



## The Biological Approach to Psychology

This Factsheet summarises the assumptions of the biological approach and its strengths and weaknesses. It also covers the research methods used, plus some applications, key studies and examples. Terms in bold are explained in the glossary.

**Exam Hint:-** You may be asked to describe and evaluate research methods used in the biological approach (see table 1).

**Table 1. Some research methods used in the biological approach**

Method	Description	Some strengths	Some weaknesses
Laboratory experiments	The <b>IV</b> is deliberately manipulated to examine the effect on the <b>DV</b> while strictly controlling variables	Can establish cause and effect. The laboratory setting increases control over variables.	Laboratory conditions are artificial and the participants may not behave naturally, therefore low <b>ecological validity</b> .
<b>PET</b> scan	Used to obtain dynamic pictures of activity in the living brain. The person is given a mildly-radioactive chemical (e.g., glucose) and lies in the scanner. The scanner's radioactivity detectors measure the level of the chemical, showing which brain areas are using most of the chemical and are most active.	Provides detailed knowledge of the brain in action. It can obtain information from conscious patients, who can be doing a psychological task.	Time-consuming and expensive. The image needs to be interpreted by an expert. It requires the use of mildly-radioactive substances.
<b>MRI</b> scan	Obtains images of the living brain, producing a static picture. The person lies in the scanner which uses a magnetic field and radio waves to measure energy released by atoms.	Gives detailed knowledge of brain structure. It can obtain information from conscious patients, who can be doing a psychological task. It does not expose the person to radiation.	It is expensive and time-consuming. The image needs to be interpreted by an expert. It does not show changes in the brain over time as it images brain structure rather than function.
Twin studies	The genetic basis of a trait can be worked out by comparing <b>monozygotic</b> (MZ) and <b>dizygotic</b> (DZ) <b>twins</b> who have been reared together in a <b>shared environment</b> . Any difference between the MZ and DZ twins is attributed to genetic differences. Twin studies can also compare MZ twins who are reared apart in different environments. Any similarities between them are attributed to their genes.	They have produced data showing the roles of both genes and environment. Twin studies show that genetic factors are involved in many behaviours.	Twin studies tend to have small sample sizes. Studies of MZ twins who have been separated and reared apart may be confounded by the twins being raised in more similar environments than assumed.
Adoption studies	A child adopted into a new family has the genes of its biological parents but the environment of its adoptive parents. Therefore any similarity in a trait between the child and its adoptive parents suggests that the environment has an influence on that trait. Any similarity in a trait between the child and its biological parents indicates a genetic basis for that trait.	These studies can isolate the influences of genes and the influences of the environment.	The samples of adoptees are limited in how much they represent the whole population because most people are not adopted. Authorities often place adoptees with families very similar to their biological family. This makes it harder to separate the effects of genes from those of the environment.
Post-mortem examinations	A person's brain is examined after death to observe its characteristics. The person may have had a disorder (e.g., schizophrenia) and have been involved in a <b>longitudinal case study</b> . The characteristics (e.g., damage) observed in the brain are attributed to whatever disorder the person had.	It enables to researchers to observe exactly what structural characteristics are associated with the disorder.	There tends to be a limited sample (e.g., a case study of one person). The findings may not generalise to the rest of population. Permission is needed; the person must donate their brain for this purpose.

**Exam Hint:-** Can you identify these research methods from examples of research studies?

**Exam Hint:-** When writing about such research methods, good answers will have several facts about the method. For example, a good answer will explain how a PET scan works in detail whereas a weak answer will only mention that it measures brain activity without any other explanation.

### What is the biological approach to psychology?

The biological approach to psychology is also called biological psychology, biopsychology or physiological psychology. It assumes that:

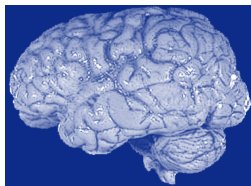
- All behaviour has a biological basis in the body.
- It examines the brain, nervous system, hormones, genes, etc. and how these relate to behaviour.
- Behaviour can be explained in terms of the body's physiology (e.g. nerves, chemicals), function, development and evolution.
- There is a genetic basis to much behaviour.
- Our physiology and behaviour has adapted to our environment through evolution.
- Mental disorders can be treated in the same way as physical illnesses; a mental disorder can be diagnosed from its symptoms and then treated.

