

PSYC 200

Lecture 14

March 2nd

Cognition and Intelligence

Cognitive Psychology

- what is cognition?
 - it is the study of the mental activities associated with thinking, knowledge, remembering and communication
 - Noam Chomsky and Jean Piaget said that to understand how someone behaves, you have to understand cognition and what's going on in their brains
- the different types of mental processes:
 - **attentional processing**: if you are a waitress, you need to distribute your attentional resources to your most important needs (greeting new customers)
 - **serial processing**: thoughts and actions of a waitress have to be done consecutively, you need to take someone's order first before you can bring them their food
 - **parallel processing**: doing things simultaneously, walking and carrying several different things at the same time
 - **control processing** (similar to attentional processing): requires attention, customers ask you a question and you have to pay attention to what they are saying in order to give the right answer
 - **automatic processing**: requires little or no attention at all, reflex
 - **bottleneck processing** (similar to serial processing): when two things cannot be done at the same time, one action has to wait before you can complete the other one, you have two tables to serve but you can't serve them at the same time therefore one table has to wait until the other has been served
- how many forms of mental processing are involved in serving food in a restaurant?
 - requires a very complex set of mental processes, on average this task involves 6 forms of mental processes
- two general categories:
 - how much attention a mental process involves
 - whether that mental process has to be done in sequence or simultaneously

Intelligence

- the capacity to reason, solve provable and acquire new knowledge
- hard to define and measure, all of us have different areas of expertise (i.e. social skills, mathematical reasoning)

Intelligence Testing

- Alfred Binet (1904)
 - Mental age: the level of ability typical of a child of the same chronological age
 - all 6 year-olds should be able to do a certain task (walking for example)
- Lewis Terman (1916)
 - Stanford-Binet Scale (adaptation of the Binet Scale)
 - $IQ = (Mental\ Age / Chronological\ Age) \times 100$
 - problem with these tests is that they are culture-sensitive, problematic for French students
- David Wechsler (1939)
 - Wechsler Adult Intelligence Scale (WAIS): since all previous tests were focussed on children, this one was focussed on adults
 - Normal distribution: scores are tracked on a bell shaped curve with a concentration of the data in the centre
 - instead of giving out IQ values, they would use standard deviation
 - if you scored a standard deviation of 1 on this test, this tells you that you're in the top 16% of the population
 - if you scored a standard deviation of 2 on this test, you've done better than 98% of the population
- Aptitude vs. Achievement
 - most IQ tests are designed to measure aptitude (potential ability); they aren't used to measure achievement (knowledge, progress)
 - the questions used on these tests do somehow happen to measure factual knowledge (not common knowledge)
 - if you share the same factual knowledge as the person who designed the test, you will do great on the test
 - despite all the criticism, these tests are fairly reliable, they do seem to predict academic achievement and performance

General intelligence

- Charles Spearman
 - are some of us more intelligent than others? According to Spearman, yes.
 - General Intelligence ('g factor')
- Raymond Cattell
 - he said that intelligence is not a single entity, argued for different two types of intelligence
 - Fluid intelligence: the ability to process info and then act accordingly, it decreases as we age because our ability to process info slows down
 - Crystallized intelligence: the ability that comes from previous experiences, it increases as we age because we experience more and more situations
 - **how these types of intelligence differ in terms of aging? (TEST QUESTION, answer above)**
- Processing speed: contributes to higher IQ
- Working memory capacity: the more info you can hold, the more intelligence you could be
- Mental self-monitoring
 - Central executive functioning
 - the set of mental processes that governs goals, strategies and coordination of the mind's activities
 - researchers have found that people who have strong central executive functioning often display higher levels of intelligence
 - located in the pre-frontal cortex
 - two pieces of evidence that proves more intelligence comes from strong executive functioning:
 - when you put people in MRI scanners, they found that as mental tasks got harder and harder, the pre-frontal cortex lit up and became very active
 - the size and volume of the pre-frontal cortex is linked to one's IQ, more so than any other brain area
 - Einstein's brain was studied, it was discovered that his posterior parietal lobe was much bigger than average

Intelligence: Nature vs. Nurture

- to what degree is a child's intelligence determined by his or her genetics?
 - "baby mozart": have your unborn child listen to classical music in order to increase intelligence, this was useless
 - twin studies: they found that twins raised in the same household (compared to siblings also living in the same house) were more intelligent (influenced by genetics)
 - the environment also plays a role in intelligence, it is a combination of both the environment and genetics
 - if you are genetically pre-disposed to have a high IQ and you are not raised in the right environment, you will never reach that IQ level
- do culture and socio-economic status influence IQ scores?
 - yes they do, however these tests are culturally biased, if your status is different from the person who wrote the test, you will not do well on it
- why are IQ scores currently on the rise?
 - Flynn effect: scores go up every 30 years by 9-15 points
 - possible explanations: the environment has changed dramatically in the last 30 years and this could influence IQ scores, a more enriched learning environment as compared to 30 years ago (info is available on demand)

