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Cognition and Emotion

Introduction to Cognitive Psychology

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What is Cognitive Psychology?

- ▶ Scientific study of the mind (and the brain).
- ▶ “Mind” = workings of a living brain.
- ▶ The mind determines and controls behaviour.
- ▶ Allows us to make sense of the world.
- ▶ Helps us decide what action to take when necessary.

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What is Cognitive Psychology?

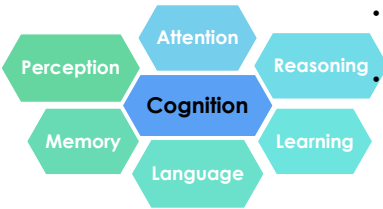
- ▶ Information is received through senses and then processed by various systems.
- ▶ Some operate automatically/unconsciously, others are conscious and require effort.
- ▶ Cognition from Latin “Cognoscere” – to know.
- ▶ Broadly, nowadays it also incorporates understanding brain structures and activity.

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Cognitive Psychology

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► Aims to understand key aspects of functioning...



- Some are well understood.
- Others not so much...
- I.e., higher-order cognitive processes.

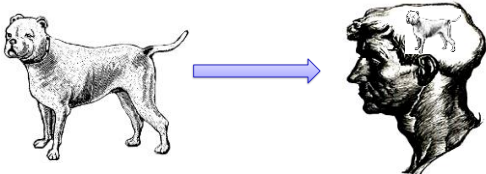
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Representation

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An important word in Cognitive Psychology!!

Does your mind represent information exactly as it exists in the world?



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What do you see?

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Historical Overview

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- ▶ **When did Cognitive Psychology start?**
 - ▶ No specific date - instead shift to cognitive experimental research
 - ▶ Work considered as involving cognitive processes had been studied as early as the 1800s.
 - ▶ Mind traditionally domain of philosophers
 - ▶ Early psychology also concerned with 'conscious' experiences.
 - ▶ Scientists would observe physical objects through own conscious experience - Known as introspection.

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Historical Overview

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- ▶ **Wilhelm Wundt**: First to call himself a Psychologist
- ▶ Believed the mind could be studied scientifically
- ▶ Produced 1st Psychology textbook:
- ▶ Studied vision, audition, & somatosensation
- ▶ Examined attention, emotional feeling, and word association.
- ▶ His approach was called 'Structuralism'



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Historical Overview

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- ▶ However, structuralism lost pace by early 20th century, due to the methods employed
- ▶ Too difficult to ask observers to report on sensations with data unmodified by experience.
- ▶ Issue of retrospection – recalling experience after it occurred, likely led to errors in report.

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Historical Overview

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- ▶ **Gestalt psychology:** German word 'Unified form'
- ▶ Argues contents of consciousness cannot be broken down to simple sensations:
 - ▶ The whole is worth more than sum of its parts
- ▶ Perceptions result from patterns of interactions among many elements across time and space.
- ▶ The task of perception was to recognise objects according to the organisation of their elements.

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What do you see?

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Historical Overview

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- ▶ **Functionalism** - began in USA as protest against Structuralism.
- ▶ Structuralism interested in components of consciousness.
- ▶ Functionalism interested in process of conscious activity.
- ▶ **Biggest proponent: Williams James** (1842–1910)
 - ▶ "My thinking is first, last, and always for the sake of my doing".
- ▶ **Meaning:** thinking was not the end, its function was to produce useful behaviours.

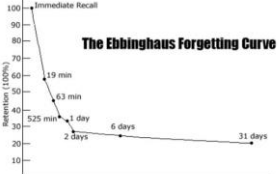


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Historical Overview

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- ▶ Objective measure of mental operations
- ▶ Studied forgetting by learning list of nonsense syllables (e.g., dap, sul), and recall them at various intervals.



The Ebbinghaus Forgetting Curve

19 min
43 min
525 min
1 day
2 days
6 days
31 days



Hermann Ebbinghaus

However, his studies were carried out on himself as the only participant!!!

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Historical Overview

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- ▶ Speed of mental operations: 1850s, Johannes Müller predicted the speed of neural conduction would never be measured (it was faster than the speed of light).
- ▶ Within a decade, his own student, Hermann von Helmholtz shown it to be only 100 meters a second.
- ▶ Mental Chronometry: Dutch physiologist, F. C. Donders, used a simple method to estimate the speed of mental operations.

