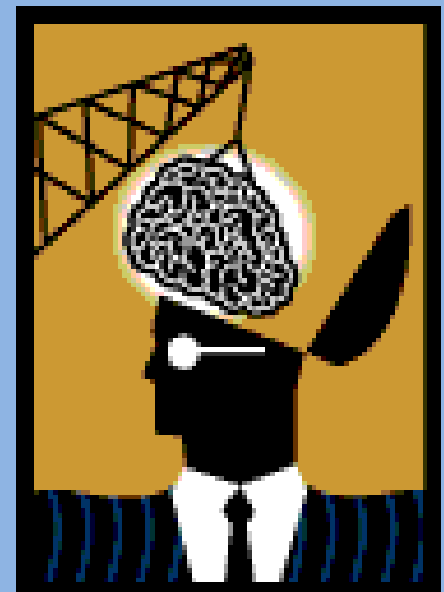


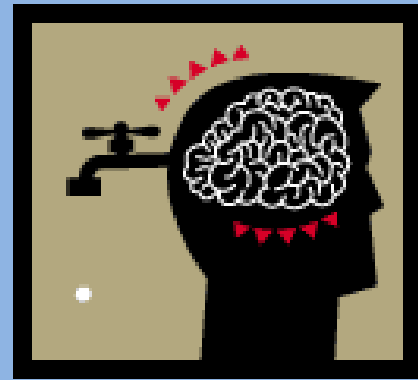


ECAP4010

Introduction to Cognitive Psychology



Aim



To introduce students to the theories and research in human cognition.

The core focus of cognitive psychology is on how people acquire, process and store information.

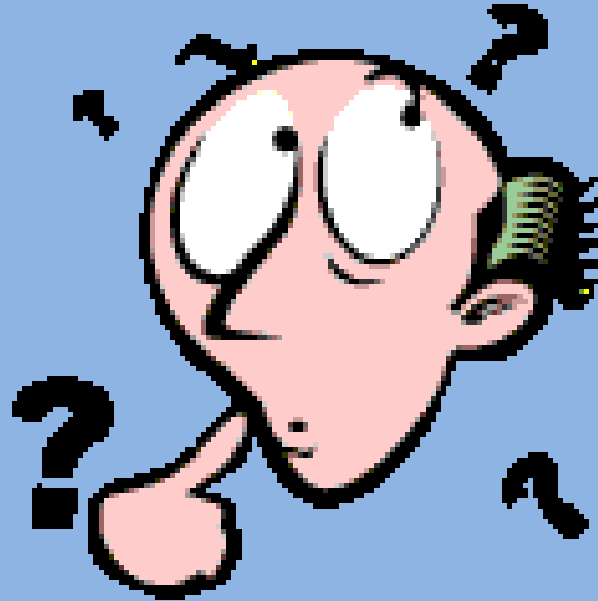
There are numerous practical applications for cognitive research, such as improving memory, increasing decision-making accuracy, and structuring educational curricula to enhance learning.

Learning outcomes

Demonstrate an understanding of theory and research relating to memory, attention and perception;

Take responsibility for their own learning and skill development; including effective personal planning, self-reflection and project management skills.

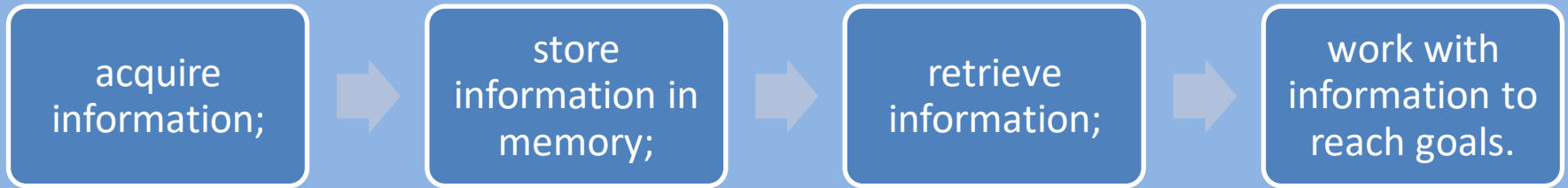
Question time



What is Cognitive Psychology?

