



The Cognitive Approach

Week 5



General facts regarding the Cognitive approach

This approach concerns itself with the way in which people manage the flow of information within their minds. The approach focuses on our knowledge and understanding as facets of cognition.

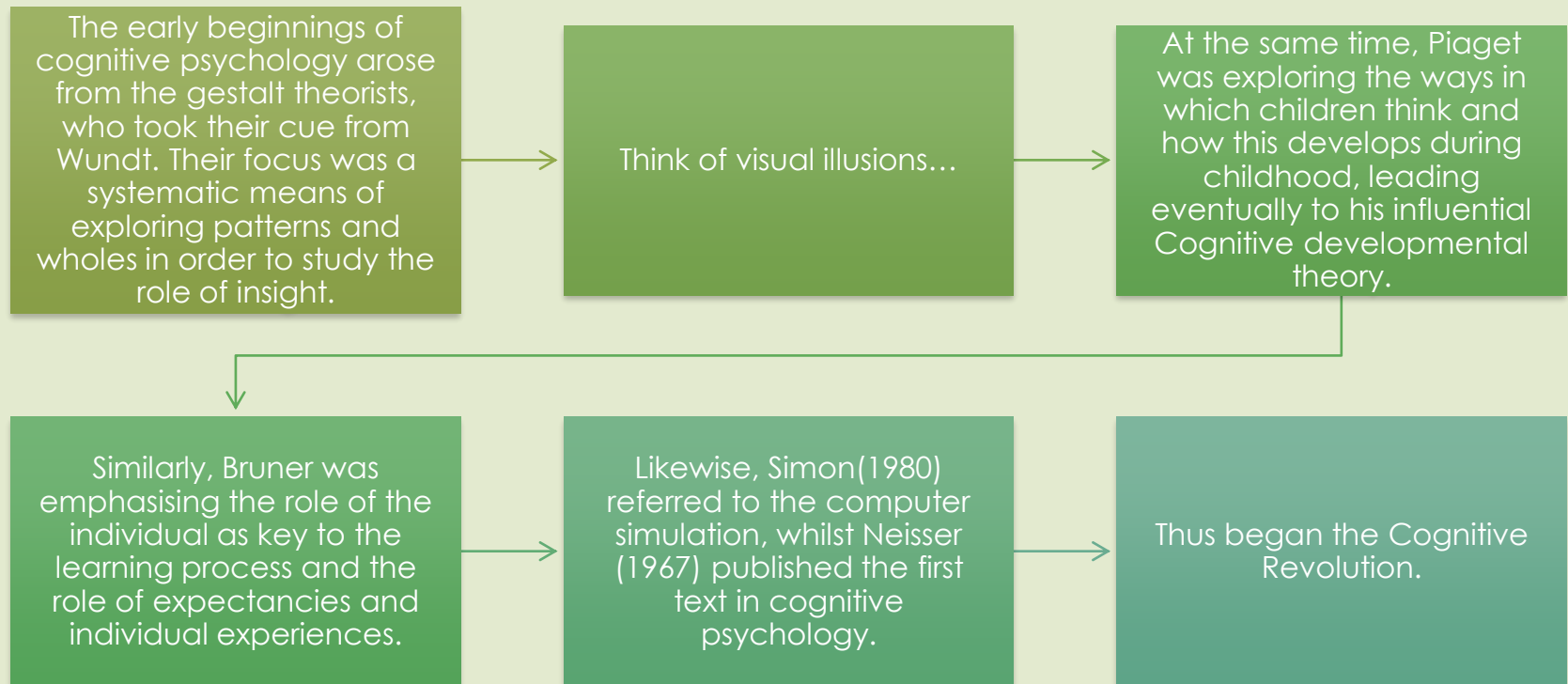


In modern cognitive psychology, we are concerned with how this knowledge is represented within the human mind (Mandler, 1985).



By and large, until recent years, the approach has explored Cognitive process independent of their biological underpinnings, that is until Cognitive science or cognitive neuroscience.

Gestalt Psychology



Principles of Gestalt Psychology

Similar things tend to appear grouped together in both visual and auditory stimuli. For example, you probably see the coloured circles as rows, not just dots.

