L10 Intelligence and academic abilities

Binet (1904) focused on individual differences when studying intelligence

Intelligence as a single trait

~hypothesised that individuals possesses an amount of general intelligence (g), common to all intellectual tasks

- ➔ Single entity measures of g correlate with indicators of school achievement, info-processing speed, speed of neural transmission in the brain, knowledge of subjects not studied in school

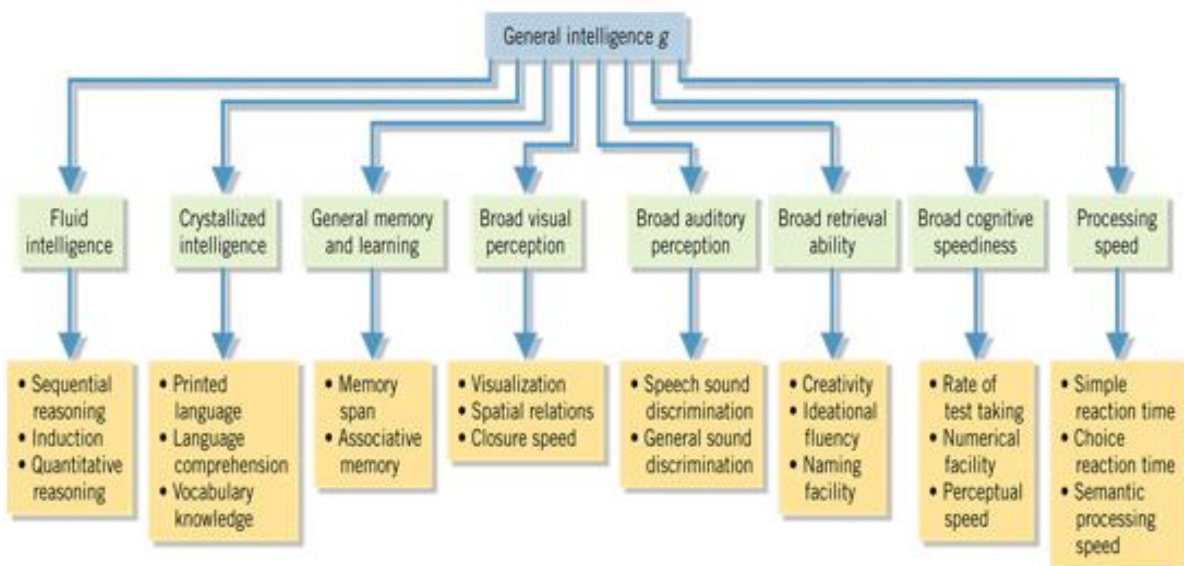
Intelligence as a few basic abilities

~crystallised intelligence – factual knowledge about the world & increases with age

~fluid intelligence – the ability to think on the spot to solve problems & declines slowly after early adulthood

Intelligence as several basic abilities

An integrated model of intelligence – Carroll's three-stratum theory of intelligence



Measuring intelligence

~test measures based on observable behaviours, e.g. problem-solving

- ➔ Wechsler Intelligence Test for Children
  - Divided into verbal section (general knowledge and skills using a language) and performance section (spatial and perceptual abilities)
  - Most widely used test for 6 years and up
- ➔ Intelligence tests measure somewhat different aspects in different ages

~Intelligence Quotient (IQ) – a qualitative measure of intelligence relative to others

- IQ scores = a normal distribution
  - 68% of scores fall within 1 SD of the mean; 95% fall within 2 SDs
- IQ is predictor of academic, economic and occupational success & more closely related to later success than socioeconomic status. Nonetheless, motivation, creativity, health, social skills, are implicated in later success.

IQ: gene vs environment

~family influences – Caldwell & Bradley's HOME (Home observation for Measurement of the Environment) as a measure of family influences

- IQ scores positively correlated with quality of family environment as measured by HOME but cannot establish causal relations between HOME and IQ scores

~influence of school

- Average IQ scores rise during the academic year and drop during the summer
- Slightly older children who had one more year of schooling did much better on IQ test than slightly younger children in the grade below them

~influence of society – by economic and social systems

- Average IQ scores have risen in many countries over the past 70 years, especially among those in the lower 10% of the distribution -> reflecting better nutrition, health care, and access to education

Gardner's multiple intelligence theory – people possess at least 8 types of intelligence

