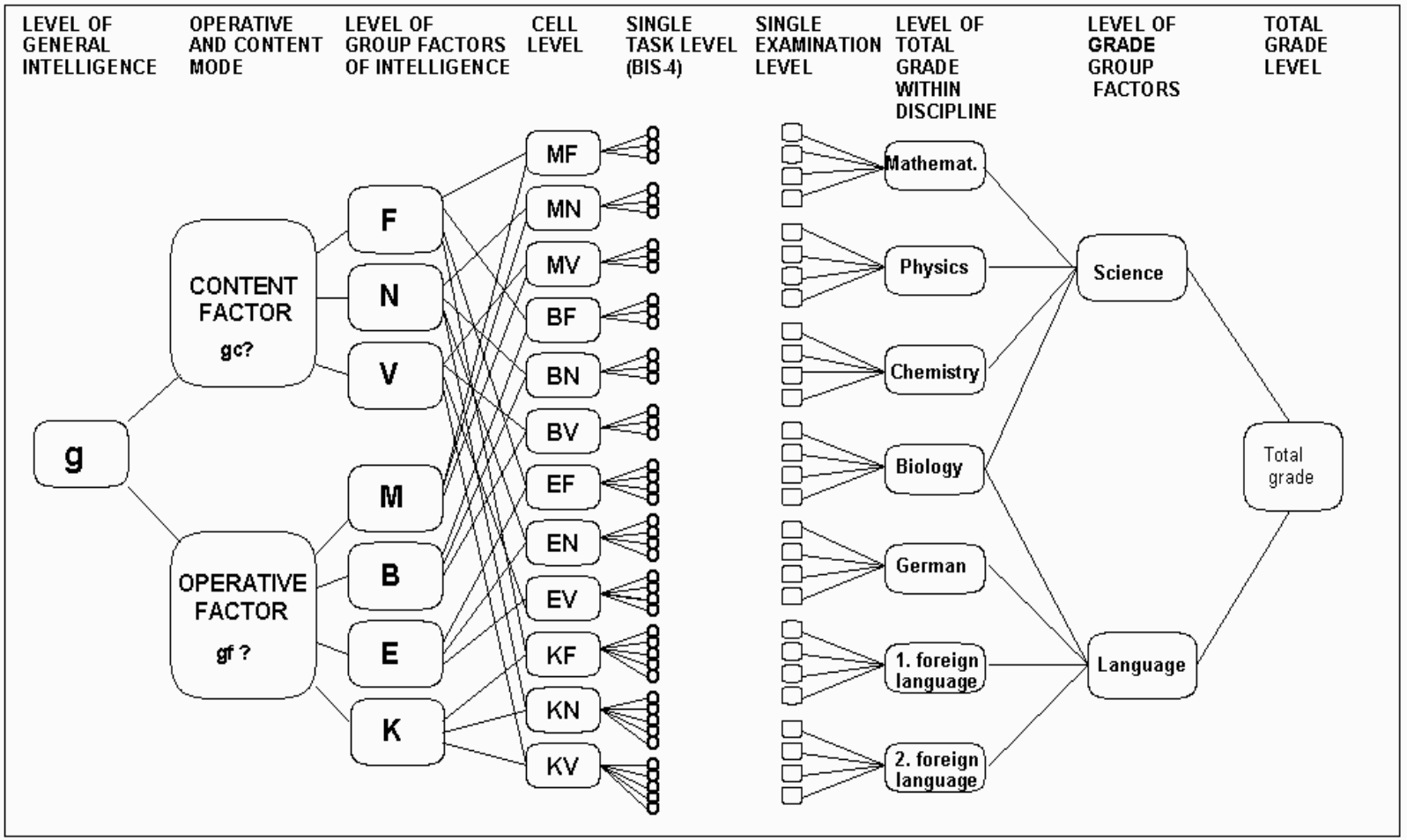

WISC Blocks
Paper Folding
Checkers
Tilted Boxes
Mental Letters
Drawing
Number Kn.
WISC Math.
Time
Ballweights
Mum motives
Def. Feeling
WISC Compr.
WISC Opp.
WISC Vocab.
WISC Simil.
Matrices
Class Inclus.
Analogies
Deduct. Reas.
WISC Picture
Vans(Causal)
Social(Causal)
Spatial
Numerical
Social/Verbal
Logic/Analysis
Causal
G
.618 .666
.817 .868
.762 .863
.735 .827
.818 .943
.862 .909
.504 .770
.661 .879
.356 .549
.660 .881
.850 .963
.748 .806
.887 .954
.864 .878
.409 .634
.638 .658
.750 .654
.874 .918
.865 .923
.913 .974
.728 .831
.852 .901
.933 .968
.788 .746
.576 .469
.740 .506
.675 .563
.575 .333
.507 .416
.864 .638
.750 .476
.935 .836
.751 .474
.526 .333
.663 .592
.462 .300
.503 .478
.913 .773
.770 .753
.661 .756
.487 .397
.501 .384
.409 .226
.686 .556
.524 .434
.361 .251
.826 .678
.854 .519
.874 .656
.882 .851
.888 .735

Standard hierarchical model of ability

- g (general intelligence)
  - Gc (crystallized intelligence)
    - Domain specific
    - Increases over much of life span
  - Gf (fluid intelligence)
    - General processing speed and flexibility
    - Peaks around 20-25

Fig. 9:

Hierarchical version of the Berlin model of intelligence and a grade hierarchy model