We perceive objects as belonging together when they are enclosed by anything that forms a visual border around them

Symmetry states that the viewer should not be given the impression that something is out of balance, or missing, or wrong. If an object is asymmetrical, the viewer will waste time trying to find the problem instead of concentrating on the instruction.

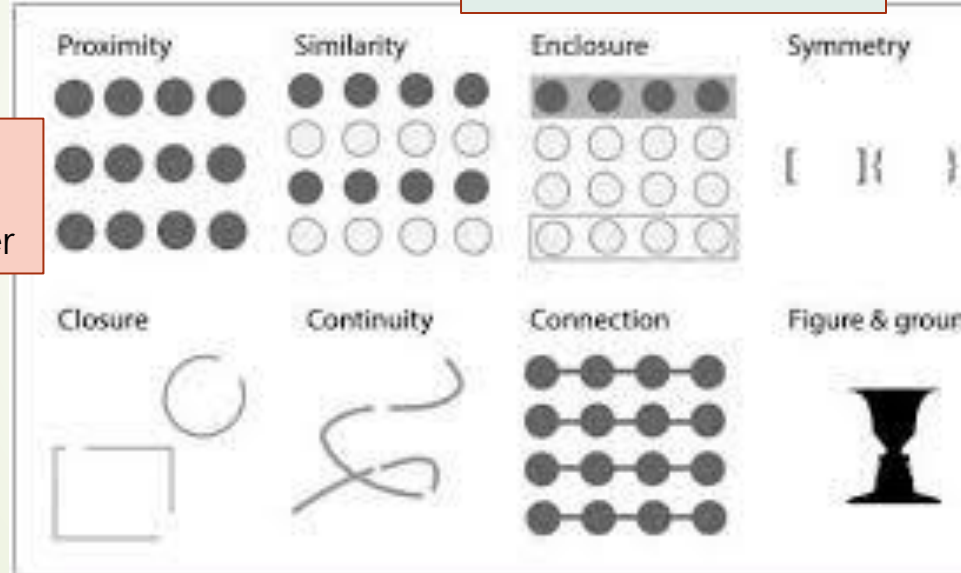
Things that are near each other seem to be grouped together

Things are grouped together if they seem to complete some entity

Points that are connected by straight or curving lines are seen in a way that follows the smoothest path

The law of connectedness states that elements that are connected to each other using colours, lines, frames, or other shapes are perceived as a single unit when compared with other elements that are not linked in the same manner.

The eye differentiates an object from its surrounding area. a form, silhouette, or shape is naturally perceived as figure (object), while the surrounding area is perceived as ground (background).



Newer ideas:

Fodor (1983) was interested in the idea of 'modularity of mind'.

This viewpoint sees cognition as a set of domain specific problem-solving mechanisms, a set of sub-systems relatively independent to one another, but with the ability to communicate to each other when necessary.

Studies from cognitive neuroscience have corroborated this idea, that our conscious experiences are not always continuous with our brain activities, but that they can be (Roser and Gazzaniga, 2004).

Think of reading for example- once acquired, it is impossible to prevent. Yet, it is not domain specific, but rather a result of sub systems in aggregate that account for our unlimited capacity to adapt to.

This is referred to as parallel distributed processing, different sources of information for one event are processed in separate parts of the brain then integrated to form our experience.

Modularity of mind and PDP: what is the difference?

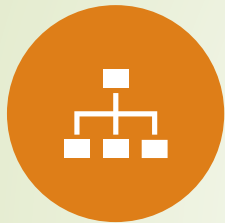
Modularity

- Hard wired and content specific neural systems
- Fast input systems automatically triggered by the specific stimulus. E.g. It is impossible to hear speech as noise; you automatically recognise it as language.
- Linebarger (1989) neuropsychological evidence for linguistic module

PDP

- Patterns of activation within interconnected networks which increase in knowledge base via experience.
- PDP networks are non modular central processors which are creative and interactive in nature.
- E.g. Memory, attention, perception.

An example of modularity



One debate of the mind, is that it is organized in specific “modules” responsible for specific tasks.



These modules operate independently of each other in order to perform their designated role in cognition, and many cannot be influenced by other modules or be processes of which we are consciously aware.



For example, there are claims that language acquisition is reliant on an innate module that specifically evolved for linguistic functions (see Noam Chomsky’s proposal on “universal grammar”).