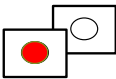



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Historical Overview

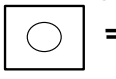
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- ▶ Donders' **Subtractive method** was the basis for modern reaction time studies.
- ▶ Respond to RED target Respond to target appearance



RT = 200ms

—



RT = 150ms

=

50ms

Time to discriminate between 2 lights

Extended this type of exp. to measure response choice – e.g., press key 1 for red and key 2 for green.
 However, subtraction may not isolate specific mental operations (c.f. Sternberg's, 1968 additive factors method).

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Historical Overview

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1800 – 1900s

- ▶ Behaviourism: focus study of psychology away from internal mental states to the study of overt behaviour.
- ▶ For example, work of:
 - ▶ Watson (1878-1958)
 - ▶ Pavlov (1849-1936)
 - ▶ Skinner (1904-1990)
 - ▶ Thorndike (1874-1949)
- ▶ Neo-behaviourism – Tollman (1886-1959)



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Historical Overview

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- ▶ Behaviourism: mental states could not be examined because they involved subjective/private processes.
- ▶ Ψ should be scientific & subject matter should be directly observed, not subjective conscious experiences
- ▶ Science aims to make knowledge empirical i.e., based on observables not on ideas or calculation.
- ▶ However, science also relies on unobservable constructs e.g., Gravity to explain falling objects, tides, planetary movement, magnetic fields, electron charge.

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Historical Overview

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- ▶ Behaviourism: even complex phenomena can be explained by simple laws of S-R learning.
- ▶ It set the way for conducting rigorous experiments in controlled manner.
- ▶ But, it restricted psychology to observable behaviours.
- ▶ Aspects of human functioning could not be explained by behavioural theories - E.g., meaningful language.
- ▶ Struggled to explain physiological aspects and individual differences.

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Cognitive Revolution

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- ▶ Chomsky: Nativist Theory - biological based theory suggesting we are pre-programmed with innate ability to develop language.
- ▶ Chomsky (1959): Language acquisition device (LAD)
 - ▶ a language organ is hardwired in our brain and once we encounter language the LAD is activated.
- ▶ Chomsky, Pinker et al: Teaching to learning does not add up.
 - ▶ Production of novel sentences not accounted for by Behaviourism. Errors appear to be overgeneralisations of grammatical rules.



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Cognitive Revolution

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- ▶ For years, concepts such as consciousness were considered outside the domain of psychology
- ▶ Protest against restrictions of behaviourism began and so the study of consciousness, feelings, imagery, and other personal/private events that occur within ourselves took force.
- ▶ The existence of mental representations allowed for a more flexible and sophisticated account than S-R connections alone.

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Cognitive Revolution

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- ▶ External environment does not solely determine behaviour
- ▶ People are not slaves to "here & now" - conduct could be a function of aspects not in the current environment.
 - ▶ Either because they were not present or had not yet been presented, or they were abstract ideas that could not exist in the environment in a concrete way.
- ▶ However, Costall (2004) noted: Cognitivism did take on aspects of behaviourism, as it understands behaviour in mechanistic terms – it wishes to understand what happens between the stimulus and a response.

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1956

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- ▶ An important year for Cognitive Psychology
 - ▶ Chomsky gave paper on theory of language.
 - ▶ Miller discussed “magic number 7 +/- 2”
 - ▶ Newell & Simon discussed “thinking computer”.
 - ▶ First systematic attempt to study concept formation from a cognitive perspective (Bruner, Goodnow, & Austin).

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Neisser (1967)

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- ▶ Seen as “Father of Cognitive Psychology”
- ▶ Wrote *Cognitive psychology* (1967).
 - ▶ Measurement and hypothesising observable behaviour
 - ▶ E.g., dual-task process
 - ▶ Cognitive hypothesis: two similar tasks take up cognitive processing abilities (“cognitive load”)
 - ▶ Observable behaviour: poorer ability to carry out task than when a separate or dissimilar task
 - ▶ His more controversial book *Cognition and reality* suggested memory is not a snap shot of a moment, it is mainly reconstructed.



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Inside your head is the most complex instrument in the (known) universe!

Your Mind

The aim of cognitive psychology is to develop tools and techniques for probing how the mind works

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Approaches to Human Cognition

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1. **Experimental Cognitive Psychology**
 - ▶ Uses behavioural evidence
2. **Computational Cognitive Science**
 - ▶ Uses computational models
3. **Cognitive Neuropsychology**
 - ▶ Involves studying brain-damaged patients
4. **Cognitive Neuroscience**
 - ▶ Behavioural evidence + evidence from the brain
 - ▶ Researchers make use of two or more combined to achieve most comprehensive account of cognition.
