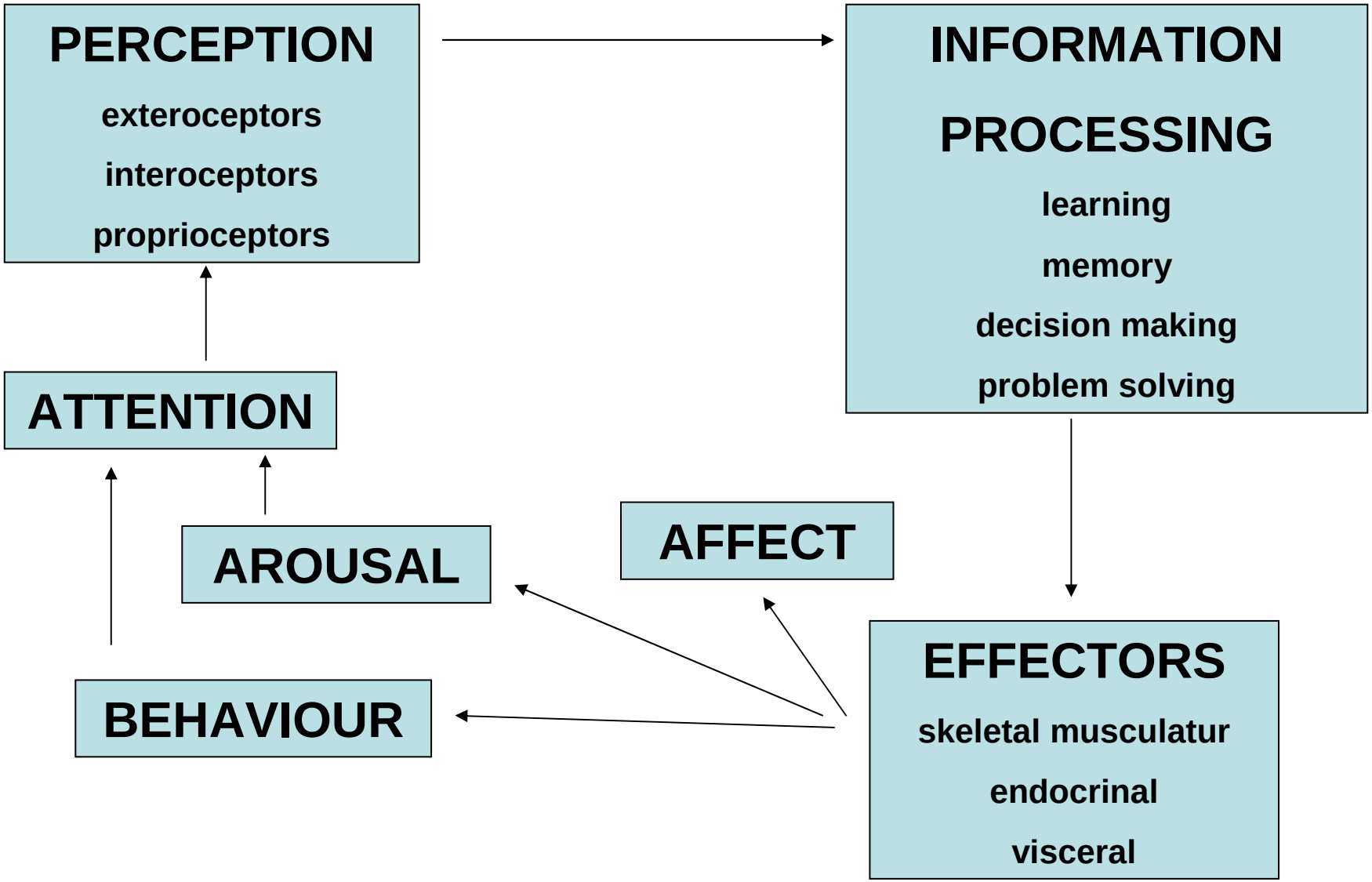
What is learning? - I

- Learning is a continuous process of interaction between an organism and its environment.
- Learning involves the perception and processing of information at a number of levels.
- At a molecular level, learning can be seen as biochemically mediated changes in cellular structure and functioning.
- At a higher level, learning is manifested by changes in the relationship between reflexes and stimuli.
- At a molar level, learning is manifested as changes in complex behavioural patterns in response to environmental demands.