Without this language-specific module, our ability to communicate in the sophisticated way that we do would be impossible. It seems there are several areas that support language (e.g., Broca’s area, Wernicke’s area), and damage to one of these areas makes the individual lose an aspect of linguistic processing, such as speech production or comprehension.

Modularity of mind

The Modularity of Emotion

Affective Neuroscience

Panskepp (1992, 1996, 1998); Davidson & Sutton (1995); Davidson (2000)

Receiving
sensory
information

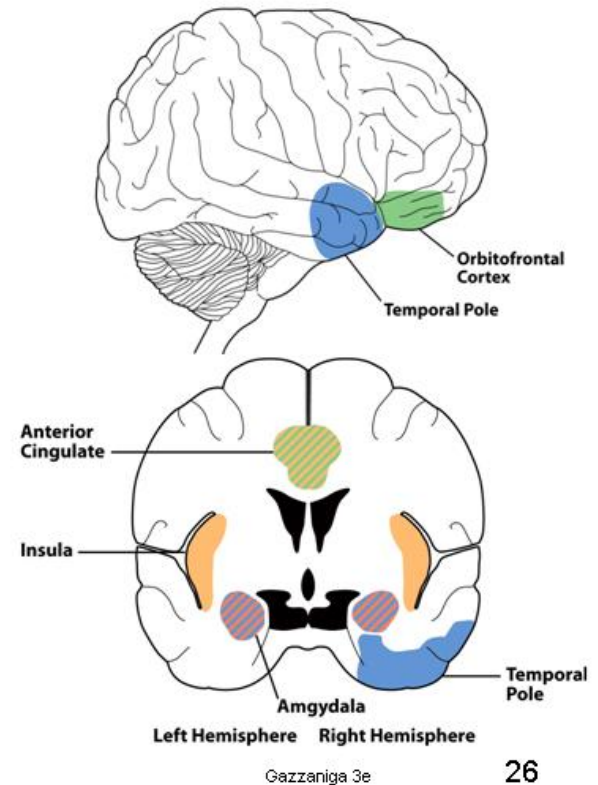
For emotional
salience

- Amygdala
- Orbitofrontal Cortex
- Anterior Cingulate Gyrus
- Nucleus Accumbens
- Insula

Regulating
emotional
responses
e.g. bonding.

Conscious
experience of
emotions

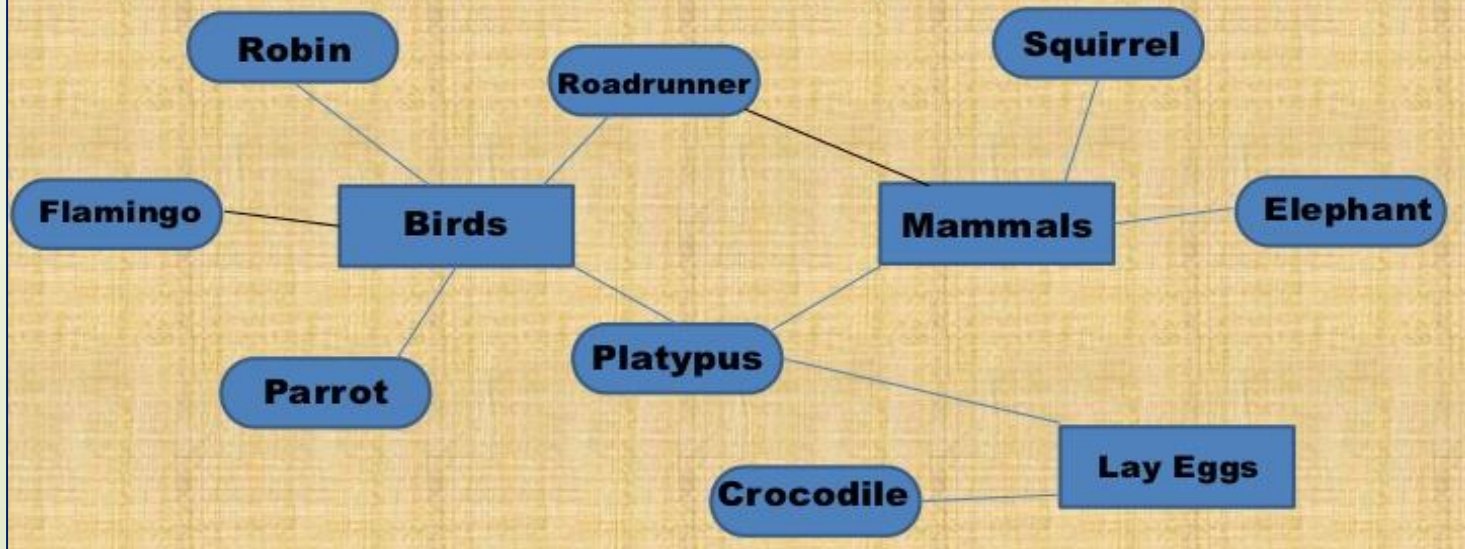
Interface
between
cognition,
emotion and
action.



