**Animal behaviour:**

**Defining animal behaviour:**

*Explain the advantages to organisms of innate behaviour*

*Describe escape reflexes, taxes and kineses of genetically determined behaviour*

**ANIMAL BEHAVIOUR: the observable responses of an animal to the environment around it, which increases its chances of survival**

* These responses usually involve movement of part/all the body
* Most behavioural responses are reversible
* Responding in the right way to an environmental change help organisms **survive** and **reproduce**
* Influenced by both **genes** and **environment**

**Innate behaviour:**

**INNATE BEHAVIOUR: any animal response that occurs without a need for learning. It’s an inherited response, similar in all members of the same species and is always performed in the same way, in response to the same stimulus**

* It is **instinctive** behaviour
* **Genetically determined**- inherited, not influenced by the environment
* **Stereotyped-** carried out in the same way, by all the individuals of a species
* **Rigid/inflexible**
* **Unintelligent-** organism probably has no sense of purpose of the behaviour
* Organisms respond in the right way to the stimulus straight away, because **no learning** is needed

**Invertebrates** rely on their survival on 3 types of **innate** **behaviour** which allow them to **escape** **predation**, **locate** and stay in a suitable **habitat**, and **locate** **food**.

1. **Escape reflexes**
2. **Taxes**
3. **Kineses**

Invertebrates tend to have very **short** **life** **spans**, live **solitary** lives and do not take care of their offspring. Each of these factor means that innate behaviours are more suitable as a **survival** **mechanism** compared to learned behaviour.

**Reflex actions:**

**REFLEX: Performed without conscious thought as an automatic response to a stimulus.**

* **Simplest** type of animal behaviour
* Type of **innate behaviour**
* A sudden stimulus induces an **automatic**, **involuntary** and **stereotyped** response
* Many are **protective**
* Move away from potential danger, usually **predators**
* Follow a **specific** **pattern**
* Determined by **inherited** **nervous** **pathways**

**Example:**

1. **Earthworms** withdraw underground in response to vibrations on the ground

**Kineses:**

**KINESIS: an undirected movement of a cell, organism, or part in response to an external stimulus**

* An orientation behaviour where the **rate of movement** increases when the organism is in **unfavourable** **conditions**
* Organisms’ movement response is affected by a **non-directional stimulus**
* Rate of movement is related to the intensity of the stimulus- not its direction
* **Orthokinesis:** changes in speed of movement
* **Klinokinesis:** changes in rate of turning (lower the rate, more likely to leave)

**Example:**

1. in a **choice chamber**, **woodlice** move faster and turn less where it’s dry

* This is a purely **physiological** response- don’t actively seek out other conditions

**Taxes:**

**TAXIS: a movement in response to the direction of a stimulus**

* an **orientation behaviour** where the rate of movement increased when the organism is in unfavourable conditions
* + taxis is movement towards a stimulus

**Examples:**

1. **Nematode worm**

* **Chemotaxis**
* Chemoreceptors in its lips sense chemical signals in the air
* moves its head from side to side in order to compare signal strengths and detect the direction of a chemical gradient before moving its whole body up (**positive chemotaxis**) or down (**negative chemotaxis**).

1. **Woodlice** show **negative phototaxis**

**Stereotyped behaviour/FAP:**

**FAP: An innate behaviour pattern that is stereotyped, spontaneous, and independent of immediate control, genetically encoded, and independent of individual learning. It is triggered by a specific stimulus and continues to its end without regard to immediate consequences or feedback.**

* **Same** **response** is given to the **same** **stimulus** on **different** **occasions**
* Shows fixed patterns of coordinated movements
* Simplest are innate responses to **specific** **stimuli (sign stimuli)**
* More **complex** than reflexes
* Sign stimulus activates **nervous** **pathways** which makes muscles move without any decision making
* Sign stimulus is usually a highly specific signal that is **consistently** **encountered** at an **appropriate** **time**

**FAPs can be modified by:**

* **Experience**
* **Precise** **conditions** in which the sign stimuli are presented (e.g. red spot on gulls indicated begging, response varies according to spot, e.g. bird calls influenced by upbringing)
* Can be acquired **after** **learning**
* **Instinctive** and **automatic**

**Example:**

1. **Tinbergen 3-spined stickleback-**

* Instinctive aggression in male sticklebacks towards anything red during the mating season
* Tinbergen noted that the female will follow almost any small red object to the nest, and once within the nest, neither the male nor and red object need be present
* Any object touching her near the base of her tail will cause her to release her eggs.

