

MAJOR APPROACHES TO HUMAN COGNITION – WEEK 1

EXPERIMENTAL COGNITIVE PSYCHOLOGY (study of behaviour to understand human cognition)

- Cognitive psychologists assume that both processes are involved in the performance of cognitive tasks
- **Bottom -Up Processing:** directly influenced by environmental stimuli
- **Top – Down Processing:** stimulus processing that is influenced by factors such as an individual's past experience & knowledge
- **Serial Processing:** one cognitive process occurs at a time, one process is completed before the next one starts
- **Parallel Processing:** two or more cognitive processes occur at the same time
- **Strengths**
- First systematic approach to understanding human cognition
- The source of most of the theories & tasks used by the other approaches
- Flexible & can be applied to any aspect of cognition
- Has produced numerous important replicated findings
- Influenced social, clinical & developmental psychology
- **Limitations**
- **Ecological Validity:** extent to which findings are applicable to everyday settings
- **Indirect Evidence:** behavioural evidence only provides indirect evidence concerning internal processes (hard to determine whether the processes underlying task performance are due to serial or parallel processing)
- **Theoretical Vagueness:** theories are often vague and hard to test empirically
- **Paradigm Specificity:** occurs when the findings obtained with a given paradigm or experimental task are not obtained even when similar paradigms or tasks are used (findings do not generalise)
- **Theoretical Framework:** emphasis on specific theories applicable to a narrow range of cognitive tasks

COGNITIVE NEUROSCIENCE (study of the brain & behaviour to understand human cognition)

- **Strengths**
- Variety of techniques offering temporal or spatial resolution
- Functional specialisation & brain integration can be studied
- Flexible & permits causal inferences
- Permits assessment of integrated brain processing as well as specialisation
- Resolution of complex theoretical implications
- **Limitations**
- Neuroimaging techniques provide essentially correlational data
- Sometimes of limited relevance to cognitive theories
- Restrictions on the tasks that can be used in brain scanners
- Poor understanding of what scans do to the brain
- Problems with ecological validity

COGNITIVE NEUROPSYCHOLOGY (study of brain damaged patients to understand normal human cognition)

- **Associations:** findings that certain symptoms or performance impairments are consistently found together in numerous brain damaged patients
- **Dissociations:** normal performance on one task combined with severely impaired performance on another task
- **Double Dissociations:** findings that some individuals do well on task “A” & poorly on task “B”, whereas others show the opposite pattern
- **Strengths**
- Dissociations have provided strong evidence for various major processing modules
- Causal links can be shown between brain damage & cognitive performance
- Has revealed complexities in cognition (eg. language)
- Has transformed memory research
- Straddles the divide between cognitive psychology & cognitive neuroscience
- **Limitations**
- **Compensatory Strategies:** the impact of brain damage on cognitive performance can be camouflaged by a patient’s development of these strategies to help them cope with the brain damage
- **Affects More Than 1 Module:** brain damage affects several modules so complicates interpretation of findings
- **Seriality Assumption:** research is based on assumption that processing is serial & proceeds from one module to another, however the brain consists of interconnected neurons & different brain regions which are activated during the performance of tasks
- **Factors:** there are differences among individuals who have similar brain damage in terms of age, expertise etc. which may affect cognitive task performance
- **Cognitive Functions:** insufficient emphasis on general cognitive functions

COMPUTATIONAL COGNITIVE SCIENCE (development of computational models to understand human cognition)

- **Strengths**
- Theoretical assumptions are spelled out in precise detail
- Comprehensive cognitive architectures have been developed
- Notion of distributed knowledge is supported by empirical evidence
- Makes use of knowledge in cognitive neuroscience
- Emphasis on parallel processing fits with functional neuroimaging data
- **Limitations**
- Many computational models do not make new predictions
- Claims of neural plausibility are not justified
- Many computational models have random parameters to fit the data
- Computational models generally de-emphasise motivational factors
- Computational models generally tend to ignore emotional factors

DESIGNS USED TO ASSESS HUMAN COGNITION

- PET scans
- fMRI’s
- ERP’s
- efMRI’s
- MEG’s
- TMS