

COGNITIVE PSYCHOLOGY

M5X00908 BRAIN, BEHAVIOUR, AND COGNITION

Lecture 1: Introduction to Cognitive Psychology

Dr Kate Williams

Module Materials

- ▶ **Moodle:**
 - ▶ **Weekly planner**
 - ▶ **Module Handbook**
 - ▶ **Lecture slides**
 - ▶ **Links to designated reading**

Module Materials

- ▶ **Moodle:**
 - ▶ **Assessment Proforma for essay**
 - ▶ **Folder of past paper exams**
 - ▶ **Some with indicative answers/feedback**

Module Aims

- ▶ **Develop an understanding of the biological bases of behaviour and neuropsychological approaches;**
- ▶ **Enable students to critically evaluate core theories of human cognition including learning, memory, language development and thinking;**
- ▶ **Enhance students' understanding of the link between emotion, cognition and behaviour.**

Learning Outcomes

- ▶ **Upon successful completion of this module, the student should be able to demonstrate the ability to:**
 - ▶ **1. Describe and evaluate key theories of various aspects of human cognition;**
 - ▶ **2. critically discuss the role of the brain and the biological bases of behaviour;**

Learning Outcomes

- ▶ **3. develop a critical understanding of the methods used to explore the link between the brain and cognition.**
- ▶ **4. have the ability to present work suitable for an academic audience through appropriate media.**

Run through Module on Moodle

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<https://moodle.uwtsd.ac.uk/login/index.php>

What is Cognitive Psychology?

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- ▶ **Scientific study of the mind (and the brain).**
- ▶ **“Mind” is name given to workings of living brain.**
- ▶ **Mind determines and controls behaviour.**
- ▶ **Allows us to make sense of the world.**
- ▶ **Helps us decide what action to take when necessary.**

What is Cognitive Psychology?

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- ▶ **Aims to understand how human cognition works.**
- ▶ **Concerned with internal processes.**
- ▶ **Suggests information is received through senses and then processed by various systems.**
- ▶ **Some systems operate automatically and unconsciously, while others are conscious and require effort on the part of the individual.**

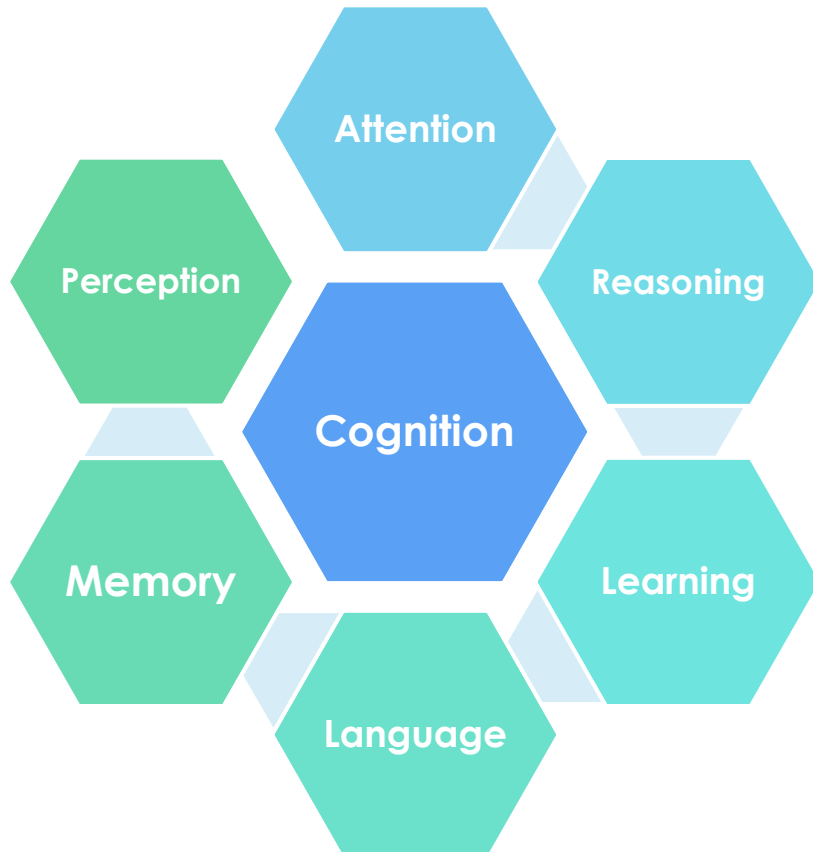
What is Cognitive Psychology?