Parallel distributed processing (LTM)

3. Parallel Distributed Processing (PDP)

Memories exist in a “network.” New experiences alter this network and change one’s knowledge base

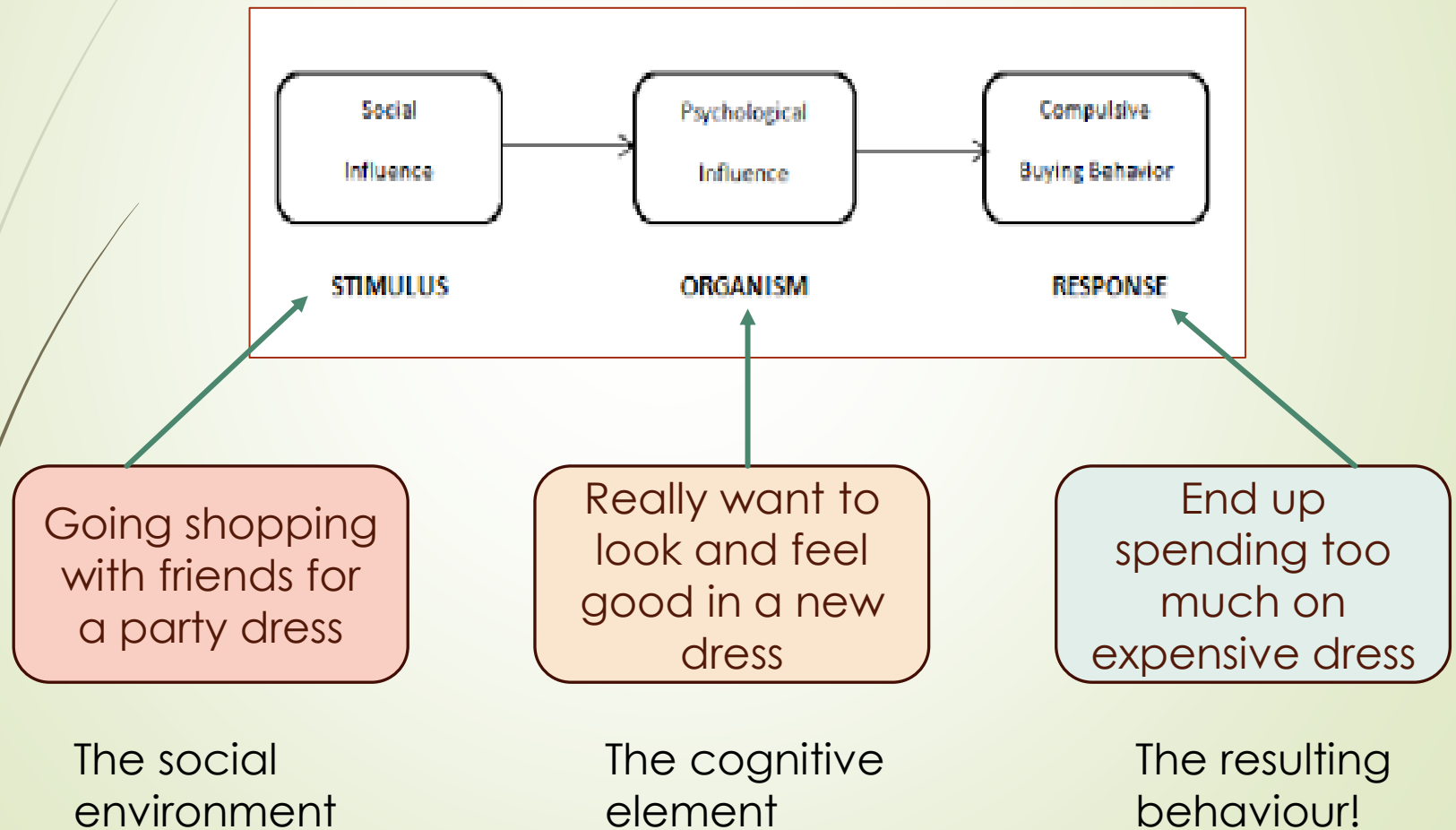




The Cognitive Approach

- Assumptions
- **1. Thought influences behaviour.**
Thought acts as mediational processes between stimulus and behavioural response.
- Behaviourists rejected the idea of studying the mind because internal mental processes cannot be observed and objectively measured.
- However, cognitive psychologists regard it as essential to look at the mental processes of an organism and how these influence behaviour.
- Instead of the simple stimulus-response links proposed by behaviourism, the mediational processes of the organism are important to understand.

Stimulus, Organism, Response



2. Humans are information processors

Without this understanding, psychologists cannot have a complete understanding of behaviour.

Research has found that if a person is aware that attempts are being made to condition their behaviour, this awareness can prevent conditioning taking place. Conscious thought mediates between stimulus and behavioural response.

This goes against the behaviourist argument that all human behaviour is as a result of conditioning.

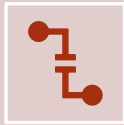
This also sets humans apart from animals and is one reason why cognitive psychologists do not as a rule carry out their research on non-human animals.



Information processing is based on transforming information, storing information and retrieving information from memory.



* Input processes are concerned with the analysis of the stimuli.



* Output processes are responsible for preparing an appropriate response to a stimulus.



Information processing models of cognitive processes such as memory and attention assume that mental processes follow a clear sequence. For example on next slide -