1. **Courtship** **displays**
2. **Hunting** and **food** **gathering**
3. Male fruit fly will perform a courtship display for a cork doused in pheromones

**Difference to reflexes:**

* In a **reflex**, a particular **stimulus** always evokes the **same** **response**
* In a **fixed action pattern** the response to a particular **stimulus** can be **modified by experience** or the precise conditions in which the stimulus is presented
* **Sign** **stimuli**- can be detected by another
* **FAP** is a sequence of unlearned acts, **carried to completion**
* Unlike simple reflexes, **FAPs** may involve a **whole** **body** **response**
* Often require a **threshold** **level** of **internal** **readiness**

|  |  |
| --- | --- |
| Reflex | FAP |
| simple motor action, stereotyped and repeatable | A complex motor act, involving a specific temporal sequence of component acts |
| Elicited by a sensory stimulus, the strength of the motor action being graded with the intensity of the stimulus | Generated internally, or elicited by a sensory stimulus. The stimulus acts as a trigger, causing release of the coordinated motor act.  The action may be all-or-nothing or graded in intensity, and it may be contingent on the type of sensory stimulus or internal state, but it maintains its basic pattern |
| Stimulus may not require brain activity, but instead may travel to the spinal cord, tracing a path called the reflex arc | May be processed in the brain as well |

**Learned behaviour:**

*Explain the meaning of the term learned behaviour.*

*Describe habituation, imprinting, classical and operant conditioning, latent and insight learning as examples of learned behaviour.*

**LEARNED BEHAVIOUR: animal responses that change or adapt with experience. There is a range of learned behaviours identified, from simply learning not to respond to a repeated stimulation, to the ability to consider a problem and formulate a response**

Gives greatest survival benefit to organisms:

* With a **longer lifespan** (time to learn)
* Element of **parental** **care**
* **Living** for part of the time **with** **other** **species** **members**
* Learn to **adjust** **behaviours** to suit **specific** **environments**
* Those reliant only on **innate** **behaviours** **cannot** **adapt** **quickly** to **environmental** **changes**- their behaviour will only change as a result of **slowly** **acting** **genetic** **mutations** over many **generations**

**LEARNING: The capacity to record specific experiences and to modify behaviour in the light of those experiences**

* Animals with **long** **life** **spans** would not survive long enough to reproduce in variable environment if they could not adapt
* Learning occurs when an animal’s **behaviour** becomes **consistently** **modified** as a result of **experience**

**Habituation:**

**HABITUATION: learning in which repeated exposure to a stimulus results in decreased responsiveness as the response results in neither a reward/punishment**

* Animals learn to **ignore** certain **stimuli** because **repeated** **exposure** to the stimulus results in **neither** a **reward** nor a **punishment**.
* **Screens** **out** non-dangerous stimuli
* **Avoids energy wastage**
* If the **stimulus** is **not** **given** for a long time, the **response** **reappears**
* When habituated to one stimulus, will usually **treat** **similar** **stimuli** in the **same** **way** **(generalisation)**
* Loss of response may be cause by **fatigue** or **sensory** **adaptation**

**Examples:**

1. Birds learning to ignore **scarecrows**
2. Humans **sleeping** near railways

**Imprinting:**

**IMPRINTING: Come to recognize (another animal, person, or thing) as a parent or other object of habitual trust**

* This involves **young** **animals** becoming **associated** with (imprinting on) another **organism**
* It is usually the **parent**.
* Occurs during a brief, genetically determined **critical/sensitive period,** usually shortly after **birth**
* A particular **stimulus** becomes **permanently** **associated** with a **particular** **response**
* **Irreversible**
* **Influences** future patterns of **social** **behaviour**
* Usually involves **learning** the **characteristics** of **parents** so can **recognisee** **parents** + **members** **of** **species**
* Allows young to **learn skills** such as **flight** and knowing to seek out the appropriate type of organism for **mating**.
* Occurs in adults, to recognise offspring
* Occurs in animals with social bonding importance

**Examples:**

1. In pioneering work by **Lopez**, **goslings** were shown to **follow** the **first** **moving** thing seen upon hatching. After that, they will only follow (and learn from) objects that look like the first object.

