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Cognition and Emotion

Lecture 2: Experimental Cognitive Psychology

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Lecture Overview

- ▶ What is Experimental Cognitive Psychology
- ▶ Methods of investigation
- ▶ Information processing
- ▶ Modularity and the mind
- ▶ Setting-up & conducting experimental research
- ▶ Strengths
- ▶ Limitations

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Experimental Cognitive Psychology

- ▶ Makes use of experimentation
 - ▶ Tests relationship between cognition & behaviour
 - ▶ Attempts to understand thinking based on subsequent action/performance/response.
- ▶ Involves manipulating Research Variables.
 - ▶ Aspect the researcher wants to examine
 - ▶ Known as *Independent Variables (IVs)*
- ▶ Response/output = *dependent variable (DV)*

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Experimental Cognitive Psychology

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► Research is conducted in highly controlled environments...

- E.g., Company research laboratories, University research laboratories.



- ❖ Noise, lighting, other distractions (confounding variables) are controlled
- ❖ Only the IV(s) are allowed to vary

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Testing Theories



Theories of behaviour developed

- Taking into account cognitive processes



Theory tested in lab

- Response time, accuracy study
- Memory, perception, decision study



Data analysed

- Results interpreted in line with theory

- More predictions are made, leading to more testing
- Theories become further defined.
- Application of theories tested in real-world.

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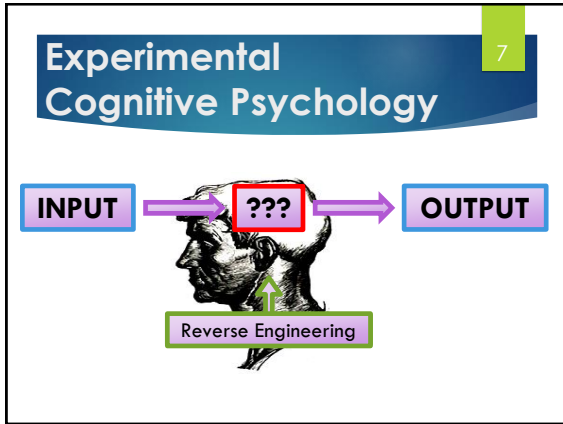
Cognitive Psychology: Information Processing

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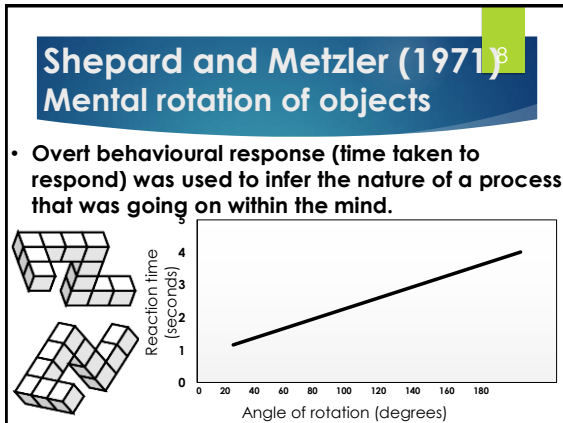
Much of Cognitive Psychology adhered to an approach called “Information Processing”

- Information is received through the senses & then Processed by various systems in the brain.
- Brain = active, systematic processor of information.
- Information from external world is acquired, selected, represented, stored, organised, transformed, and used by the brain according to rules.

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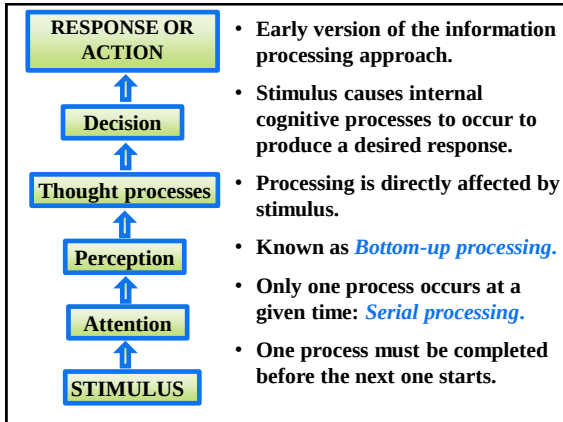


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Inattentional blindness: Neisser & Becklen (1975) 9

- Ps view distinct, superimposed videos of people performing simple actions:
 - 1. passing a basketball
 - 2. playing a hand-slapping game.
- When asked to focus attention on one event, they failed to notice an unexpected event occurring in the other.
 - E.g., when counting no. of basketball passes, they failed to notice the people in the hand-slapping game shaking hands.