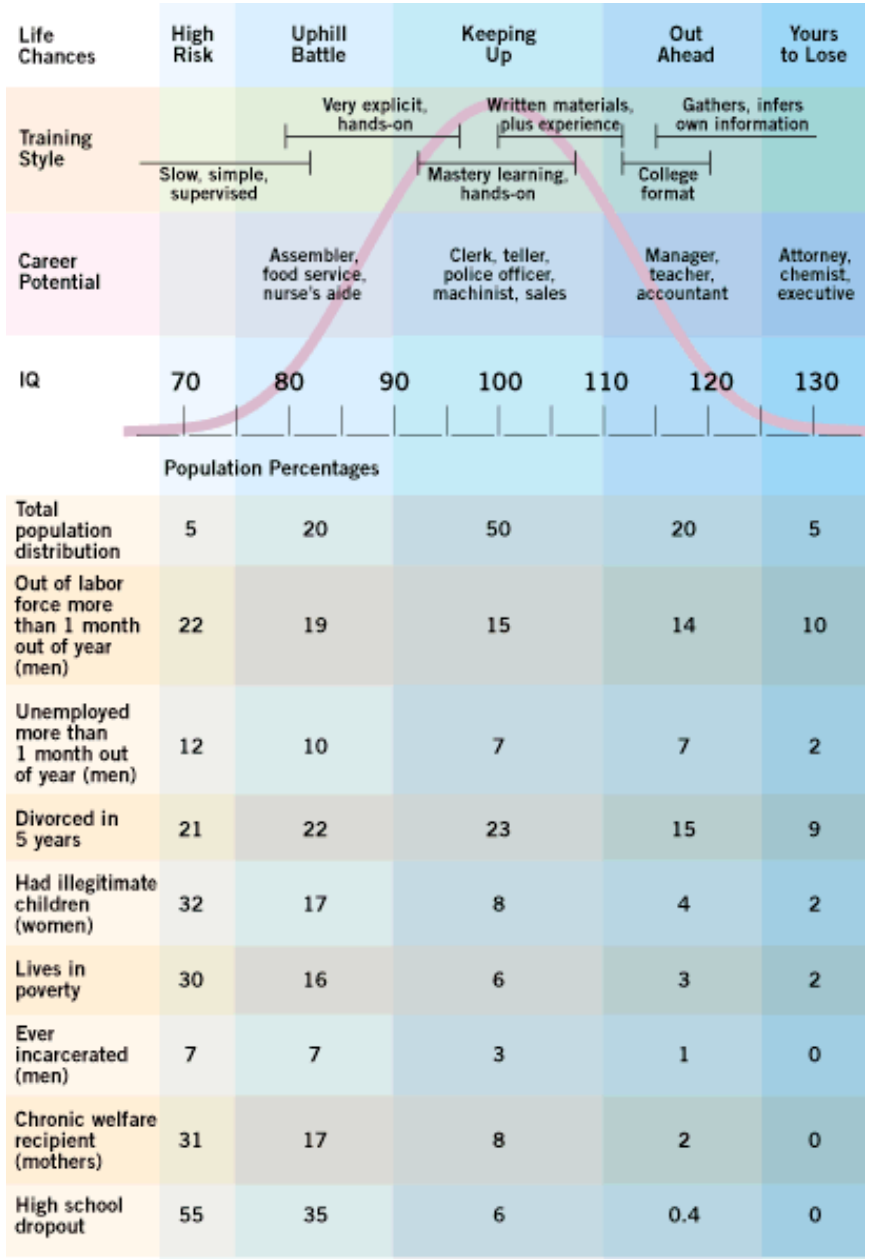


K: Processing capacity for complex information, i.e. reasoning
E: Creativity
B: Speed on relatively simple tasks
M: Memory, i.e. storage capacity for information

F: figural Intelligence
N: numerical Intelligence
V: verbal intelligence

Life as an intelligence test

- Conventional tests are short (30 minutes to 2-3 hours) and use representative content
- Continued performance across many situations is a continuing test of ability
- (see L. Gottfredson)



	Population Percentages				
Total population distribution	5	20	50	20	5
Out of labor force more than 1 month out of year (men)	22	19	15	14	10
Unemployed more than 1 month out of year (men)	12	10	7	7	2
Divorced in 5 years	21	22	23	15	9
Had illegitimate children (women)	32	17	8	4	2
Lives in poverty	30	16	6	3	2
Ever incarcerated (men)	7	7	3	1	0
Chronic welfare recipient (mothers)	31	17	8	2	0
High school dropout	55	35	6	0.4	0

Gottfredson, Scientific American

Life as a intelligence test (adapted from Gottfredson, 2002)

Relative risk (odds ratio) of this outcome for "dull" (IQ 75-90) vs. "bright" (IQ 110-125) persons: Young white adults	
High school dropout	133.9
Chronic welfare recipient (female)	10.0
Ever incarcerated (male)	7.5
Lives in poverty	6.2
Had illegitimate child (women)	4.9
Unemployed 1+ mo/yr (male)	1.5
Out of labor force 1+mo/yr (male)	1.4
Divorced in 5 years (ever married)	1.3

Life as an intelligence test (adapted from Gottfredson, 2002)