**Exam Hint:** Make sure that you can outline these assumptions of the biological approach.

**Exam Hint:-** It is important that you are able to draw on many other aspects of your knowledge when discussing the biological approach. For example, you should know how this approach is involved in explaining:

- ~ sleep
- ~ aggression
- ~ stress
- ~ gender development
- ~ eating and satiation
- ~ mental disorders

It also relates to the nature-nurture debate.



### What are the strengths and limitations of the biological approach?

- It is a scientific approach as it is based on the **hard science** of biology.
- It is objective, using experimental research which can establish cause and effect between variables.
- It has increased our understanding of a range of behaviours, such as stress and sleep.
- It provides evidence for the nature side of the nature-nurture debate.
- Its practical applications are effective and valuable (e.g., drug therapy).

However...

- It is reductionist; it examines complex behaviours by breaking them down into more basic elements (e.g., the action of neurons and chemicals).
- It oversimplifies behaviours and can ignore other factors, such as a person's experience in their environment. For example, it looks at stress in terms of the body's arousal but ignores the person's judgement of a stressor and its emotional effects.

**Exam Hint:-** Make sure that you can evaluate the biological approach, discussing its strengths and limitations.

### What are the applications of this approach?

The biological approach has many practical applications, such as:

- Knowledge about the effects of arousal on sporting performance.
- Knowledge about the effects of shift work and its associated sleep patterns on employees.
- Knowledge about the genetic basis of a child's ability.
- Treating mental disorders by using such therapies as drugs, electroconvulsive therapy (ECT) and psychosurgery (see textboxes A, B and C).

#### A: Drugs

Psychotropic drugs, which act on the brain, can be used to treat mental disorders. For example, antianxiety drugs (e.g., Valium) alleviate anxiety by reducing the level of **serotonin** in the brain. Antipsychotic drugs treat **psychotic** disorders, such as Risperidone which treats schizophrenia by reducing the activity of **dopamine** in the brain. Drugs are effective for certain disorders, and are fast-acting and easy to use. However, drug therapy does not account for the psychological and social aspects of a mental disorder.

#### B: ECT

ECT involves applying an electric current of between 70 and 130 volts to a person's head in order to cause a seizure in the brain. The current is applied for one second or less. ECT was controversial because it was done without the use of muscle relaxants or anaesthetics, but today the person is always given these. It is an effective treatment for severe depression. However, there are ethical issues, such as whether it is possible for the person to give informed consent for the treatment.

#### C: Psychosurgery

Psychosurgery involves removing sections of the brain or causing lesions in order to treat a condition. For example, in one form of psychosurgery, called an amygdalotomy, the **amygdala** is destroyed using thin wire electrodes which are passed through a small hole in the skull. Amygdalotomies are now very rarely done. There are ethical issues as the damage is permanent.

**Exam Hint:-** Be aware of ethical issues that might arise from such research methods and applications. For example, an ethical issue arising from using PET scans relates to the ethical guideline of informed consent. Patients must be made fully aware that this form of scanning involves the injection of radioactive glucose into the bloodstream.

## A biological psychology theory

Hans Selye (1976) proposed a theory, called the General Adaptation Syndrome (GAS), about the body's general response to stress. GAS outlines how the body initially copes with stress and what happens when the stress is prolonged. It has three stages:

1. Alarm reaction stage	2. Stage of resistance	3. Stage of exhaustion
The body's systems which deal with stress are activated, for example, increasing heart rate and releasing energy.	The body is working at full power to deal with the stress. The body adapts to the demands of the stressor.	The body's ability to cope with the ongoing stress is exhausted. The body is affected, for example, stress-related diseases become likely (e.g., heart disease).



- Selye's work was influential and promoted research into stress.

However...

- It suggests that people respond to stress passively whereas they are actually active in dealing with stressors.
- It is based on work with non-human animals, which may not generalise to humans.
- It ignores psychological factors in stress (e.g., emotional responses).

## Research studies

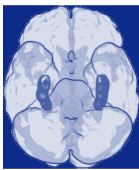
Table 2 shows a selection of research studies. They illustrate the variety of research methods used in biological psychology and the type of topics studied.