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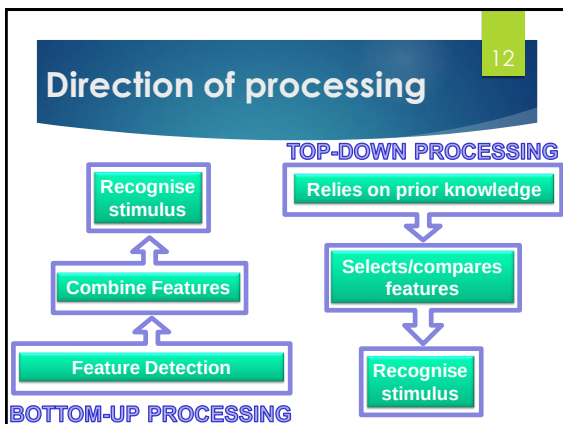
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Major issue 1: Direction of processing 11

- ▶ Oversimplified explanation of complex mechanisms.
- ▶ *Top-down information processing* exists:
 - ▶ Influenced by an individual's expectations and knowledge rather than just looking at a stimulus.
 - ▶ E.g., look at the triangle and read the words out aloud...

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Major issue 2: Type of processing

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- Oversimplified assumption of serial processing



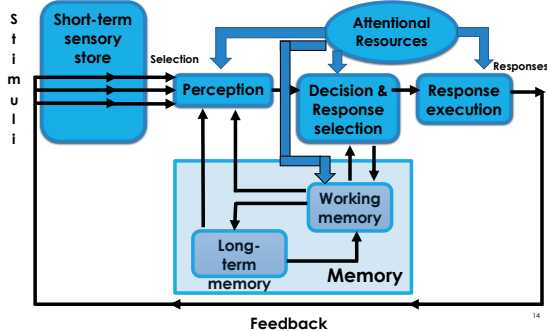
- **Parallel Processing** exists:

- Some processes are carried out simultaneously during a task.



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A structure for Information-processing (Wickens, 1992)



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Modularity and the mind

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- Question: what is the nature/structure of mental organisations.



- Fodor: the mind is organised in a collection of modules.....
 - Functional units that do a particular task or processes a particular type of information (domain specific).



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Modularity and the mind

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- Differs to how associationists view the mind –
 - The mind operates with one general purpose mechanism, i.e., association.
 - The same processes and principle explain everything in the mental domain.

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Modularity and the mind

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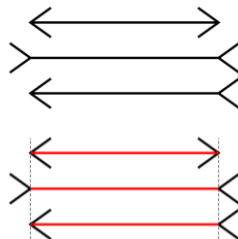
- But for Fodor the existence of particular modules, precedes the processing of information.
- Info can only be processed because the modules exist.
- The structure of the mind is the cause of the processing that takes place and not the effect of that processing.
- Furthermore, these modules can develop and change over time as we mature.

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Müller-Lyer Illusion & Fodor's theory of modularity

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- Through automatic processing, modules deal with specific information with minimal interference from other modules:
- Known as information encapsulation.



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Modularity and the mind

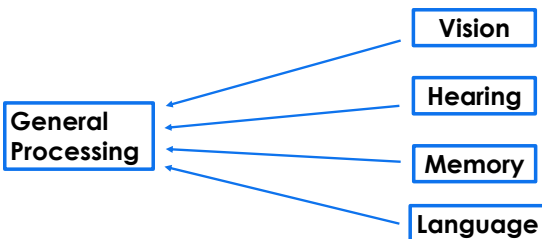
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- System of modules = more efficient
- Able to deal with threats quicker
 - If they were not independent then information entering one could slow down another.
- But at times we need to combine/coordinate info
- Thus, Fodor suggests there are a set of general processes that deal with the output of many different modules.