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- ▶ It is about trying to learn the rules and discover how information in the brain is represented.
- ▶ Studies knowledge & how we use knowledge
- ▶ Cognition from Latin “Cognoscere” – to know
- ▶ Broadly, nowadays it also incorporates understanding brain activity and structure.

Cognitive Psychology

► **Aims to understand key aspects of functioning...**



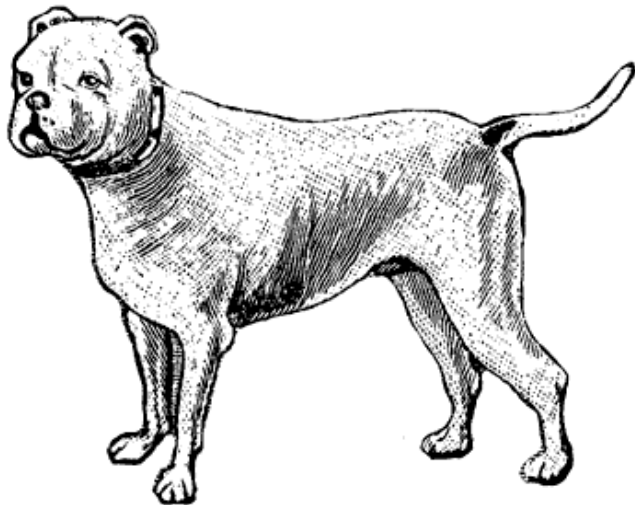
- **Some are quite well understood.**
- **Others are less well understood.**
 - **I.e., the higher-order cognitive processes.**

Representation

An important word in Cognitive Psychology!!

Does your mind represent information exactly as it exists in the world?

This is the question of ‘representation’ in cognition



Historical Overview

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- ▶ **When did Cognitive Psychology start?**
 - ▶ **No specific date - instead a shift in to cognitive experimental research - Why?**
 - ▶ **protest against restrictions of behaviourism**
- ▶ **Started during late 1940s & took hold during 1950s**
- ▶ **Work tapping on to what we would consider cognitive processes had been studied as early as the 1800s.**

1956

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- ▶ **An important year for Cognitive Psychology**
 - ▶ **Noam Chomsky gave a paper on his theory of language.**
 - ▶ **George Miller discussed the “magic number 7 ± 2 ”**
 - ▶ **Newall and Simon discussed the “thinking computer”.**
 - ▶ **First systematic attempt to study concept formation from a cognitive perspective (Bruner, Goodnow, & Austin).**

Neisser (1967)

- ▶ Seen as “Father of Cognitive Psychology”
- ▶ Wrote *Cognitive psychology* (1967).
 - ▶ Measurement and hypothesising observable behaviour
 - ▶ E.g., dual-task process
 - ▶ Cognitive hypothesis: two similar tasks take up cognitive processing abilities (‘cognitive load’)
 - ▶ Observable behaviour: poorer ability to carry out task than when a separate or dissimilar task
- ▶ His more controversial book *Cognition and reality* suggested that memory is not a snap shot of a moment, it is mainly reconstructed.