**Exam Hint:-** You may be required to know some of these studies in detail.

**Table 2: Research studies**

Study	What was done	What was found	Evaluation
<b>Bellis et al. (2001)</b>	Examined sex differences in changes in the human brain as it matures. Obtained MRI scans of brains of 61 male and 57 female participants, aged 6- to 17-years-old. Measured volume of <b>grey matter</b> , <b>white matter</b> and the <b>corpus callosum</b> .	There are sex differences in age-related changes in the brain. Males showed more decrease in grey matter volume and more increase in white matter and corpus callosum volume than females. Females showed the same changes but at a slower rate of development.	There were good controls; e.g., the groups of male and females were matched for IQ, age, socioeconomic status, etc. It is a cross-sectional study which takes a 'snap-shot' across different participants – it needs to be supported by data from longitudinal studies.
<b>Bennett-Levy &amp; Marteau (1984)</b>	Examined what animal characteristics humans are <b>prepared</b> to fear.  One group of participants completed a questionnaire rating their fear and avoidance of small, harmless animals (e.g., cockroach, hamster). Another group completed a questionnaire rating the same animals in terms of their characteristics (e.g., ugliness, sudden movement).	A significant correlation between fear and nearness ratings and ratings of the animals' characteristics.  Ugly, slimy, speedy, sudden-moving animals are more fear-provoking and less approachable than animals without these characteristics. Fear seems to depend on the animals' perceived harmfulness and certain characteristics.	Various factors were <b>controlled</b> (e.g., using the same list of animals in both questionnaires). The findings suggest that animal phobias can be treated by desensitising the person to certain animal characteristics. Correlation does not inform us about cause-effect relationships, so it is not clear how the animal characteristics are involved in phobias beginning.
<b>Dement &amp; Kleitman (1957)</b>	Laboratory experiment and observation to examine how <b>REM</b> sleep relates to the experience of dreaming. Participants slept in the laboratory with electrodes attached to measure brain and eye activity. They were woken at various times. They immediately reported into a recorder whether they had been dreaming and the dream's content.	Found that: (i) dreams are related to REM sleep; (ii) people do dream in real-time; and (iii) eye movement pattern is closely related to dream content.	Experiment done in controlled laboratory conditions (e.g., controls include all participants being woken in the same way). It shows that dreams can be investigated in an objective way. It used a limited sample of mostly men, which means that the findings lack generalisability. Sleeping in a laboratory can affect sleep patterns.

Table 2: Research studies Continued

Study	What was done	What was found	Evaluation
<b>Maguire et al. (2000)</b>	Experiment to examine whether the human brain shows changes in structure associated with navigation experience. The brains of London taxi drivers were compared with those of controls. The taxi drivers were 16 adult males (mean age 44 years), who had been licensed drivers for a mean 14.3 years. The 16 right-handed, adult male controls were non-taxi drivers. MRI brain scans of both groups were compared to identify any differences in grey matter density over whole brain and <b>hippocampus</b> size.	Navigation experience is associated with change in hippocampus size. The taxi drivers had significantly greater volume in the posterior hippocampus, whereas the controls had significantly greater volume in the anterior hippocampus.  (This shows the two hippocampi looking up at the underside of the brain)	A well-controlled study; e.g., the groups were matched for age, handedness and gender. The person who judged grey matter density/hippocampus size was unaware whether the MRI was of a taxi driver or control. The experiment was ecologically valid as the taxi drivers had acquired their navigational skills in the real world. Correlational analysis does not tell us about cause and effect. The samples were small (n=16).
<b>Money (1975)</b>	Case study of a genetically male infant, Bruce Reimer, who was sex-reassigned as a female and renamed Brenda. Money aimed to show that gender identity is flexible and can be learnt through socialisation. Due to a circumcision accident at 6-months-old, Reimer's penis was severely burned. He was castrated and reassigned as female at 17-months old. The family raised him as a girl. He was given oestrogen at adolescence.	Money reported that, at 4-years-old, Reimer showed 'feminine' behaviour, such as liking dresses instead of trousers. Money claimed that the case illustrated the effect of socialisation over biology in determining gender. However, when he was a teenager Reimer refused to have any more contact with Money. At 14-years-old, Reimer decided to have surgery to create a penis and to take male hormones without any knowledge of his earlier sex-reassignment. He went on to live as a male, calling himself David.	The study was mostly based on subjective reports by the child's mother. Contrary to Money's early reports of success, David Reimer's own testimony stated that he never identified as being a girl or felt feminine.
<b>Rahe et al. (1970)</b>	Examined whether the stress of life events is correlated with illness. 2684 male navy personnel on three ships (mean age 22.3 years) completed a questionnaire listing significant life events (e.g., in personal life and employment) over the past two years. A total life event score was calculated for each participant. A doctor reviewed their health records.	Found that stress of life events was correlated with physical illness. The correlation was +0.118. The direction of the correlation was positive although the strength of the relationship was weak.	The study has high ecological validity as it was conducted in a real-life situation (on ships) rather than in a laboratory. As it involves a correlation, it cannot tell us about cause and effect; only that there is an association. The sample was ethnocentric as it used participants from only one culture and it is androcentric as only males were