**Conditioning:**

* Also called **associative learning**
* Animal learns to **associate** a particular **behaviour** **pattern** with **reward/punishments**

**Classical conditioning:**

**CLASSICAL CONDITIONING: a form of learning in which two unrelated stimuli are applied to an animal, one a ‘normal response’ another unrelated. After repeated exposure to both stimuli together the animal will eventually response with the normal response to the unrelated stimulus.**

* **Responding** to a **stimulus** that was **previously neutral**
* Uses **conditioned** **reflexes**
* Requires **development** of a **new** **nervous** **pathway** in which the **association** **area** in the **cortex** of the **brain** makes a **link** between **2 different types** of **stimuli** and gives the **same** **response**
* Uses **positive/negative reinforcement**
* Unconditioned stimuli=food
* This type of learning is **passive** and **involuntary**

**Examples:**

1. **Russian scientist Pavlov**

* Observed that when **dogs** were shown **food,** or when they smelt food, they **salivated**.
* This is a **normal** **reflex** **action**.
* It is a **response** to an **unconditioned** **stimulus** – the sight or smell of food.
* He rang a **bell** when he was about to give the dogs food
* The dogs began to **salivate** upon **hearing** the **bell**, even if they could not see or smell food.
* The **ringing** is known as a **conditioned** **stimulus** which leads to a **new** **reflex** called a **conditioned** **response**.
* This is **classical** **conditioning** where animals can learn to **relate** a pair of **events** and **respond** to the **first** in **anticipation** of the **second.**

**Operant conditioning:**

**OPERANT CONDTIONING: also known as trial and error learning. The term is used to describe the learning that takes place in animals given reward or punishment to reinforce the performance of a particular operation. This type of learning is seen in rats and pigeons in a ‘skinner box’, where operation of a lever rewards the animal with food.**

* In **classical conditioning,** an animal **associates** a particular **stimulus** with a **reinforcer**
* In **operant conditioning**, the animal **associates** a **behavioural act** with a **reinforcer**
* In **classical** conditioning, the **reinforcer** is **controlled** by a **human**
* In **operant**, it is **controlled** by the **animal**
* This type of learning is still **active** and to an extent **voluntary**.
* In **natural circumstances**, we often refer to operant conditioning as **trial and error learning.**

**Examples:**

1. The scientist **B.F Skinner** became interested in creating a specific behavioural reaction to a stimulus by adding an element of reward or punishment.

* In several experiments with **rats** and **pigeons**, using a **Skinner box**, he showed that animals in the box would at first **randomly** press a **lever** which resulted in the reward of a food pellet.
* This **reward** led to **increasing** **frequency** of **pressing** the lever because the animals had learned to **associate** this **operation** (hence operant conditioning) of pressing the level with the **reward** of food.
* A variety of rewards and punishments (**reinforces**) can be used in **conditioning** **animal** **behaviours**.

1. The **training** **of** **dogs** is substantially based on the rewards of attention from owners.
2. **Monkeys** can be conditioned with **‘social rewards’** such as seeing other monkeys.

**Latent learning:**

**LATENT LEARNING: a form of learning that is not immediately expressed in an overt response; it occurs without obvious reinforcement to be applied later.**

* Animals will **explore** **new** **surroundings** and **retain** **information** about their surrounding that is not of immediate use and may be **essential** to staying alive at some **future** time.
* **No apparent reward**
* Demonstrates **exploratory** **behaviour**
* Make quick **escape** if **danger** threatens

**Examples:**

1. **Young rabbits** explore the surroundings of their burrows, learning the features of the environment

* This knowledge can be life - saving if it helps the rabbit **escape a predator** in later life.

