Approaches to Human Cognition

Study of Cognition

Aims: to understand workings of the human mind by studying human behaviour using experimental methods
Assumes: Most cognitive behaviour involves more than just one cognitive process
Major Goal: specify the processes and structures involved in cognition

Types of Processing

Parallel: two processes occur at the same time (in sync)
e.g. talking and driving
Serial: One process occurs after the other is complete
- Discrete (separate)
e.g. turn on ignition —> step on accelerator
- Cascaded (overlapping)
e.g. turn on indicator —> turn wheel to change lanes

Bottom Up: external stimulus causes internal cognitive processes to occur, producing the desired response
Top Down: processing influenced by the individual's expectations and knowledge
e.g. PARIS IN THE THE SPRING - expectation of sentence helps to miss the second THE

Approaches to Study of Cognition

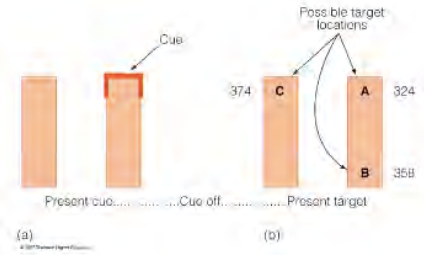
Cognitive Psychology: experimental method to test research hypothesis (observe people's behaviour)
Independent Variable: manipulation (conditions)
Factorial Design: more than one IV
Dependent Variable: measurement (data)
Computational Cognitive Science: use computational models - programme computers to model aspects of human cognitive functioning
Simulation: Compare model's behaviour to human behaviour
- Requires researchers to make explicit assumptions
Cognitive Neuropsychology: study brain-damaged patients to lear about intact and impaired patterns of cognitive performance
Assumptions:
1. Functional Modularity: cognitive system consists of numerous independent processing units - modules exhibit domain specificity (only respond to certain stimuli)
2. Anatomical Modularity: each module is located in a specific brain region
Cognitive Neuroscience: use information about brain and behaviour through various techniques
Temporal Resolution: accuracy of measuring when an event occurs in the brain
Spatial Resolution: accuracy of measuring where an event occurs in the brain

Object Based Attention

Attention can select an entire object

Cueing Task: press button when target appears —> cue signals where target may appear

Participants reacted the fastest when cue was valid —> also quicker if target appeared in same rectangle as cue



Equidistant rectangles rules out impact of spatial attention

Neural Evidence: Attention changes what object is processed in an overlapping stimulus

Attend to Face —> activation in face processing area (FFA) increases

Attend to House —> activation in scene processing area (PPA) increases

Spatial Visual Attention

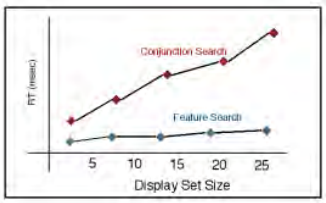
Attention directed to a location in the visual field

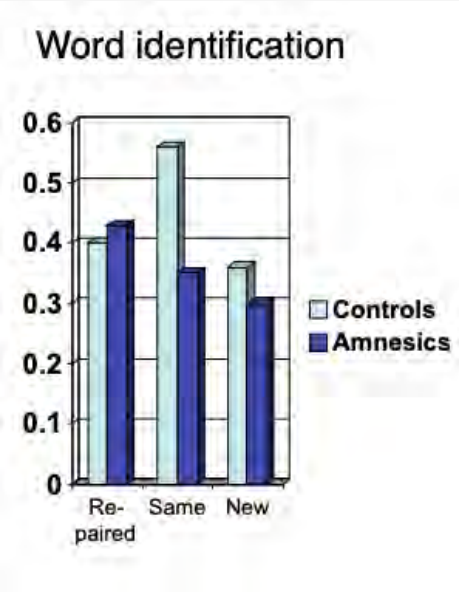
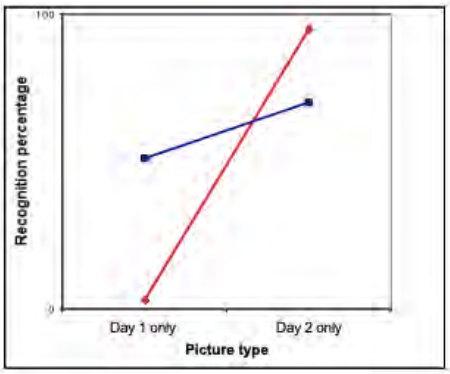
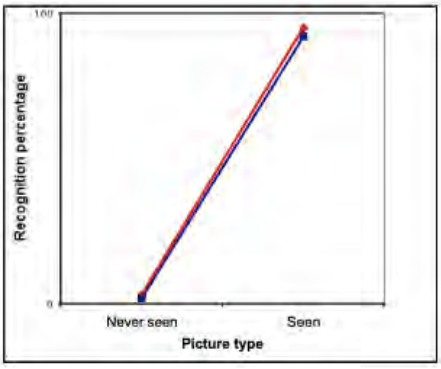
Spotlight Metaphor: attention moves across the visual field highlighting spatial locations

Effect of Set Size: Reaction time in finding a target is affected by the size of the set and whether or not the distractors share key features of the target

Find targets quicker in small set size compared to large set size

Pop out occurs when visual distractors share no key features with target (quicker to find)