Cognitive psychology

- ...seeks to answer that broad question and is the study of how humans (and other animals):



In all these cases, we are dealing with internal or mental representations. How such representations are formed, stored and used is the essential business of cognitive psychology. What happens in our minds.

Cognition in everyday life think of some everyday examples

- Attention and Processing Speed - capacity to sustain focus in any mental activity and take in information
- Learning and Memory - ability to encode, store, and retrieve information
- Executive Functions - ability to achieve insight and self-awareness, to reflect on, initiate, evaluate, and regulate thinking and behaviour, and to incorporate feedback
- Abstract Thinking - ability to use generalized information and apply it to specific, new situations
- Language - ability to verbally comprehend, repeat, express, and write
- Visual Perception/Construction - ability to recognize, perceive, and construct drawings/puzzles
- Sensory/Motor Functions - ability to detect normal visual, auditory, and tactile sensations. Ability to perform gross and fine motor tasks

What we are aware of...

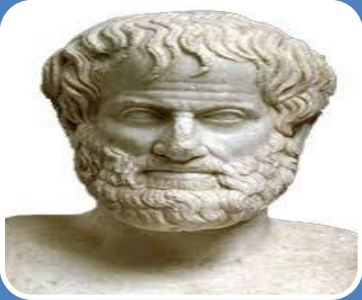


The complexities of cognition are usually hidden from our consciousness.

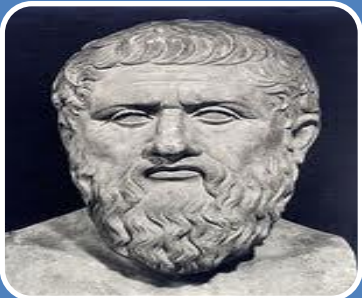
History



Cognitive psychology stems back to early philosophers asking themselves where knowledge comes from and how it is represented in the mind



Ancient Egyptian hieroglyphics – knowledge was localized in the heart (Aristotle agreed)



Plato – brain was the locus of knowledge

Two perspectives

Empiricists

- Knowledge comes from experiences gained through the lifetime
- E.g., everything we know is learned

(Berkeley, Locke, Hume and Mill)

Nativists

- Knowledge is based on innate characteristics of the brain
- We're born *hardwired* with some existing knowledge

(Descartes and Kant)

Neither can be definitively proved – so the argument continues

Empiricism



One major proponent of empiricism was the 17th century English philosopher John Locke.

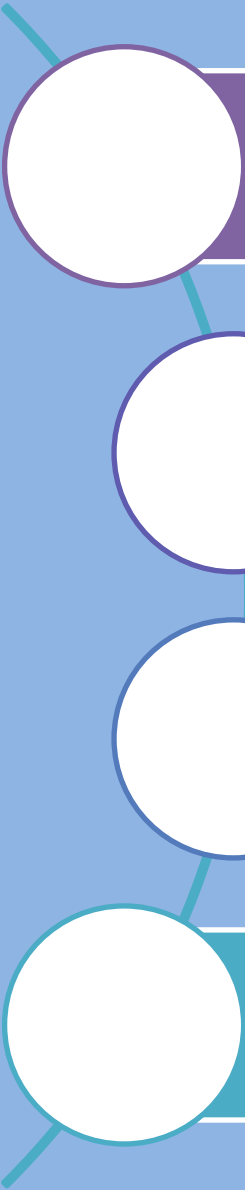


Locke argued that the human mind was born without any knowledge.



He said humans are born with a "tabula rasa," or a blank slate. People can only then gain knowledge, he said, through experience.

Nativists



Nativism, which was strongly advocated by German philosopher Immanuel Kant in the 18th century.

Kant argued that the mind is born with a number of innate categories which enable people to understand their senses.

These categories make perception possible.

Kant said that categories of space, time, and causality dictate all experiences. They are, he said, a part of the mind's structure.

Each of these schools of thought give the mind a different functional role.

If the mind has no knowledge at birth and acquires knowledge only through experience, then the mind must have a passive role (Zeitlin, 1968).

It is as if the mind were a video camera or tape recorder. It takes in information, can hold on to it and store it, but cannot think about it, organize it, or create more.

Empiricism



If, on the other hand, the mind has some innate knowledge and uses this knowledge to understand the senses, then the mind must have an active role.