* Storage processes cover everything that happens to stimuli internally in the brain and can include coding and manipulation of the stimuli.



For
example:

- This has been used to explain how humans perceive ambiguous figures. Information comes in via the senses. The information is then organised and interpreted based on prior expectations and what we already know about the world. The correct behavioural output is then given. For example when we read this:
- The middle letters are ambiguous but we can still read the words because we use the information around the letters and our prior knowledge of reading and writing to help us to interpret these unclear figures and correctly interpret the visual information as “the cat”.

TAE CAT

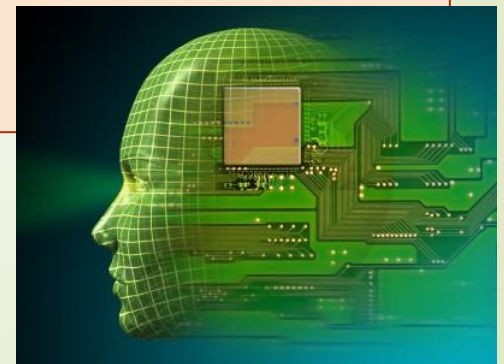
3. The mind operates like a computer

- How humans and computers process information. In cognitive development, the information processing theory of cognitive development has likened children's minds to computers. Functioning in both computers and children is dependent on an increase in processing capacity, processing speed and processing efficiency.

Humans	Information taken in via senses	Info processed in the brain	Info stored in memory	Info retrieved from memory	Behavioural response
Computers	Information taken in via keyboard	Info recorded	Info stored	Info retrieved from memory	Symbolic output

Cognitive models

- Cognitive psychologists use the results of their research to develop **models** of how people process information
- They **infer** mental processes from comparisons between the **information** (input) a person receives and the **behaviour** (output) they produce
- Such computational models of the mind have proved useful in the development of 'thinking machines' or **artificial intelligence**