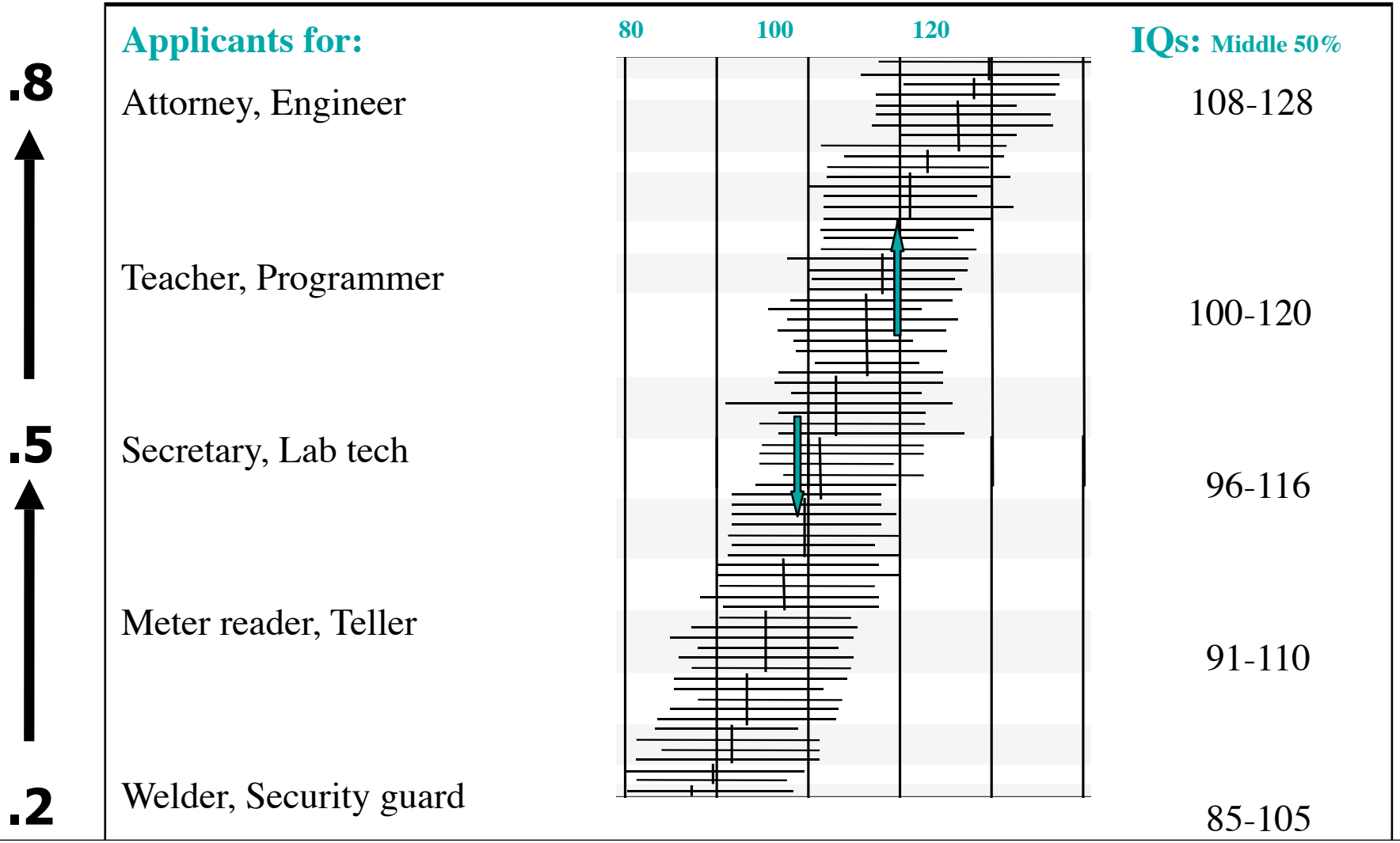
Common subtests, e.g.

- Elementary, secondary school
- Law-abiding, employed, married
- Rung on occupational & income ladders
- Daily self-maintenance (functional literacy)
- Personal health & safety

Different subtests, e.g.

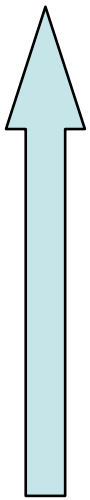
- Tertiary education & training
- Job performed
- Hobbies
- Type of civic participation