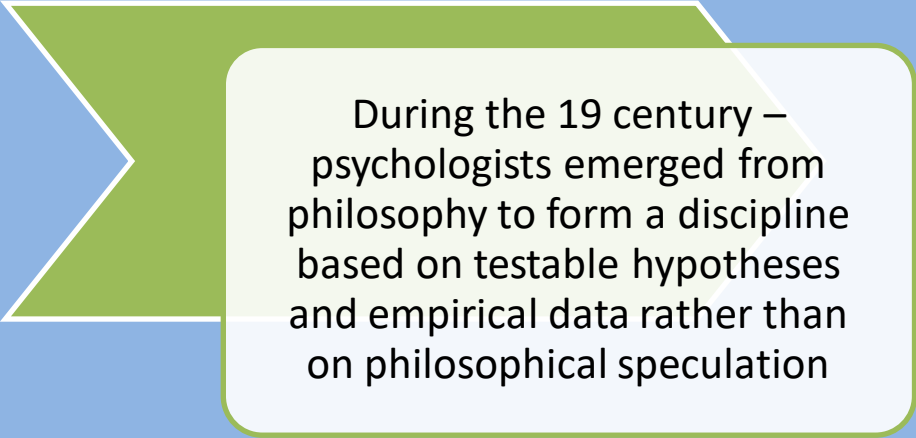


By using a priori knowledge to evaluate and make sense of the world, the mind is organizing, thinking, and creating knowledge (nativism).

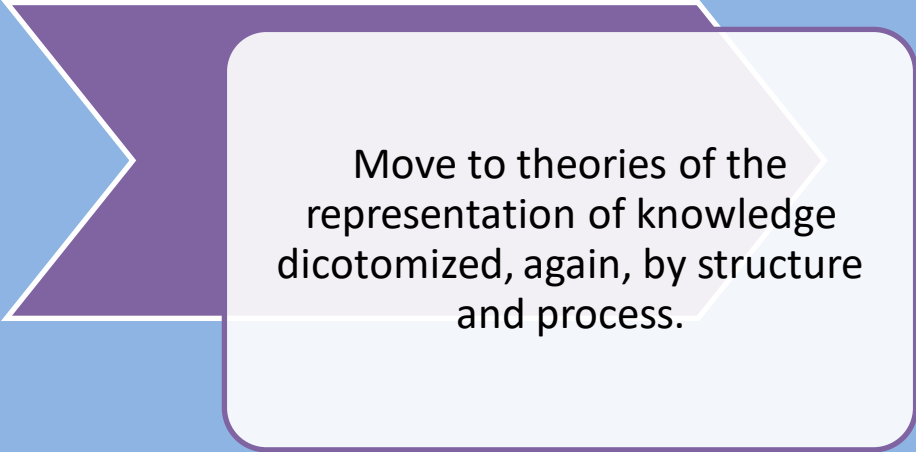


Nativism

History of Cognitive Psychology



During the 19 century – psychologists emerged from philosophy to form a discipline based on testable hypotheses and empirical data rather than on philosophical speculation



Move to theories of the representation of knowledge dicotomized, again, by structure and process.

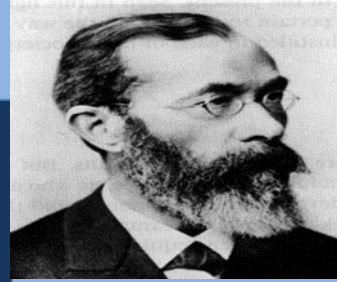
So...what is the mind made up of and what are the processes that take place when we use it?

Two men decided to take the principles of scientific research and apply them to human behaviour. Wundt – Structuralist and James – Functionalist.

Wilhelm Wundt (1879)

First psychological laboratory in Leipzig, Germany

- Founder of psychology as a science
- Many early psychologists had roots in Wundt's lab
- Sought to identify the building blocks/structure of psychological experience
- Importance of conscious processes and immediate experience (sensation, perception and attention)



Other sciences have been broken down in this way before.. Chemistry and Physics fundamental laws...

The Periodic Table

A standard periodic table of elements, color-coded by groups. The elements are arranged in rows and columns, with their atomic numbers and chemical symbols. The table includes all elements from Hydrogen (H) to Oganesson (Og).