Approaches to Human Cognition

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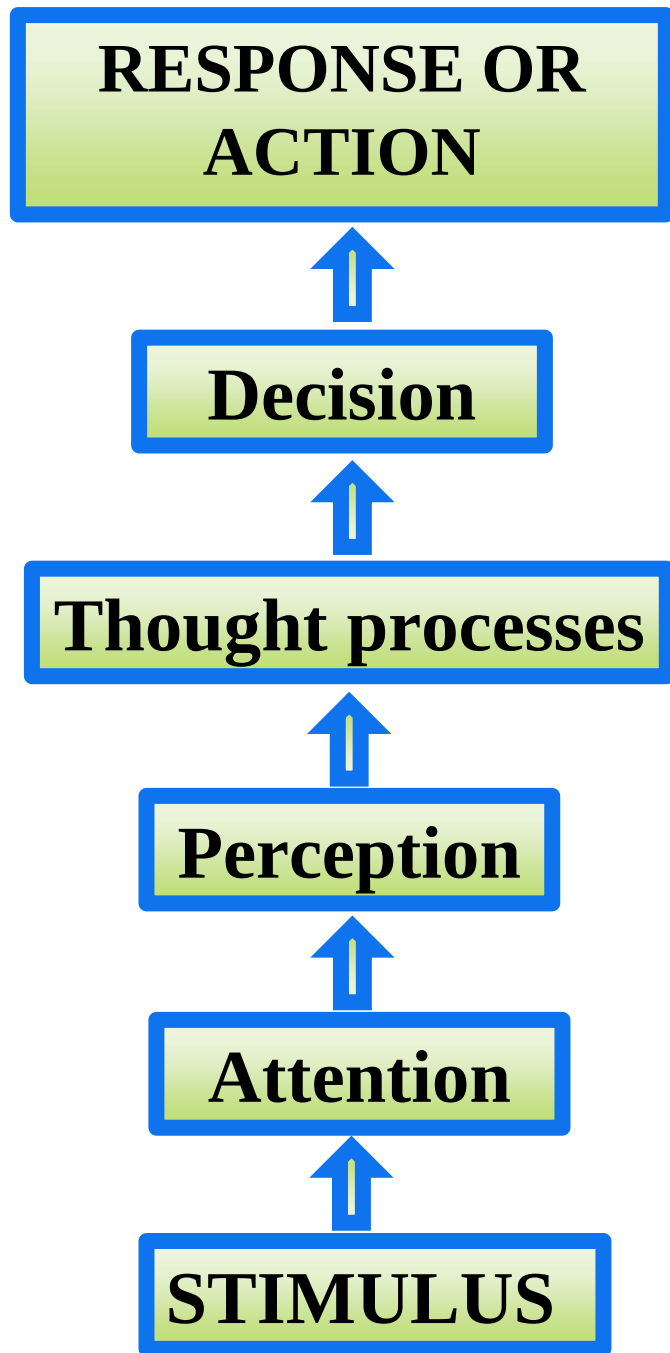
- 1. Experimental Cognitive Psychology**
 - ▶ Uses behavioural evidence
- 2. Computational Cognitive Science**
 - ▶ Uses computational models (takes account of our knowledge of behaviour and the brain).
- 3. Cognitive Neuropsychology**
 - ▶ Involves studying brain-damaged patients
- 4. Cognitive Neuroscience**
 - ▶ Behavioural evidence + evidence from the brain
 - ▶ Researchers make use of two or more combined to achieve most comprehensive account of cognition.

Cognitive Psychology: Information Processing

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

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

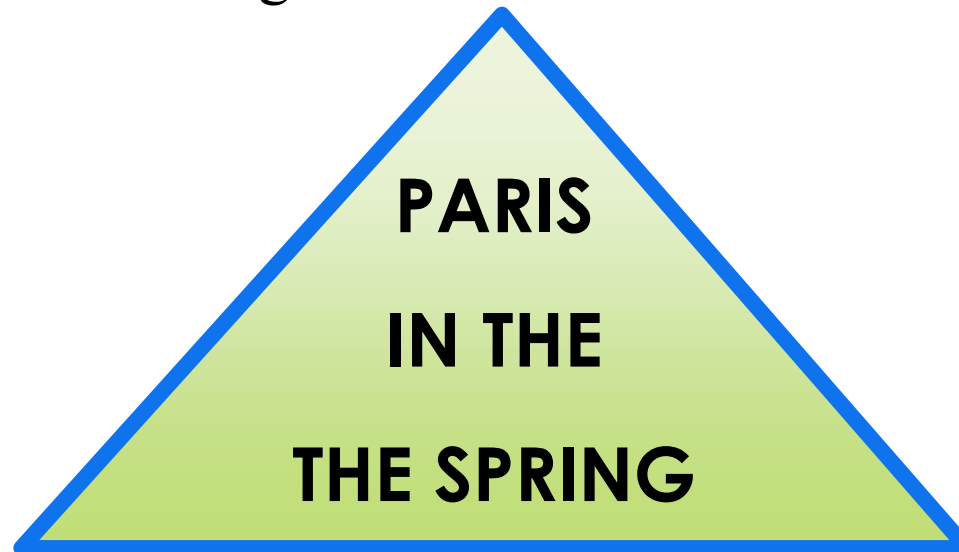


- Early version of the information processing approach.
- Stimulus causes internal cognitive processes to occur to produce a desired response.
- Processing is directly affected by stimulus.
- Known as *Bottom-up processing*.
- Only one process occurs at a given time: *Serial processing*.
- One process must be completed before the next one starts.

Major issue 1: Direction of processing

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- ▶ **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...