3. How Does Our Own *g* Level Affect the Life Tests We Take?

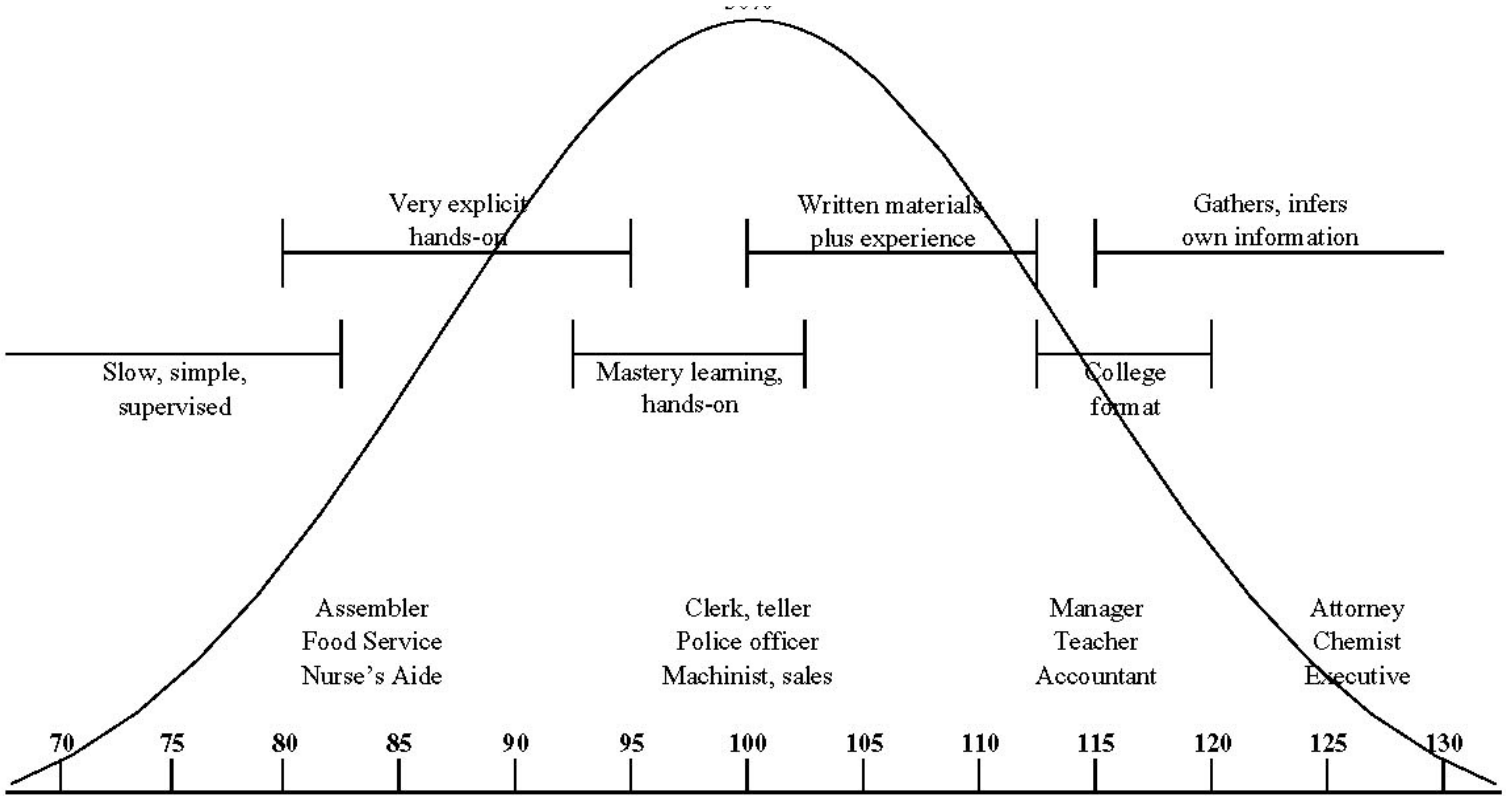


g-Related Relative Risk Varies by Kind of Outcome

Complex
Cumulative



Simple
Episodic



Intelligence: unanswered questions

- Stability and change over time within individuals and between individual
- Cultural effects
- Genetic Effects

