

PSY246

Topic list

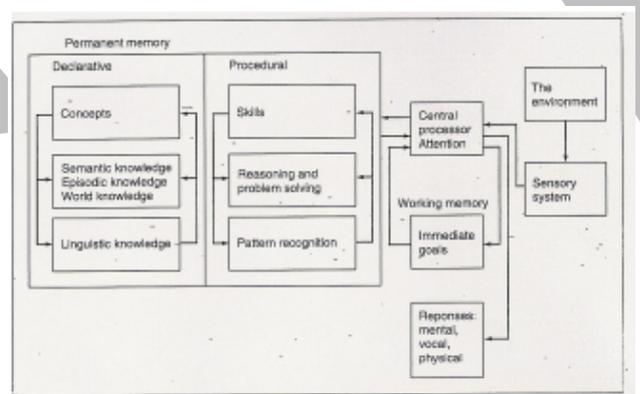
- Week 1 – approached to human cognition
- Week 2 – working memory
- Week 3 – attention
- Week 4 – visual attention and object recognition
- Week 5 – episodic memory
- Week 6 – semantic memory
- Week 7 - BREAK
- Week 8 – concepts and categories
- Week 9 – word recognition and reading
- Week 10 – thinking and reasoning
- Week 11 – language production
- Week 12 – cognitive neuropsychology
- Week 13 – revision

Lecture 1

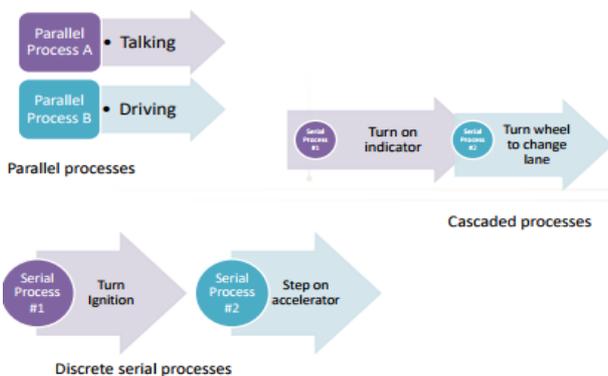
Approaches to human cognition

- Aims to understand the workings of the human mind by studying human behaviour, often using experimental methods (also neuropsychological data)
- Most cognitive behaviour involves more than just one cognitive process

Stimulus → attention → perception → thought processes → decision → response or action



Types of processing : parallel vs. serial



Types of Processing: bottom-up vs. top-down processing



- External stimulus causes internal cognitive processes to occur, producing the desired response
- Processing influenced by the individual's expectations and knowledge

Cognitive psychology → attempt to uncover the nature of human cognition by observing people's behaviour

Cognitive neuroscience → the attempt to use information about behaviour and the brain to understand human cognition. Techniques include single unit recording, erp, functional magnetic resonance imaging, magneto-encephalography.

Temporal resolution – the accuracy with which one can measure when an event occurs in the brain.

Spatial resolution – The accuracy with which one can measure where an event occurs in the brain

Invasiveness – this refers to whether the equipment is located internally or externally.

Computational cognitive science → the attempt to use computational models to further understanding of human cognition. Computational modelling is programming computers to model or mimic some aspects of human cognitive functioning. Compare models behaviour to human behaviour. It requires researchers to make their assumptions explicit.

Cognitive neuropsychology → the attempt to understand human cognition by studying brain – damaged patients

Event related potentials (ERP)

- EEG non invasively measures electrical activity in the brain during cognitive activity
- Electrodes are placed on the scalp
- Event – related potentials (ERP) are recorded during repeated events
- **Limitations** → limited spatial resolution, despite high temporal resolution. Requires many trials. Skull and brain tissue distort electrical fields. Largely blind to subcortical activity

Functional magnetic resonance imaging (fMRI)

- Measures changes in the blood flow during cognitive activity
- Active brain regions have a higher ratio of oxygenated haemoglobin (blood), which have different magnetic property.
- Provides a non-invasive indirect measure of brain activity
- Spatial resolution is high, but temporal resolution is poor.

Magneto-encephalography (MEG)

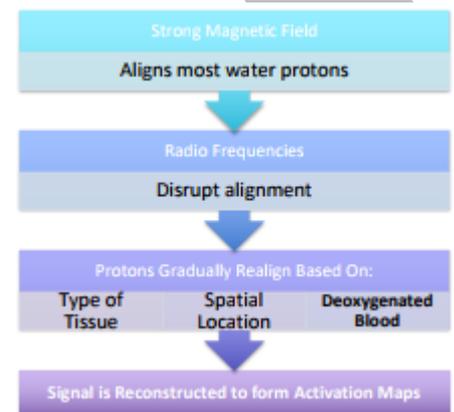
- Uses a superconducting quantum interference device
- Measures the magnetic fields produced by the brain's electrical activity
- Provides high temporal resolution and moderate spatial resolution.
- Not prone to some of the artifacts that affect scalp eeg. (because scalp is transparent to magnetic fields)
- **Limitations** → its expensive, requires participant to maintain an uncomfortable body position for long periods of time. The technology and analysis are relatively new and complicated, expensive to keep squid cool.