Major issue 2: Type of processing

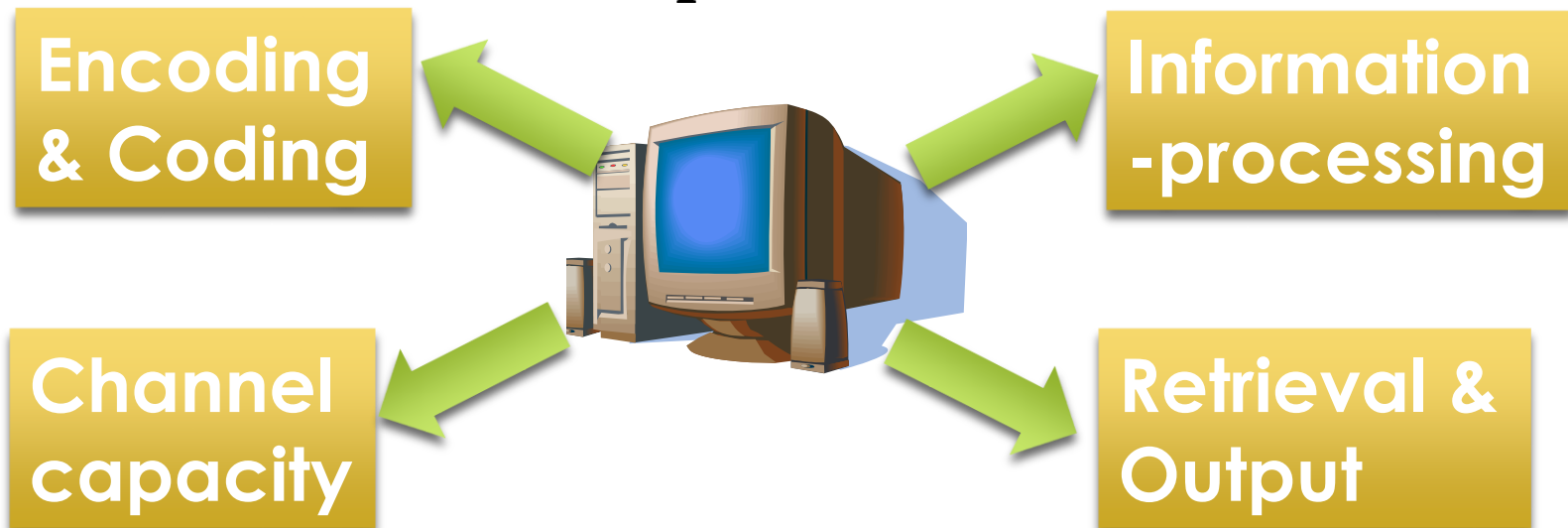
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- ▶ Oversimplified assumption that processing is serial
- ▶ *Parallel Processing* exists:
 - ▶ Some processes need to be carried out at the same time during a cognitive task.
 - ▶ E.g., the difference between an experienced and a learner driver.
- ▶ Because the information-processing approach was first devised to describe the operations of complex physical systems, such as computers, the model of the human brain for many cognitive psychologists was the computer.

The computer metaphor

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- ▶ **Neisser (1967):** “The task of....trying to understand human cognition is analogous to that of... trying to understand how a computer has been programmed” (p.6).
 - ▶ **Hardware = brain structures etc.**
 - ▶ **Software = mental processes and abilities**