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Modularity and the mind

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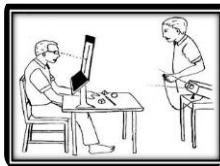


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Conducting Cognitive Experimental Research

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- ▶ Typically: Ps complete computer based task where memory, attention, etc. are measured.
- ▶ Relevant stimuli designed or gathered by researcher from existing sources is presented on screen & Ps respond accordingly.
- ▶ Response depends on study aims.



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Conducting Cognitive Experimental Research

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Typically a measure of response time and/or accuracy will be gathered.



- ▶ Response method can include:
 - ▶ Pressing a certain key on the computer keyboard
 - ▶ Writing down answers
 - ▶ Verbally responding while being recorded.

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Conducting Cognitive Experimental Research

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- ▶ Most research uses computer programming to conduct an experiment & analyse data.
- ▶ It is useful and essential for conducting accurate, robust & standardised research.
 - ▶ E.g., measuring reaction time precisely is near impossible without a computer programme.
- ▶ It is challenging, but can be fun.
- ▶ It makes life easier in the long run!



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Programming cognitive research studies

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- ▶ Write using codes (numerical or alphabetical), a series of instructions that a computer will implement, through a programming software package.



- ▶ Basically telling the computer to present/do things in a certain order/way and record/capture how the P responds.

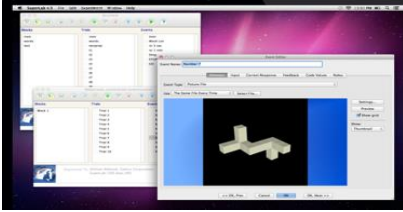
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Programming cognitive research studies

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► Packages for running Cognitive Psychology experiments include:

- SuperLab
- E-prime
- Psyscope
- Presentation
- Gorilla
- Matlab
- Python
- C/C++
- OpenSesame



Some are free to download & use, others require a licence.

* Others are also available

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What do these programming packages allow you to do?

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► A range of things.....

► For running an experiment you can:

- Display pictures, words, films, or other forms of stimuli on the screen
 - Can get Ps to view, respond, compare or perform other task with the stimuli
- Play sound files: at specific points in the experiment or throughout.
- Can randomise order of presentation of stimuli & use blocks of trials
- Can change position, colour, exposure time of stimuli
- Can provide Ps with feedback/corrections.

► For capturing data from an experiment you can:

- Collect response time and/or accuracy (in all trials or by blocks of trials)
- Can specify method of response: keyboard, mouse, microphone.

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Strengths

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- **Highly rigorous and scientific.**
 - Uses standardised procedures
- **Produces reliable and objective data.**
- **Easy to replicate**
- **Paved way for neuropsychology and neuroscience.**
- **Can lead to the refinement of new theories.**
- **Good internal validity as extraneous variables are controlled.**
- **Can be applied to a wide range of practical and theoretical contexts.**

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Limitations

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- ▶ Typically only examines healthy adults
 - ▶ Mainly undergraduate Psychology students
 - ▶ Who are typically aged between 18-25, female, have college level education, and first language English.
- ▶ Lab research lacks ecological validity
- ▶ Can only infer mental processing, cannot observe it.
- ▶ Reductionist: other factors influence responses
- ▶ Paradigm specific
- ▶ Emerging theories can be quite vague

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Lecture Summary

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- ▶ Theories regarding mechanisms of cognition (memory, attention, etc.) tested experimentally.
- ▶ Lab based studies run whereby Ps must respond to presented stimuli (usually on-screen).
- ▶ Mechanisms of cognition inferred based upon response time and/or accuracy data.
- ▶ Highly rigorous and controlled but lacks ecological validity.

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