Cognitive neuropsychology

- **Functional modularity** → cognitive system consists of numerous, independent processing units. Modules exhibit domain specificity
- **Anatomical modularity** → each module is located in a specific brain region. These assumptions may not be met because brain damage may be diffuse or the cognitive process in question recruits many brain areas
- **Approaches include** → behavioural accuracy reaction time, electromagnetic, haemodynamic(fmri), brain lesions.
- All methods involve making inferences about underlying cognitive processes from the observable measures.
- Correlation, not causality except in true experiments

Neuropsychology → cognitive disorders due to brain impairment in reading (dyslexia), spoken language (aphasia) memory (amnesia), visual cognition)prosopagnosia – specific difficulty recognizing faces

Clinical psychology → delusion, memory, attention



Developmental psychology → reading acquisition, developmental changes in attention, memory and language

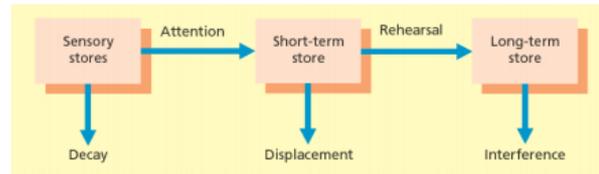
Forensic psychology → attention, memory (eye witness identification)

Lecture 2 – working memory

Memory : Architecture and processes

- Architecture is the way in which the memory system is organised
- Processes is the activities occurring within the memory system
- Sensory stores → holds information in its original sensory modality (visual, auditory..)
- Short – term memory (STM) → store very limited capacity and the storage is fragile.
- Long- term memory (LTM) → store essentially unlimited capacity and holds information over long periods of time.

The original multistore model of memory



Criticisms of the original multistore model

1. Sensory store, stm store and ltm store are NOT unitary.
 - Each store does not operate in a single, uniform fashion but has subcomponents → stm replaced by working memory, ltm replaced by episodic memory and semantic memory
2. Over-emphasis of structural aspects of memory
 - Emphasis on processes (see episodic memory)
3. STM is not the gateway to LTM
 - The systems are interconnected → short-term memory tasks make use of knowledge in LTM.
 - Rehearsal may not be as crucial to learning → maintenance rehearsal does not result in durable memory
 - Impairment of STM does not necessarily lead to impairment of LTM.

Patient KF	
<p>Background</p> <ul style="list-style-type: none"> • A man aged 28 • Left parieto-occipital fracture in a motorcycle accident 11 years before • Verbal iq of 79, performance iq of 113 	<p>The main deficit → inability to repeat verbal material</p> <ul style="list-style-type: none"> • Digit/letter/word span of 1 • Recognition by pointing also poor • Paired- associate learning (of associated words) with 24 hour delay was normal. • Damage to parietal and temporal • Normal long term memory • Poor stm for letter words and digits

Short term and long term memory : evidence for independence

Amnesics

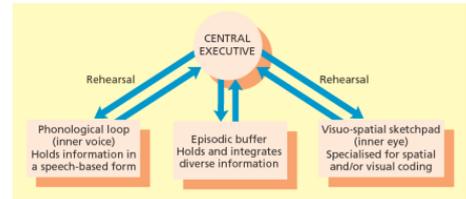
- Damage to the medial temporal lobe
- Impaired ltm
- Intact stm

WORKING MEMORY

- Baddeley and Hitch (1974) replaced the concept of short term store with working memory.

Central Executive	Phonological Loop	Visuo-Spatial Sketchpad	Episodic Buffer* (added in a later model)
<ul style="list-style-type: none"> • Modality free • Resembles attention • Deals with any cognitively demanding task • Uses slave systems 	<ul style="list-style-type: none"> • Holds info in speech-based form 	<ul style="list-style-type: none"> • Specialised for spatial and visual coding and manipulation 	<ul style="list-style-type: none"> • Added in an updated model (Baddeley, 2001; Repovš and Baddeley, 2006) • Temporary storage system • Holds and integrates information from phonological loop, visuo-spatial sketchpad, and LTM

Baddeley's Working Memory System



The major components of Baddeley's working memory system. Adapted from Baddeley (2001)

- The central executive resembles attention – a control system which co-ordinates the peripheral storage systems
- Episodic buffer was proposed later to account for data that could not be explained by the original model
- All components of the system are thought to be limited in capacity and relatively independent
 - If two tasks use the same component, they can't be performed successfully together
 - If two tasks use different components, they should be able to be performed similarly together or separately.