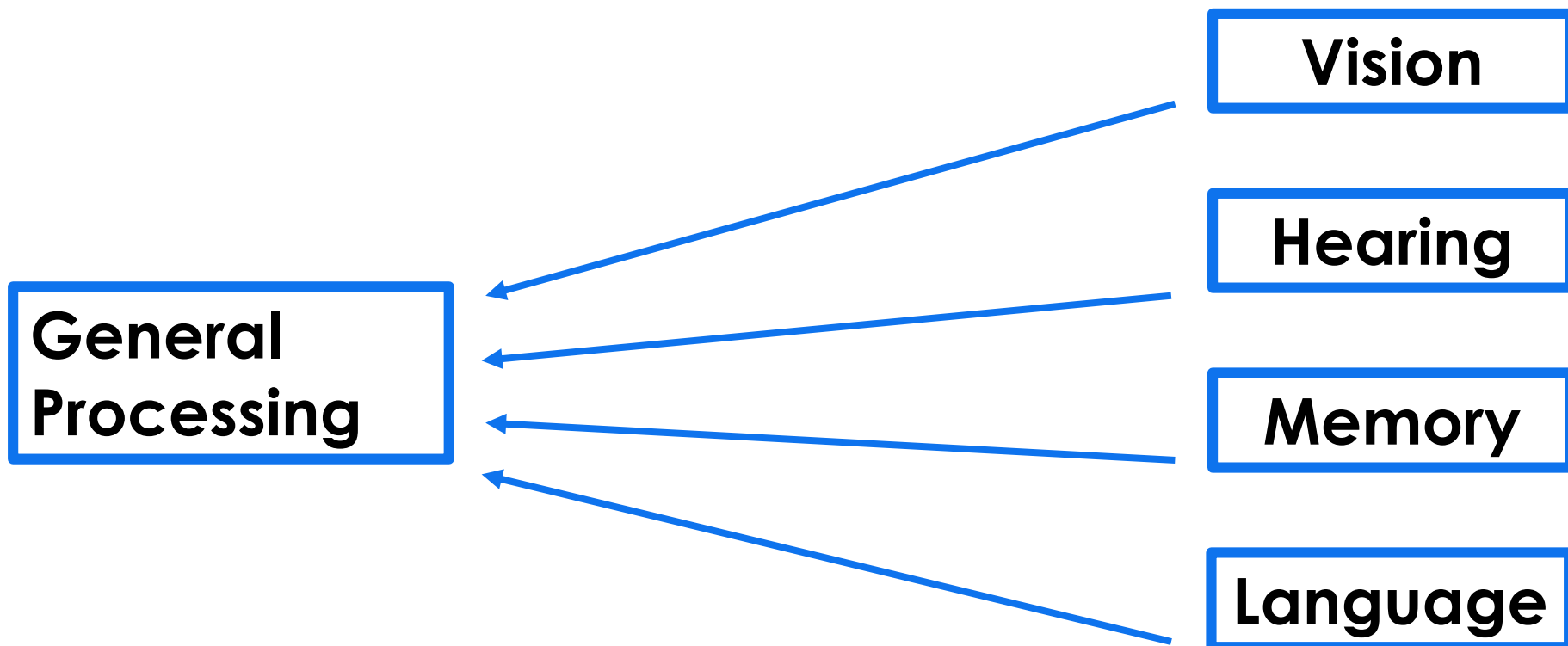


Modularity and the mind

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- **Question: what is the nature and structure of mental organisations.**
- **Fodor: the mind is organised in terms of a collection of modules**
 - **Functional units that do a particular task or processes a particular type of information (domain specific).**

Modularity and the mind



► **Key assumptions of cognitive neuropsychology.**

- Cognitive system made up of many modules/processing modules that operate relatively independently/separately.
- Domain specific: they only respond to one type of stimuli.
- Anatomical modularity: each module is located in a particular area of the brain - E.g., visual processing system.
- Coltheart (2001): “uniformity of functional architecture across people” – if these modules do exist, they are the same for everyone.
- Comparisons between brain damaged patients and healthy controls can be achieved.
- Assumption of subtractivity: brain damage can delete/remove modules/connections but it cannot introduce new ones.
 - Important because if a patient's brain damage did produce a new module then it would make understanding normal cognitive functioning very difficult.

Embodied cognition

- ▶ **The importance of recognising the brain, body and the environment in the psychological.**
- ▶ **Perception & cognition are for control of action, not just gaining knowledge for the sake of it.**
- ▶ **Perception & cognition are themselves considered forms of action, and as particular types of behaviour performed on the organisms environment.**

Limitations of Cognitive Neuropsychology

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- ▶ Can conclusions from brain-damaged patients tell us how normal cognitive functioning works?
- ▶ Assumes seriality
- ▶ Brain damage tends to not be restricted to one area
- ▶ Differences between patients despite having similar types of brain damage.
- ▶ Only focuses on certain types of cognitive functioning (e.g., language and memory)

Cognitive Psychology: Limitations

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- ▶ Low Ecological validity: most experiments take place in the lab – how well does this relate to real life?
- ▶ Indirect evidence of internal processes: Cognitive Psychology experiments typically measure speed and/or accuracy of a participant during a task.
- ▶ Vague theories: Difficult to make connection between verbal description and what's actually going on in the brain.
- ▶ Paradigm specificity: Findings are so specific that they cannot be generalised to other tasks.
- ▶ Specific theories applicable to narrow range of tasks.

Summary

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- ▶ Cognitive psychology = the study of mental processes (and underlying biology).
- ▶ It's approach and philosophy continues to refine in light of technological advances and emerging knowledge.
- ▶ Primarily concerned with explaining the **function** of cognition, the **representation** of information in the mind, the **structures** and **processes** applied to this information

Inside your head is the most complex instrument in the (known) universe!

Your Mind

The aim of cognitive psychology is to develop experimental tools and techniques for probing how the mind works

Next Week:

- ▶ Lecture: Language
- ▶ Seminar: All students together for Assessment guidance