**Insight learning:**

* Regarded as the **highest** **form** of learning.
* Solve problems by **internal** **mental** **processes** which cannot be observed
* It is based on the **ability** to **think** and **reason** in order to solve problems or deal with situations in ways that do not resemble simple fixed, reflex responses or the need for repeated trial and error
* Involves **cognition**
* Once solved, the **solution** to the problem is **remembered**.

**Example:**

1. In **Wolfgang Köhler’s** work, **chimpanzees** were presented with bananas hung out of reach and a set of boxes

* The chimpanzees were able to stack the boxes on top of each other to reach the bananas.
* Since then, behaviour among other apes such as gorillas, orang-utans and gibbons, has been studied

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| --- | --- |
| Innate Behaviours | Learned Behaviours |
| Genetically determined and so offspring has no impact on behavioural response. Passed on to offspring via reproduction | Determined by the relationship between **genetic** make – up of the individual and **environmental** **influences**. Not passed on to offspring via reproduction but maybe by teaching. |
| Rigid and inflexible | Can be **altered** by **experience** |
| Patterns of behaviour are the same in all members of a species. | Considerable **variety** is shown between members of a species. |
| Unintelligent in the sense the organism probably has no sense of the purpose of the behaviour | Learned behaviours form the basis of all intellectual activity. |

**Primate behaviour:**

*Describe, using one example, the advantage of social behaviour in primates*

**HIERARCHY:** **exists within a group where individuals have a place in the order of importance within the group. This is often shown by individuals higher up in the hierarchy receiving more food, or having rights of access to mate with** other **individuals.**

* **Primates** are **mammals**. They include the **apes** and **monkeys** as well as the more primitive **lemurs**.
* Most primates live in **family** **groups** where the young **remain** until they reach **sexual** **maturity** –
* Involves **interactions** between 2 or more specie members
* Refers to that of organisms of a particular species living together in groups with **relatively** **defined** **roles** for each member
* **Interact strongly**
* Involve **hierarchies**
* Such **hierarchies** lead to **social control** within the group which **protects** all group members.
* Primates have **large brains** (compared to body size) with a highly **developed** **cerebral cortex.**
* This is linked to **social development** and interaction.
* It is thought that all social behaviours in primates are derived from the extended dependency period of the offspring.

**Advantages:**

* Greater ability to **detect** and **deter** **predators** is achieved by groups of individuals working together.
* Improved **detection**
* **Escape** systems
* **Knowledge** and **protection of food** sources is shared with the group.
* Increased **feeding efficiency**
* Increased **reproductive efficiency**
* Increased **offspring survival** through communal feeding and protection
* **Saving of energy** by endothermic animals
* Saving of energy by vortices in fish/birds
* The **maternal care** and **group protection** enhances the **survival rate** of the **young**.
* Females give birth to only one (or very few) infants at a time.
* Young **learn** through **observation and play**- Learned behaviour is vital to the survival of primates.

**Disadvantages:**

* **Competition** for space, food and mates
* **Susceptibility** to **disease**
* **Higher** **risk** of being **hunted** by humans
* **Predation** by **cannibalistic** **neighbours**

**Organisation in gorillas:**

1. **Grooming**

* pick parasites off another
* Hygienic
* Reinforces bonds

1. **Clear-cut hierarchy**

* Prevents fighting which wastes energy
* Males already know their rank order in the group

1. **Care for the young**

* Mother looks after young
* At 5 months there is constant skin contact
* By 12 months venture as far as 5m
* During this period the female protects the young gorilla as it learns the social and other skills necessary to live independently.
* Further learning takes place after the age of 2.
* The silverback is important in the development f young gorillas from the age of 3 to 6 years, both in terms of protection from older males within the group, and in play as a source of learning new skills.
* Imitate adults for foraging etc

1. **Communication**

* Grunts, calls and displays etc to signal danger
* Threats
* Facial expressions for recognition of other members of the group

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