Began establishing fundamental relations and structures that could be used to explain all behaviour

Wundt (Germany) and Titchener (US)

Emphasized the structure of mental representation through introspection

Wundt's Introspection

Used introspection to report contents of consciousness

Subject looks carefully inward and reports on inner situations and experiences

How to study the mind?

- Introspection: "Self-observation"

The subject must know when the experience begins and ends

Subject is master of situation

Introspection: Mayer and Orth (1901)

- Participants performed a free-association task. The experimenters spoke a word to the participants and then measured the amount of time the participants took to generate responses to the word. Participants then reported all their conscious experiences from the moment of stimulus presentation until moment of their response.
- Many participants reported rather indescribable conscious experiences, not always seeming to involve sensations, images, or other concrete experiences. This result started a debate over the issue of whether conscious experience could really be devoid of concrete content.

To get a feeling for this method, try to come up with an association for each of the following words; after each association, think about the contents of your consciousness during the period between reading the word and making your association. Dot, book, coat, bowl.

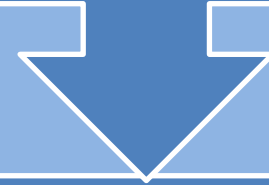


Edward Titchner

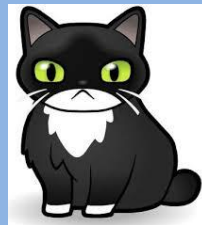
Student of Wundt's, taught at Cornell University in 1892
Proponent of *introspection*

The study of the structure of the conscious mind

Interested in how people process sensory stimuli



The first to draw a distinction between sensation (a stimulus' effect on our senses) and Perception (our brain's interpretation of the stimulus)



Did they hear a sound?
What did they hear?

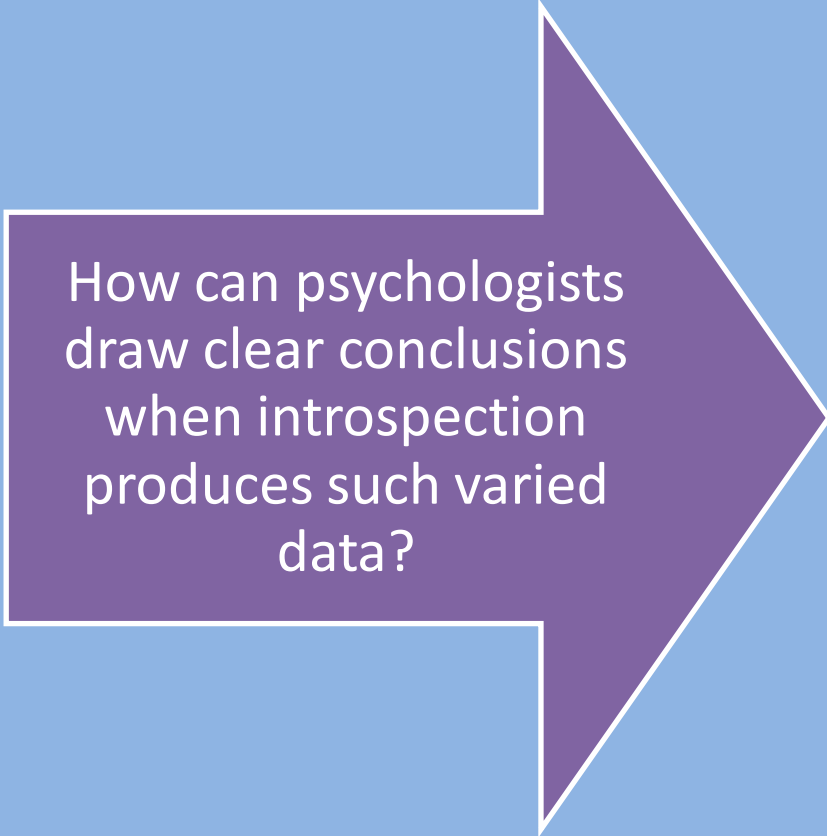
The processing and categorising of sound took longer than hearing it = perception is separate, but related to sensation

Narrow view of psychology. Excluded mental illness, education applications and social psychology because not open to introspection Note: Method at that time defined what was allowable science

Problems with structuralism



Observers were highly trained, but self-reports were not consistent across people



How can psychologists draw clear conclusions when introspection produces such varied data?