~linguistic, logical-mathematical, spatial, musical, naturalistic, bodily-kinesthetic, intrapersonal, interpersonal

Academic skills: reading and math

~individual differences in reading and math tend to be stable over time -> reflect both shared genes and shared environments

- e.g. parent who are good and frequent readers provide genes and environments that are more likely that their children will be good readers

~dyslexia – the inability to read well despite normal intelligence

- affects 5 to 10% of children in US; 13 – 14 yo with reading disabilities correctly identified no more words than typical 7 – 8 yo
- poor phonological processing is at the heart of dyslexia
  - phonological processing = the ability to discriminate and remember sounds within words
  - so they have difficulty with pseudowords – words that can be pronounced only by using phonological recording
  - should be taught to use strategies that enhance their phonological **recording** skills

~dyscalculia (math/arithmetic disabilities)

- ~8% children internationally, despite having normal IQ
- Little overlap between dyslexia and dyscalculia
- Dyscalculic kids never develop complicated strategies to solve arithmetic problems. -> so they have no flexibility in composing or decomposing the problem. they can learn but they don't transfer the learning over time.
  - For typical kids, problem difficulty is positively correlated with more strategies used

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L11

Word segmentation problem: spaces between words can't be heard

~people use phonotactic constraints: limitations on which sequences of sounds are permissible in that language

- Helps you decide there probably isn't a boundary here bc it would make a word start with sounds that are not normal to start with

~people use prosodic constraints: influencing which stress patterns are common in that language

- e.g. English stress pattern is usually strong-weak

~^ infants are aware of those by 9 months old

~transition probability – for each unit, it's the probability of each other one following

- words are 'chunks' of language that always have the same sequence of phonemes
- test: habituate infants to a stream of speech whose "words" are defined solely based on transition probabilities. If they respond differently to those words in isolation later, this is an indication they segmented them out successfully.
  - Then compare response to partial word and non-word.
  - Result: they listened longer (surprise) to the non-words.

~does transition probability explain word segmentation for an entire language?

- Test: teach four adults an artificial language with 1000 word types and 60,000 tokens (i.e. many words appear more than once) (10 hours of speech, listened to while exercising)
- Test immediately and after 1-2 months. Segmentation was far above random or yoked controls (people who took the test without training)
- Even after three years, they remembered the high-frequency words

~tracking transition probability is not a language-specific skill

- Also unconsciously applies to visual sequences, action sequences, spatial organisation
- We don't lose the ability to do TPs over the course of our life

Word learning

~word leaning is hard because of 1) the arbitrariness of sign – the form of a word tell you very little about its meaning; 2) the problem of reference – the meaning of any word is logically underconstrained, i.e. somehow we're just automatically ruling out a bunch of options (those that are not logically possible)

~first words come in between 8 and 14 months & vocab spurt (very rapid learning) at between 14 to 24 months

~vocab growth varies with SES (environment)

- ➔ College educated parents > working class parents > welfare parents
- ➔ Due at least in part (can be traced back to) the number of words they hear & the amount of conversational turn-taking they experience

~production of words (speech) follows comprehension of words

~children rely on biases and principles to learn words

- ➔ Shape bias: children prefer to categorise (most) nouns by shape
  - Emerges over the course of the second year
  - May be learned based on statistical associations between words and features of the categories they pick out
  - Evidence for learning: teaching children new nouns cleanly organised by shape speeds up later word learning.
    - Shape nouns (objects were organised by shape) > material nouns > no noun training
- ➔ Mutual exclusivity: children generally assume items don't have more than one label
  - Problem: it must be a soft bias, because many items do have multiple labels (pet, animal, dog, Fido, etc).
- ➔ Size principle: **multiple** examples (not single) are evidence for the smallest category that covers them
  - Superordinate (mammals), basic (dogs/cats), subordinate (shepherds/terriers)
  - An example of underconstrained inference
- ➔ Social reasoning: infants only learn labels if the **speaker** is looking at the objects & do not learn labels if the speaker has previously mislabelled other items

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L12

A) The importance of verbs

Parts of speech (arguments) – things like noun, verb, etc

- ➔ Open class (noun, verb, adjective etc):
  - easy to add new members
  - carry much of the content
  - produced earlier
  - easier for 2nd language learners
- ➔ Closed class (pronoun, conjunction, preposition):