### Glossary

**Amygdala:** An almond-shaped part of the brain which is involved in motivation and emotional behaviour, such as aggression.

**Controlled:** Holding variables constant.

**Corpus callosum:** A band of nerves which join and pass information across the left and right hemispheres of the brain.

**Dizygotic (DZ) twins:** Fraternal twins who develop from different eggs; they share 50% of the same genes (as for any siblings).

**DV:** The dependent variable. It is the variable which is not manipulated by the researcher. The effect of the independent variable on the dependent variable is measured.

**Dopamine:** Dopamine is a neurotransmitter involved in voluntary movement, learning, arousal and feelings of pleasure.

**Ecological validity:** The extent to which the findings of an investigation generalise to real-life settings.

**Grey matter:** Areas of the brain and spinal cord which look grey because they contain many more cell bodies of neurons than axons.

**Hard science:** A term used to describe sciences which are believed to rely on experimental, quantifiable data and focus on accuracy and objectivity.

**Hippocampus:** A banana-shaped part of the brain which is involved in long-term memory. There is one on each side of brain. Plural: hippocampi.

**IV:** The independent variable. It is the variable which is manipulated by the researcher.

**Longitudinal case study:** A case study which follows a person over many years.

**Monozygotic (MZ) twins:** Identical twins who develop from the same egg; they have exactly the same genes (100%).

**MRI:** Stands for magnetic resonance imaging.

**Shared environment:** An environment which is shared by, for example, siblings or twins and which makes those who share it similar in characteristics (e.g., twins share the same womb environment).

**PET:** Stands for positron emission tomography.

**Prepared:** Refers to 'preparedness' which is the idea that we have an innate inclination to learn to fear certain animals.

**Psychotic:** Where a person loses touch with reality, such as hearing voices.

**REM:** Rapid eye movement.

**Serotonin:** A neurotransmitter involved in such processes as sleep, pain and mood disorders.

**White matter:** Areas of the brain and spinal cord which look white because they contain many more axons of neurons than cell bodies.

## Worksheet: The Biological Approach to Psychology

Name \_\_\_\_\_

1. Give two assumptions of the biological approach.

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2. Briefly give a biological explanation of one of the following topics:  
sleep, aggression, stress, gender development, satiation, a mental disorder

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3. Using an example, explain what is meant by the nature-nurture debate.

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4. Give two points of evaluation of the biological approach.

1. -----

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2. -----

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5. Complete the table of some key terms in the biological approach.

<i>Key term</i>	<i>What it means</i>
autonomic nervous system	
synapse	
receptor	
neuron	
neurotransmitter	
genes	
hormones	
lateralisation	
localisation	
cortical specialisation	
adrenal glands	
adrenalin	
fight-or-flight response	
genotype	
phenotype	

### Example Exam Question

*Discuss the biological psychology approach to understanding human behaviour, referring to topics that you have studied in psychology.*

In your answer, you need to both describe and evaluate the biological approach. You will need to know the assumptions of this approach in order to describe it. You will gain marks for showing your knowledge of how this approach is used to understand behaviour, such as explaining behaviour by referring to genes and hormones. You are also required to apply the biological approach to some topic areas, such as aggression, intelligence, stress and so on. Use your knowledge from other modules in your course to explain these behaviours biologically. To evaluate this approach, refer to its strengths and limitations as well as how it has contributed to our understanding of behaviour and its applications. Remember that an evaluation can include both positive and negative criticisms. You can also compare it to other approaches and refer to debates (e.g., nature-nurture, reductionism).

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