Herman von Ebbinghaus

https://www.youtube.com/watch?v=TGGr5Uc8_Bw

Contemporary of Wundt in Germany

Big influence on cognitive psychology: Developed method for studying forgetting as function of time

- Stimuli: lists of *non-sense syllables*: Consonant-Vowel-Consonant's (CVC's) (no pre-existing associations)
- Method: Learn list of CVC's, count number of trials to recall perfectly → Wait 2 days → re-learn list.
- Savings score = # of trials to learn the 1st time - # of trials to learn 2nd time
 - One subject entire career – himself
 - Learned over 40,000 CVC's

William James

Wundt's student, hired at Harvard: Philosopher, but started first American psychology laboratory

Proposed Functionalism

Stressed the functions of the mind rather than contents/structure

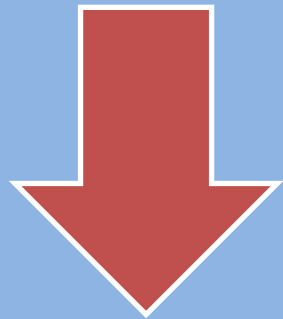
- How does the mind function?
- How does the mind adapt to new circumstances?
- Proposed multi-component memory system: Primary Memory vs. Secondary memory

Functionalism

Focus was to understand the function of the mind

Concerned with the “why” of mental processes

- This led directly to an interest in motivation



Focus was not upon a description of its attributes.



The function was to aid the organism in adapting to its environment.



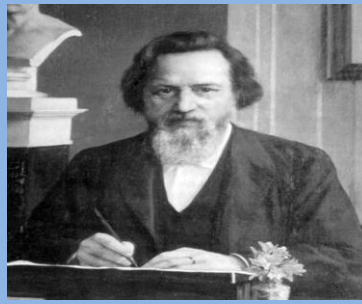
Accepted both mental processes and behaviour

- Both accepted as legitimate for psychology

Interested in individual differences

- More interested in individual differences among organisms than similarities.

