E-411 PRMA

LECTURE 13 INTELLIGENCE AND FACTOR ANALYSIS

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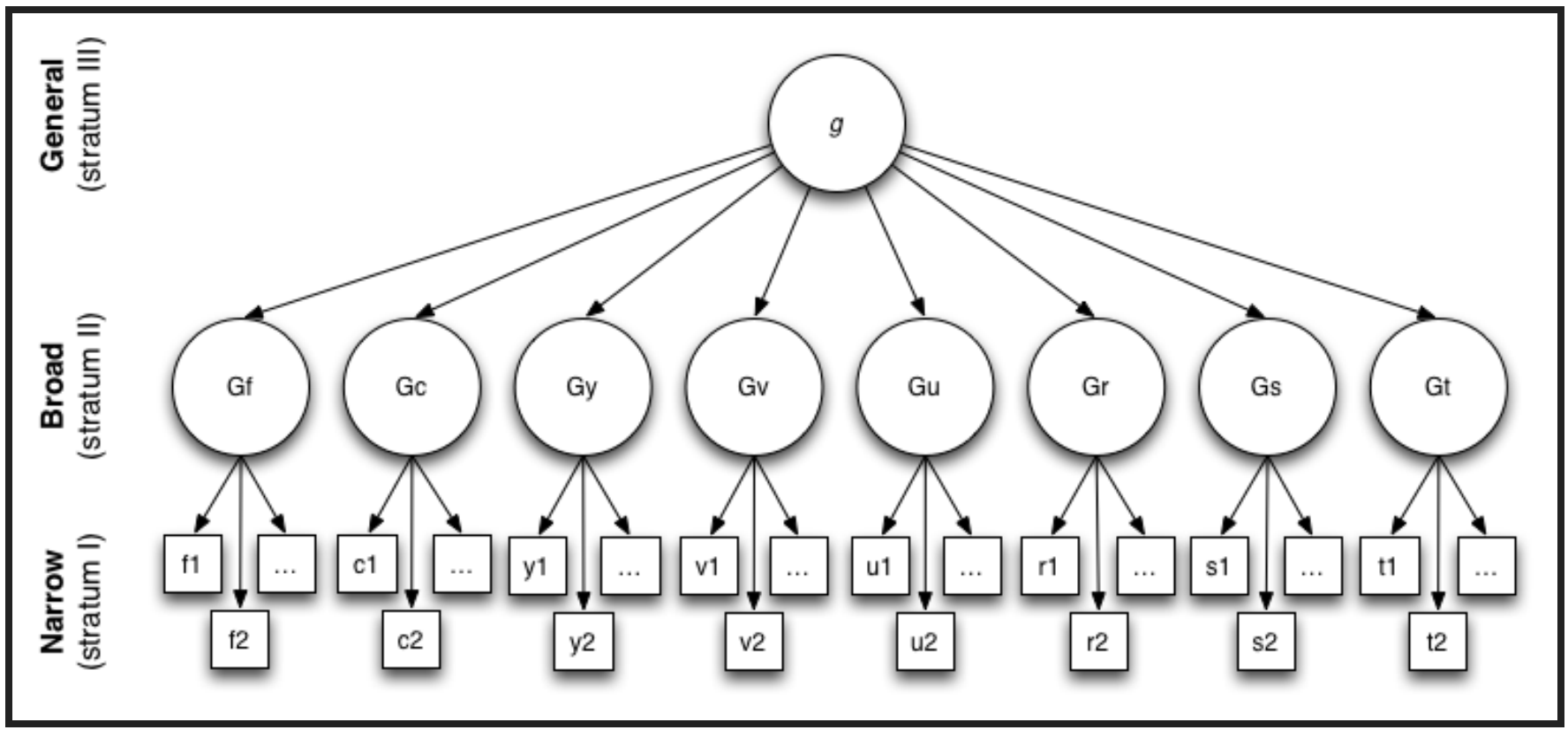
MOTIVATION FOR THE CHC MODEL