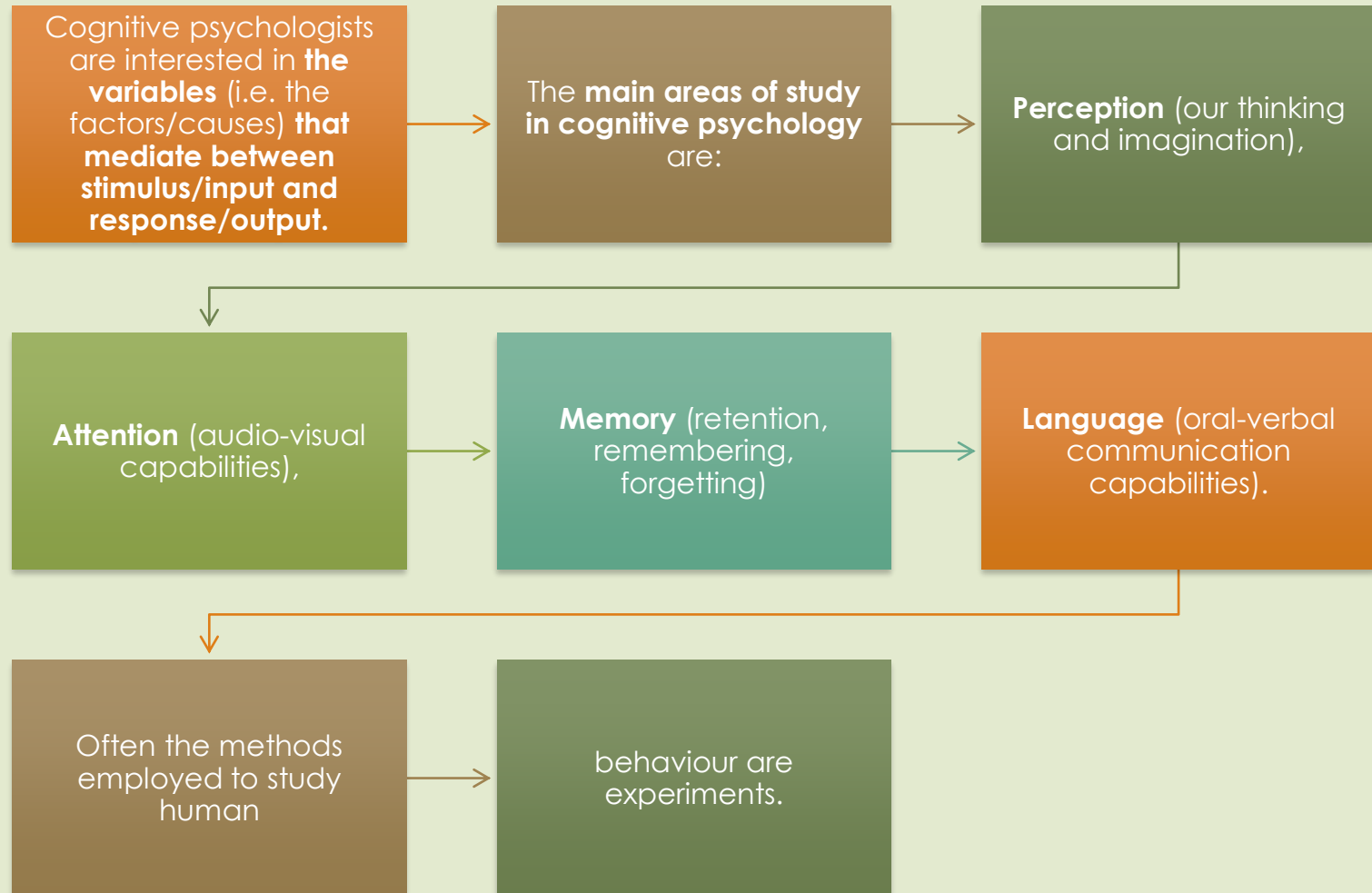


4. Internal mental processes can and should be investigated scientifically

Cognitive psychologists follow the example of the behaviourists in preferring objective, controlled, scientific methods for investigating behaviour. They use the results of their investigations as the basis for making inferences about mental processes.

Carefully designed experiments have demonstrated that people are able to remember 5-9 items on a memory test. The number of items recalled is the behavioural output and from this we are able to infer that the capacity of the STM is 7 ± 2

Methods used in Cognitive Psychology



However...

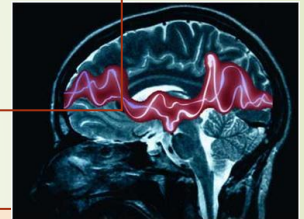
- Idiographic techniques have been applied through individual case studies:-
- E.g. Shallice and Warrington (1974) 'KF'- A patient who suffered brain damage as a result of a motorcycle accident. His LTM (long term memory) was normal, but his STM (short term memory) became severely impaired.
- HM (Milner, 1965) severe anterograde amnesia.
- Clive Wearing (severe retrograde and anterograde amnesia).
- KC (Tulving, 2002) inability to form or retrieve episodic memory.