PERCEPTION
exteroceptors
interoceptors
proprioceptors
INFORMATION
PROCESSING
learning
memory
decision making
problem solving
ATTENTION
AROUSAL
AFFECT
BEHAVIOUR
EFFECTORS
skeletal musculatur
endocrinal
visceral

What is learning? - II

- Learning is the process by which increasingly complex behaviours are developed to afford the organism survival advantage over its rivals:
  - Information
  - Knowledge
  - Control of energy resources
    - effective learning leads to efficient energy use
  - Reproductive advantage
  - Power
- Learning is an evolutionary process at an individual level and evolution is a learning process at the species level.

Classical Conditioning

Background

People often ask if I have heard of classical conditioning. I usually tell them that it rings a bell.

Ivan Pavlov (1849-1936) was the bell-ringer here, emerging from his Russian seminary to undertake his seminal work with salivating dogs on a diet of PAL (Pavlovian Associative Learning).

Classical Conditioning

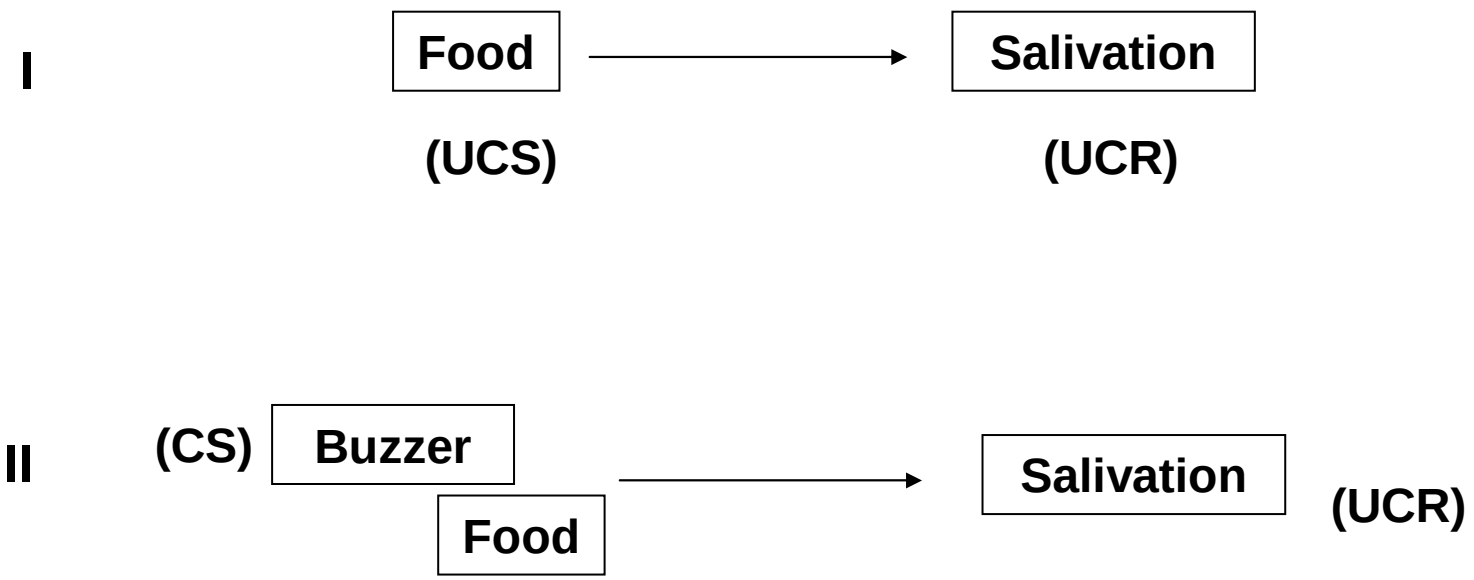
Basic Concepts - I

- CC is concerned with the relationship between stimuli and responses.
- The building blocks of behaviour are simple reflexes. Broadly defined, a reflex is a reliable and predictable response elicited by an environmental event – e.g. limb withdrawal in response to a pin-prick.

Classical Conditioning

Basic Concepts - II

- An unconditioned stimulus [UCS] elicits an unconditioned response [UCR]
- Repetitive pairings of the UCS with a neutral stimulus (CS – conditioned stimulus) leads to the elicitation of a conditioned response (CR) when the CS is presented in the absence of the UCS.
- Classical conditioning has occurred when a response has been brought under the control of a previously neutral stimulus.
- Crucially, responses are *elicited* by the environment and typically involve the involuntary musculature and viscera.