Sternberg's Triarchic Theory of Intelligence

- Analytic intelligence
 - type of intelligence generally assessed by intelligent tests that present well-defined problems with only one correct answer (solving math problems)
- Creative intelligence
 - type of intelligence characterized by the ability to adapt to new situation, come up with unique and unusual ideas and think of novel solutions to problems
 - Steve Jobs: had a high level of creative intelligence, he could see the future of how his products could be applied and used
- Practical Intelligence
 - the ability to find many solutions to complicated or poorly defined problems and use those solutions in practical, everyday situations
 - in other words, this is called common sense

Garner's multiple intelligences (8)

- linguistic, naturalistic, interpersonal, interpersonal, bodily/kinaesthetic, musical, spatial, logical/mathematical
- if you were a dancer, you would score high on spatial, musical and bodily intelligence
- if you have trouble making friends, you will score low on interpersonal intelligence

Social Intelligence

- Emotional intelligence
 - This is the ability to perceive, understand, manage, and utilize his or her emotions
 - the ability to navigate in a social environment
 - example: if you are socially intelligent, you can easily understand social situations and your part in these situations
 - controlling your emotions so that they do not get the best of you, for your benefit
 - people with high emotional intelligence are very self-aware (how they think, how they act, etc) and they are also aware of how other people are thinking and acting
- Is emotional intelligence different from cognitive intelligence?
 - there is a ton of clinical studies that show that brain damage can impair emotional intelligence but not cognitive intelligence, take someone that experiences someone that experiences damage to the orbital frontal cortex, they are no longer able to use emotions to help guide their behaviours (very emotionless)
 - psychopaths are very low in terms of emotional intelligence, they do things without feelings some sort of remorse

Neurological Measurements of Intelligence

- is there a correlation between brain size and intelligence?
 - the pre-frontal cortex seems to be correlated with IQ
 - other factors also influence this relationship, such as the environment, socio-economic status (nutrition)
- is there a relationship between the rate at which the brain matures and IQ?
 - plasticity: the ability of the brain to grow and change, studies show that there is a relationship between the rate at which the brain matures and one's IQ
 - example: two groups, one group is high IQ kids and the other is normal IQ kids, the cortex of the high IQ kids is thinner compared to the normal IQ kids, during teenage years, the cortex of the high IQ kids thickens much more rapidly compared to normal IQ kids
- Does intelligence reside in a particular part of the brain?
 - perceptual speed: the speed at which we process info, the time it takes to perceive a stimulus and to process this info
 - there seems to be a relationship between electrical brain activity and IQ as well, individuals who have high IQs have more complex patterns of brain activity

Concepts

- Hierarchies
 - A levelled or ranked organization of concept categories based on a particular feature
 - example: the concept of a car contains everything from a Toyota to a Ferrari, once you have formed a concept category of "car", you can classify the objects within that category even more by creating hierarchies such as price, fuel consumption, mileage, size
- Prototypes
 - a mental image or typical example that exhibits all the features associated with a concept
 - example: you are more likely to identify a new type of car you've never seen before if it looks like a prototype you have of the concept category of a car
 - we use categories to organize the world around us and the info in our brains
 - **how are concept categories formed? by mental images (TEST QUESTION)**
- Family resemblance theory
 - we put items in the same category if they share certain characteristics even if not every member of the category has similar features
 - example: concept category of games like ping pong, poker, baseball: all three have very little in common yet they are all related by a common thread which is that they are games
- Exemplar theory
 - we make category judgements by comparing new things that we encounter with examples of others that we remember fit into that category, using prototypes
 - example: your concept of dogs isn't formed by a single prototype but by every dog you've ever seen

Problem Solving: the act of combining current info with info you have stored in memory to find a solution to a problem (TEST QUESTION)

- Initial state
 - a person has incomplete or unsatisfactory information
- Goal state
 - a person has all the information they need
- Set of operations
 - these are steps that a person needs to get from the initial state to the goal state (from A to B)
 - example: if you are lost, you can call your friend to ask your directions, use a map

Problem Solving Strategies (Set of operations)

- Algorithms
 - a step-by-step procedure that one follows to arrive at a solution for a particular problem
 - as long as you use the correct process using the algorithm approach, you will always arrive at an appropriate solution
 - example: finding stuff in a grocery store, starting at the far end of the store and making your way through the all the aisles in order to find what you're looking for
- Mental Set
 - a pre-existing state of mind that a person uses to solve problems because that state has helped them solve similar problems in the past
 - useful for everyday tasks
 - example: the dishwasher wasn't turning on and you realized you had to press two buttons in order to get it to work, your roommate asks you how to use it and you explain it to them
- Functional fixedness
 - a bias that limits a person's ability to think in unconventional ways
- Insight
 - the sudden realization of the solution to a problem
 - example: realizing the answer to a question on an exam after having handing it in to the teacher
 - biological basis to this strategy, the right temporal lobe is involved
 - solving a problem when you are in a bad mood is pointless because your thoughts and focus become really restricted



Problem Solving

this is an example of **functional fixedness**

to solve this situation, you could tie the pliers to the string, swing it back and forth, get up on the chair with one string in hand and wait for the other string to swing your way