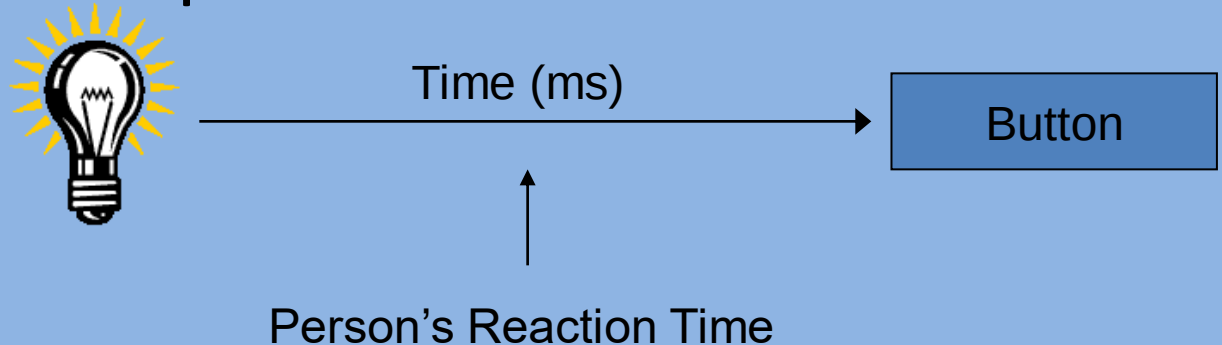
Early experiments - 1860s



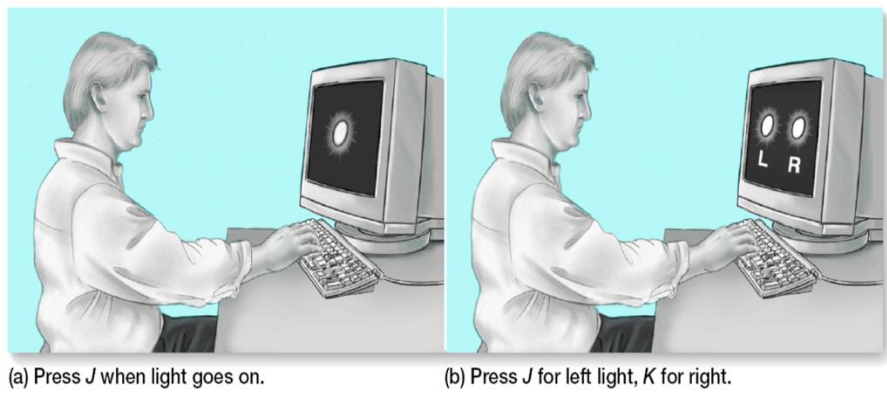
What is reaction time?

- Franciscus Donders - measured the speed of thought
– 1868
- Reaction time experiments (how long to make a decision)

- The time elapsed between some stimulus and the person's response

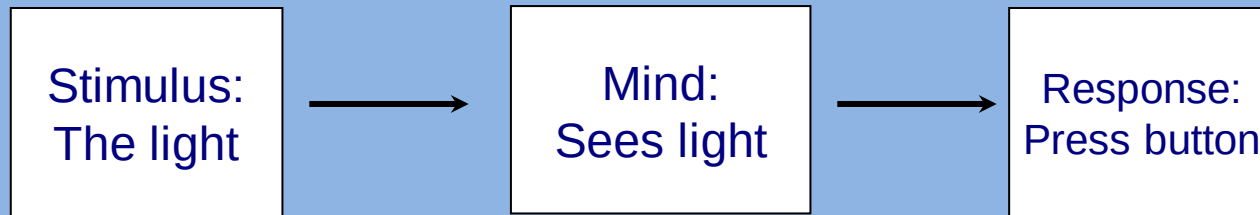


- Typically measured in milliseconds
- Considered a measure of difficulty



Measuring the speed of thought

Simple Reaction Time experiment:



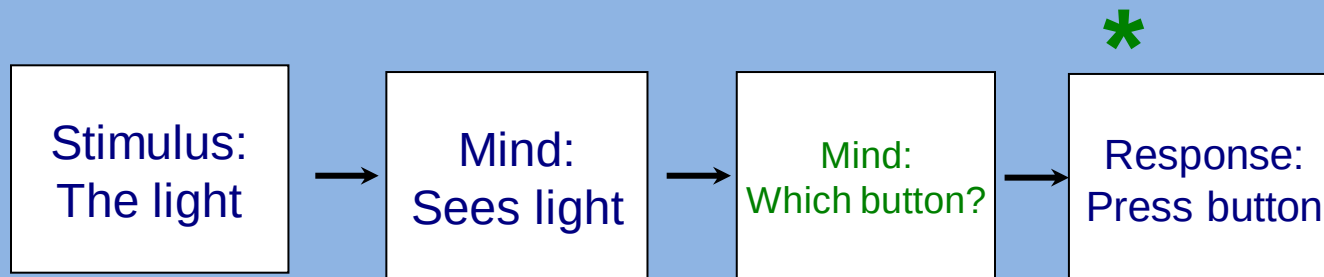
Example:

Choice Reaction Time experiment:
500 ms

Simple Reaction Time experiment: 350 ms

$$500 - 350 = 150 \text{ ms}$$

Choice Reaction Time experiment:



150 ms for the extra stage in choice RT:

150 ms to choose which button to press

Task

Try the reaction time test.

Laptop -

https://www.psychtoolkit.org/lessons/simple_choices_rts.html

<https://backyardbrains.com/experiments/reactiontime>

Applying cognitive psychology to everyday life!

Reliability of EWT (e.g., Loftus, 1996) - led to guidelines for law enforcement personnel (U.S. Department of Justice, 1999).

Applications of basic information processing to the design evaluations - modern flight management systems on aircraft (John, Patton, Gray, & Morrison, 2012).

Applications to education - reading instruction (Rayner, et al, 2002) and computer-based systems for teaching mathematics (Koedinger & Corbett, 2006).

Important contributions to our understanding of brain disorders that reflect abnormal functioning, such as schizophrenia (Cohen & Servan-Schreiber, 1992) or autism (Dinstein et al., 2012; Just, Keller, & Kana, 2013).