Social cognition

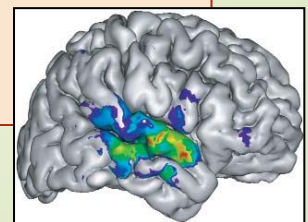
- Social cognition focuses on how people process, store, and apply information about other people and social situations. It focuses on the role that cognitive processes play in our social interactions.
- A branch of social psychology, social cognition concerns itself with impression formation, heuristics and social categorisation.
- Think of schema and stereotyping
 - The cognitive component in our perceptions of group members is the stereotype—the positive or negative beliefs that we hold about the characteristics of social group. We may decide that “French people are romantic,” that “old people are incompetent,” or that “university lecturers are absent minded.”

The emergence of cognitive neuroscience

The scientific study of biological structures that underpin cognitive processes.



- Cognitive neuroscientists study many different aspects of human cognition, including the neural processes underlying memory, attention, perception and awareness.
- They are also interested in social cognition, the brain regions involved when we interact with others.
- What is also of interest is how impairments in these regions may characterise different psychological conditions.

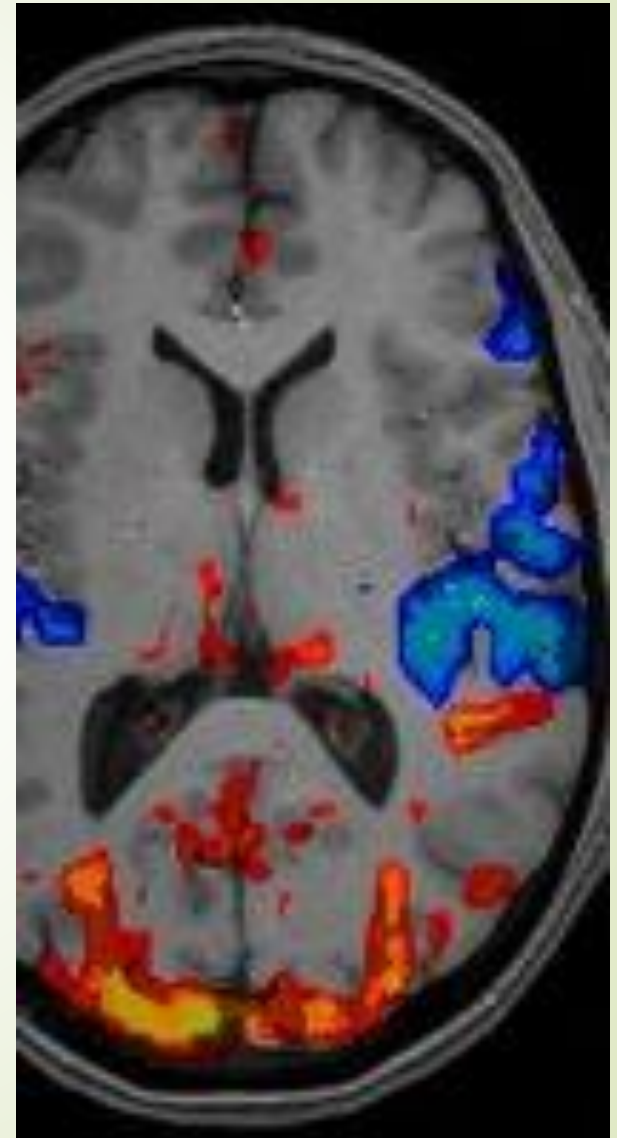


Cognitive neuroscience and impression formation (person perception)

- Mason and Macrae (2004) used functional magnetic resonance imaging (fMRI) scans to test whether people stored information about other people in a different location in the brain than where they stored information about animals, and they found that this was the case. The areas of the prefrontal cortex that were more active when people made judgments about people rather than dogs.
- Neuroimaging revealed that responses in the amygdala and the posterior cingulate cortex (PCC) were stronger while encoding social information that was consistent, relative to inconsistent, with subsequent evaluations (Shiller et al., 2009).
- These findings provide evidence for encoding differences on the basis of subsequent evaluations, suggesting that the amygdala and PCC are important for forming first impressions.