Study	Procedure	Findings
Trreisman and Gelade (1980)	Conjunction target = target that shares features with distractions (conjunction search - R amongst Ps and Qs) Feature target = target shares no features with distractors	Reaction time increased as set size increased for conjunction searches Why? Attention 'binds' the features together making it more difficult to differentiate between distractor and target 

Study	Procedure	Findings
Schacter, Church and Bolton (1995)	Subjects heard words by 6 different speakers Subjects heard muffled words and identified them in implicit memory test (auditory word identification Conditions: same voice, re-paired voice, 'new' ((non-studied words)	Amnesic's lack the ability to bind an item (word) with the context (voice) 
Huppert and Piercy (1976)	Korsakoffs and controls were shown pictures on day 1 and different pictures on day 2 Test 1: Day 2, 10 mins after picture presentation. Subjects asked to respond to only day 2 picture (say no to day 1 pictures) Test 2: subjects asked to respond to all pictures presented (day 1 and 2)	Test 1: only controls able to discriminate between day 1 and day 2 pictures —> korsakoffs could not differentiate context (day)  Test 2: both groups performed equally well —> korsakoffs able to distinguish between seen and unseen pictures (responding on the basis of familiarity of pictures not recollection of context (which day) 

Spreading Activation Model:

Concepts organised non-hierarchically (explains lack of hierarchical effect)
Links between concepts vary in associative strength (explains typicality effect)
Activation of a concept spreads to other concepts linked to it (explains semantic priming effect)

Study	Procedure	Findings
Meyer and Schvaneveldt (1971)	Lexical decision task	Response to a word is faster following a semantically related word e.g. is 'truck' a word —> Car-truck is faster than flower-truck

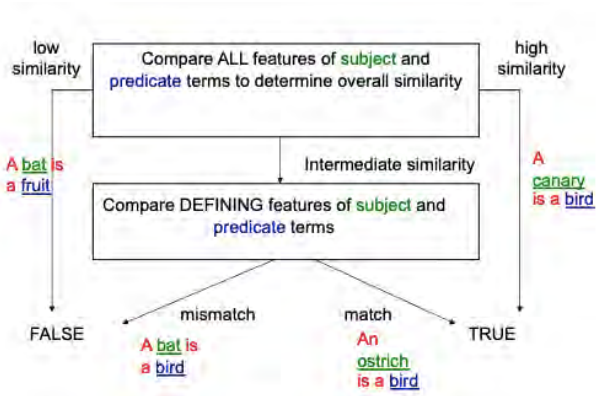
Feature Comparison Model

Assumes concept is represented as distributed features in semantic space
e.g. concept of 'sheep' represented in terms of:
Visual features: four legs, covered in whiteish fleece
Tactile: fleece soft + oily
Auditory: it baas
Gustatory: tastes great roasted; goes well with mint

Sentence Verification Data Explanation: Two-Stage Decision Model
Assumes decisions are made by comparing the similarity of features of subject and predicate terms
Assumes futures can be two types
Defining features: features essential to a concept
Characteristic features: features characteristic but not criterial to the concept

		Features represented by predicate noun	
Hedge	Statement	Defining	Characteristic
(A true statement)	A robin is a bird	+	+
	A sparrow is a bird	+	+
Technically speaking	A chicken is a bird	+	-
	A goose is a bird	+	-
Loosely speaking	A bat is a bird	-	+
	A butterfly is a bird	-	+

Two Stage Decision Model:



Faster decisions involve only the first stage decision (high/low similarity)

Typicality effect explained: higher similarity between a canary is a bird than an ostrich is a bird

Similarity effect explained: low similarity between a bait is a fruit than a bat is a bird

Problem: clear definition of defining and characteristic features is lacking
e.g. a bird has wings (defining); a bird can fly (characteristic) —> if you take the wings off a sparrow - is it still a sparrow?

Disorders of Semantic Memory

Semantic dementia: a neurodegenerative disease that is characterised by the gradual deterioration of semantic memory

Tutorial 1

Phonological Similarity Effect

Method:

On each trial a list of letters is presented one at a time in random order
Subjects asked to recall the letters in the same order that they were presented
Articulatory suppression trials involved repeating aloud '1, 2, 3, 4…' whilst the letters were presented

IV: two different independent variables

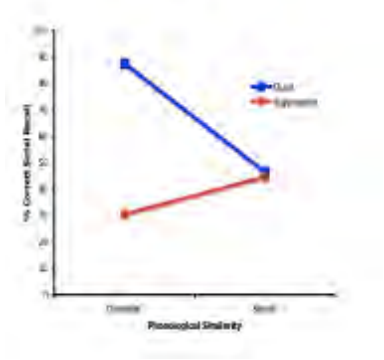
1. Whether the letters sounded similar or dissimilar
2. Whether participants were asked to participate in articulatory suppression

DV: proportion of letters correctly recalled

Dual Task Paradigm: performing two tasks simultaneously using the phonological loop very difficult

Hypothesis:

1. Participants should recall more dissimilar than similar letters
2. When engaging in articulatory suppression, performance should be worse than when not engaging in it and there should be no difference in recall of similar and dissimilar letters



Articulatory Suppression: prevents the conversion of visual information into phonological information - prevents subvocal rehearsal of articulatory control process from maintaining information through rehearsal

Evaluation:

Phonological similarity effect is fairly robust, it is not always eliminated by articulatory suppression however it is almost always greatly reduced in size