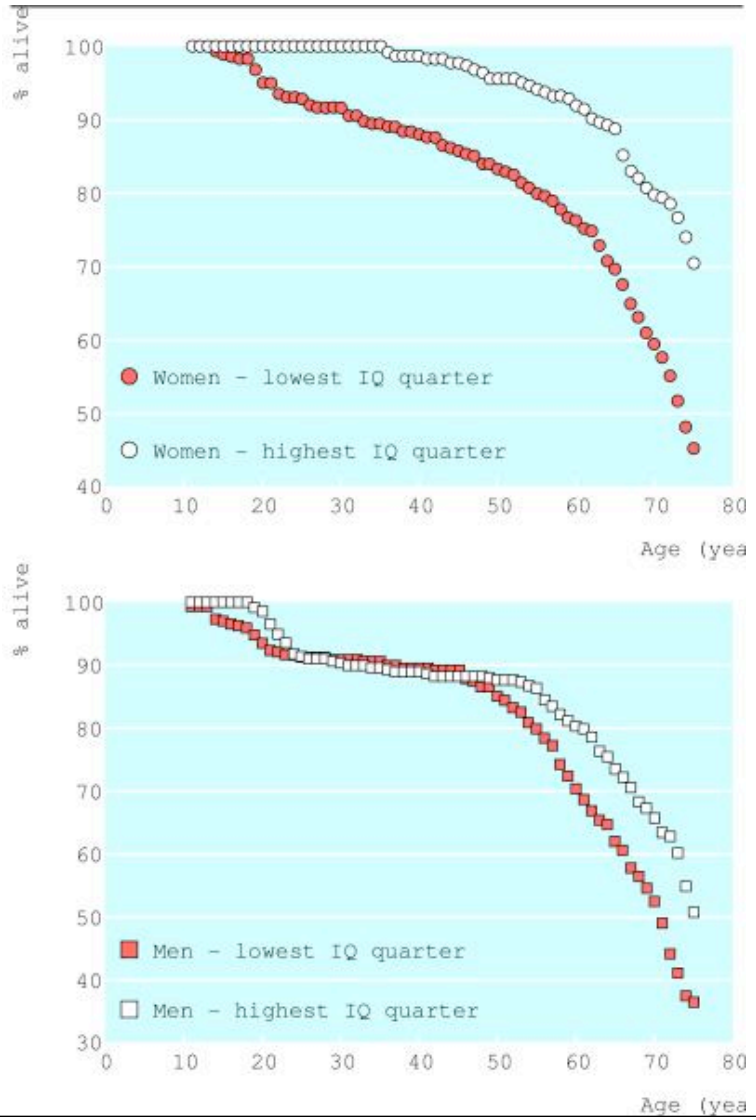
The Scottish Longitudinal Study

- June 1, 1932, all children age 11 attending school in Scotland (N=87,498) took a 45 minute IQ test (Moray House Test)
- Followup studies from Ian Deary and his colleagues (N>600) have examined mortality risk, test retest correlations, MRI scans, Alzheimer onset, etc.

Scotland Longitudinal Study

- Test retest (age 11 to age 77) r = .63, corrected for range restriction = .73
- Mean scores on Moray House Test increased from age 11 to age 77 (43 to 54, sd = 11).
- IQ at age 11 predicted relative risk of dying before 80

Intelligence and Mortality
Deary - Midlothian study



IQ increases: the "Flynn Effect"

- Although normed for a mean of 100, sd=15, IQ scores have increased over time
  - Comparisons of standardization samples given older and newer tests
- IQ scores on "culture fair" tests have tended to go up about 1 sd/generation
- IQ scores on "crystallized" tests have not increased as much

The Flynn effect: shadows on the wall

- Flynn effect is on observed variables, but what about change on the unobserved?
- Jensen and Plato's cave
  - Latent variables as real heights
  - Observed variables as shadow heights
  - Shadow length is changing (Flynn effect) but are the real heights?

Group differences and heritability

- Group differences of 1 standard deviation
- Heritability within groups of .6-.8
- Is the between group difference genetic?
- Lewontin's pot example
  - Consider a bag of seed, take two random handfuls, put one into a pot with good soil and the other into a pot with fewer nutrients. Within pot differences are all genetic, between pot differences are all environmental.
  - Within group heritability implies nothing about between group differences

Stability of personality across time

- Longitudinal studies
  - Age trends
  - Correlational patterns
  - Absolute changes
- Cross sectional studies
  - Mean scores as a function of age