How are these biological structures investigated?

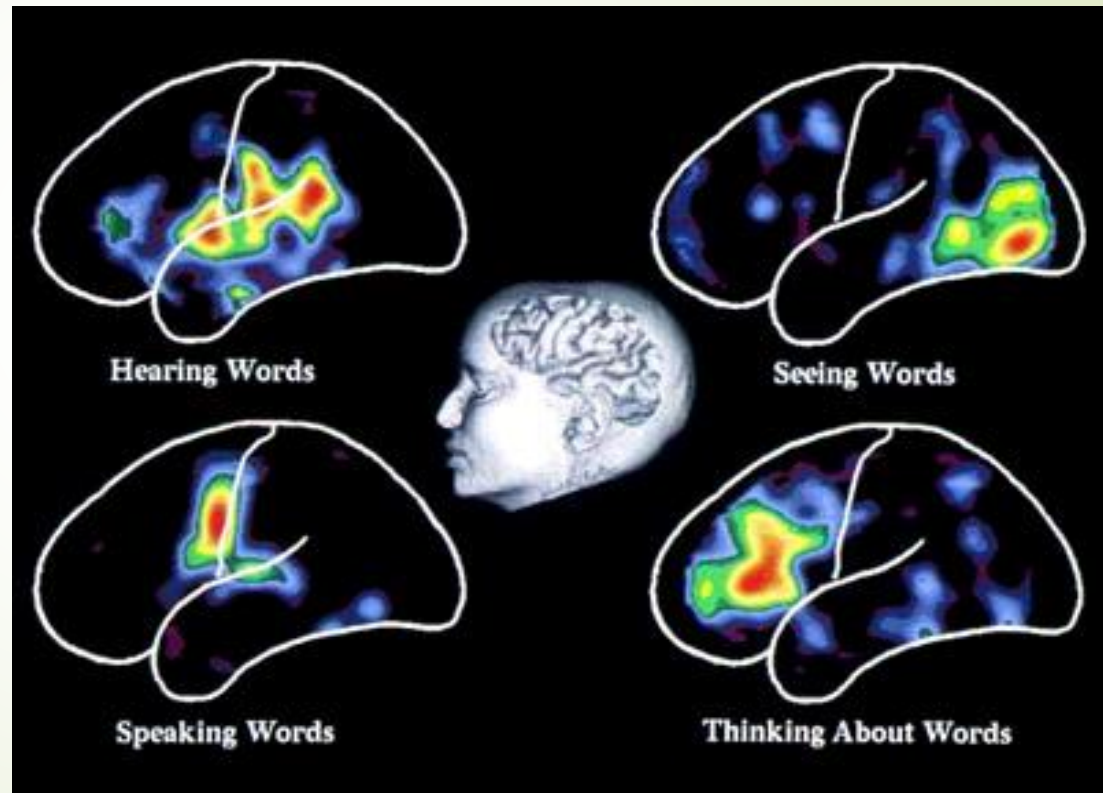
- It is only in the last 20 years, with advances in brain imaging techniques that scientists have been able to systematically observe and describe the neurological basis of mental processes.
- This has been possible due to the development of brain imaging techniques such as **fMRI** and **PET** scans (more on this in *biopsychology*).
- As a result of the use of sophisticated scanning techniques (to observe functioning in specific areas) alongside the experimental methods (to infer the processes taking place), cognitive neuroscience is rapidly becoming the dominant paradigm in modern psychology.



How are these biological structures investigated?

➤ **Example of neuroscience use for studying cognitive processes:**

➤ It has been possible to work out which parts of the brain are involved in the processing of words



Cognitive neuroscience and memory

- We know from biopsychology that the Amygdala is involved with memory consolidation. In addition, research has shown that the hippocampus plays an essential role in the formation of new episodic memories, along with the mammillary bodies and dorsomedial thalamus.
- However, as a result of cognitive neuroscience, we know that long term episodic memory is not stored in these structures. Mathematical models based on the connectivity of cortical neurons indicate that it is the cortex that is optimised for information storage (Brunel, 2016). E.g. studies of patients with Korsakoff's syndrome (damage to these areas) can be treated with thiamine to prevent further deterioration.