- Cattell proposed a theory of intelligence that consists of crystallized and fluid intelligence
- crystallized intelligence, *Gc*, ability to use skills, experience, & knowledge (e.g. retrieving and applying information)
- fluid intelligence, *Gf*, capacity for solving novel problems
- Horn added additional factors *Gs*
- Carroll proposed a 3 layered hierarchical view with *g* on the top, then factors similar to Cattell's and Horn's, and specific factors depending on the second-level factors

CARROLL'S MODEL



CHC MODEL

McGrew and colleagues tried to reconcile these approaches

Proposed a modified Carroll model without a *g*

Omission of *g* based on the lack of utility for their needs

McGrew calls for adoption of the CHC model and made data available here

CHC MODEL

There are 10 broad-stratum abilities

- fluid, crystallized, quantitative knowledge, reading/writing ability, short-term memory, visual processing, auditory processing, long-term storage/retrieval, processing speed (perform automatic cognitive tasks, couple minutes), and decision time/speed (reaction time, couple seconds)

There are 70 narrow-stratum abilities

INFORMATION-PROCESSING FRAMEWORK

- Rather than using factor analysis to derive "what" intelligence is, examine how information is processed
- simultaneous processing, integration at once
- successive processing, sequential integration
- Extant tests do not take into account problem solving strategy
- Sternberg proposed successful intelligence, how well we adapt, share, shape, select environments that confirm to personal and societal success

HOW TO MEASURE INTELLIGENCE?

- Myriad of tasks developed depending on age of testtaker
- Infants focused on sensorimotor skills; shift towards verbal and performance abilities as children age
- Mental age has fallen out of favor
- For children, tests often used for school placement
- Adults, test more diverse and typically used clinically

PROBLEMS IN INTELLIGENCE

- Nature vs. nurture
  - Preformationism & predeterminism - slave to your genes
  - Twin studies
  - Interactionist view - unlimited potential
- Stability
  - Young adult intelligence most important predictor of intelligence of older adults
  - Aging, physical/mental health, medications - confounders
  - "Early ripe, early rot"

- Early ripe, early rot

MORE PROBLEMS

Flynn effect - rise in intelligence test scores expected to occur on a normed intelligence test from the date the test was first normed.

TED Talk by Flynn

Personality ≡ Intelligence

Gender differences?

Family effects starting in the womb?

Cultural considerations? Culture-loading and creation of culture-fair tests

STANFORD-BINET IQ TEST

- Conceived by Binet to screen for children with developmental disabilities
- Originally intelligence calculated as the ratio of mental age to true age
- Deviation score, mean of 100 and standard deviation of 15
- Measures fluid reasoning (fluid), knowledge (crystallized), quantitative knowledge, visual-spatial, and working memory (see Table 10 - 2)
- Adaptive

FIFTH EDITION

- Full scale IQ from ten subtests
- Subtest scores can be combined to get other composite scores (e.g. verbal score)
- Standardized for the USA population aged 2 to 85
- Manual reports high internal consistency, test-restest, and inter-rater reliability (though items with low reliability were pruned)
- Criterion-Related VE from concurrent and predictive data
- Use in a clinical population and factor structure unclear

WESCHLER INTELLIGENCE TESTS

- Age-appropriate tests for very young children, children, adults
- All originally used a verbal, performance, and FSIQ, now only young children uses V and P scales
- Many subtests and items specific just to Weschler's tests (Table 10 - 3)
- Consists of core subtest and supplementals used to extract clinical information
- Short forms exist, but discouraged
- Good psychometric properties

COMPARISON AND OTHER TESTS

- Both purport to measure intelligence
- Highly correlated, differ by amount of *g*
- Both work within the CHC model
- Both represent gold standard
- Different factor structures and definitions of intelligence
- Kaufman tests focus on processing not structure

GROUP TESTS

- USA army developed tests for recruits in WWI
- Alpha, those who could read, Beta, those who couldn't
- Assigned duty and service based on performance
- Tests used in post-war because they were much cheaper
- Later, Army General Cliassification Test and Armed Service Vocational Aptitute Battery
- Also used in the schools in the USA for placement (not as much now)