I
Food
Salivation
(UCS)
(UCR)
II
(CS)
Buzzer
Food
Salivation
(UCR)
III
Buzzer
Salivation
(CS)
(CR)

Classical Conditioning

Basic Concepts - III

- **Extinction** – repeated presentation of the CS in the absence of the UCS leads to the decrease and eventual loss of the CR.
- **Generalisation** – CRs are elicited by CSs that have similarities with the original CS (e.g., tones of different pitches). Remember Little Albert!
- **Discrimination** – Conversely, CRs can be brought under the control of very specific CSs through differential conditioning procedures.

Operant Conditioning

Background

- People often ask if I have heard of operant conditioning. I ask them what's in it for me if I tell them.
- OC arose from the work of Thorndike, who put chicks and cats (but not together) in puzzle boxes. He established the "law of effect" in 1898: - behaviour is governed by its consequences.
- OC was taken forward by the work of Skinner and his boxes. He was instrumental in laying the foundations of our understanding of OC.

Operant Conditioning

Basic Concepts - I

- OC is mostly concerned with voluntary musculature.
- OC is concerned with the relationship between environmental events and behaviour.
- The probability of a behaviour being *emitted* can be manipulated by the use of contingencies – i.e. by controlling the consequences.

Operant Conditioning

Basic Concepts - II

- The probability of a behaviour occurring can be increased or decreased.
- There are 4 basic principles:
  - Reward [↑ behaviour] – Positive reinforcement
  - Escape [↑ behaviour] – Negative reinforcement
  - Punishment [↓ behaviour]
  - Omission [↓ behaviour] – Negative punishment

Operant Conditioning

Basic Concepts - III

- To explain further:
  - Increase behaviour by
    - Giving something pleasant
    - Taking away something bad
  - Decrease behaviour by
    - Giving something bad
    - Taking away or withholding something pleasant

Operant Conditioning

Basic Concepts - IV

- Schedules of reinforcement – these affect the pattern of responding in terms of rate and topography:
  - Fixed interval (FI)
  - Fixed ratio (FR)
  - Variable interval (VI)
  - Variable ratio (VR)
  - Less commonly:
    - Differential reinforcement of low rates (Drl)
    - Differential reinforcement of high rates (Drh)

Operant Conditioning

Basic Concepts - V

- **Shaping** – reinforcement of behaviour close to the desired behaviour, such that the desired behaviour is achieved through a process of *successive approximations*.
- **Gradient of Reinforcement** – immediate consequences of a behaviour exert more control than longer-term consequences.
- **Discriminative Stimuli** – the presence or absence of specific stimuli can signal particular reinforcement schedules.

Two - Factor Theory

Behaviour as observed in the real world cannot always readily be explained in terms of classical or operant conditioning. Two-factor theory tries to account for this by integrating the two theories.
A good example is avoidance behaviour. A person with agoraphobia has a classically conditioned fear response, and their escape and subsequent avoidance of the environments that elicit this response are operantly conditioned.

Social Learning Theory

Background

- People often ask me if I have heard of social learning theory. I tell them to mind their own business.
- So, *mind* has intruded into our neatly controlled and predictable world of stimuli and responses (elicited and emitted).
- Social learning theory emphasises the links between behaviour and environment as mediated by cognitive processes.

Social Learning Theory

Basic Concepts - I

- Our behaviour is governed by internal representations of the world that allow us to predict the consequences of our actions and alter them accordingly.
- We learn to respond in certain situations by observing the behaviour of others – *vicarious learning* or *modelling*.

Social Learning Theory

Basic Concepts – II

- SLT also emphasises the importance of self-regulatory processes. Our behaviour has an impact in the world (consider **self-efficacy** *vs* **learned helplessness**) and is reinforced by both external and internal (self-evaluative) factors.
- Concepts such as *attribution*, *locus of control* and *cognitive dissonance* (our old friend from motivational interviewing) also play a role.

Social Learning Theory

Basic Concepts – III

- We experience dissonance when we judge our behaviour to be out of line with our beliefs and values.
- We are motivated to reduce dissonance by changing either our behaviour or our beliefs.