Zig Zag Education

Psychology AS / A Level | Edexcel | 8/9PS0

Course Companion for AS and A Level Edexcel Psychology

Topic 3: Biological Psychology

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Teacher's Introduction

This course companion is designed to support the AS and A Level Edexcel Psychology
Within the companion biopsychology has been divided into seven chapters, with ea
of the specification. These chapters follow the order of the specification so that kn
and developed as the companion progresses.

The course companion provides a detailed set of notes on the specification content a
by your students. Opportunities to put their learning into practice are found throug
tasks and questions.

Tasks have been created to strengthen students' learning by providing ways to test a
they have covered. You may also come across 'Think!' or 'Consider' boxes during c
to encourage students to look beyond the information in front of them and conside
studies relate to one another, the significance of findings and how the findings relat
points that could be raised are provided for these boxes.

At the end of each chapter will be two sets of questions to reinforce your students' l
understanding' questions, which focus on testing students' knowledge of the conte
companion. Following these are 'Exam-style' questions which test the ability to tra
style answers. Model answers have been provided for all questions, and also tasks w

At the end of the entire set of seven chapters there is a set of six A Level exam-style questions aimed at those taking both the AS and A Level courses. Each question corresponds to each of the chapters in chronological order, i.e. A Level Question 1 is based on: 'Chapter 1: The Central Nervous System and the Role of Neurotransmitters', question 2 is based on 'Chapter 2: Recreational Drugs and the Central Nervous System' and so on. These questions are marked by an asterisk (*). The mark schemes are provided at the end of the answers section of the resource.

Teacher's Notes on Tasks

Short tasks for students to complete are provided throughout the companion, and ta
student interaction or guidance are identified underneath. Below are recommenda
but adjustments can be made depending on the classroom.

Task 5.2: Debate

Encourage students to think about the consequences of both sides of action: What w
were allowed to have special consideration? What is fair to the 'everyman' and wha
gene? What are the implications of this for other possible genes identified and crim

Chapter 1: The Central Nervous Syste
Role of Neurotransmitters

Overview

This chapter takes a look at our central nervous system (CNS) and its role in our behaviour. It also considers neurotransmitters, the brain's chemical messengers, and how they are used to transmit information between neurons (synaptic transmission).

Learning outcom

After studying this chapter you

- ❑ Describe the central nervo neurotransmitters
- ❑ Describe the structure an
- ❑ Describe the process of sy

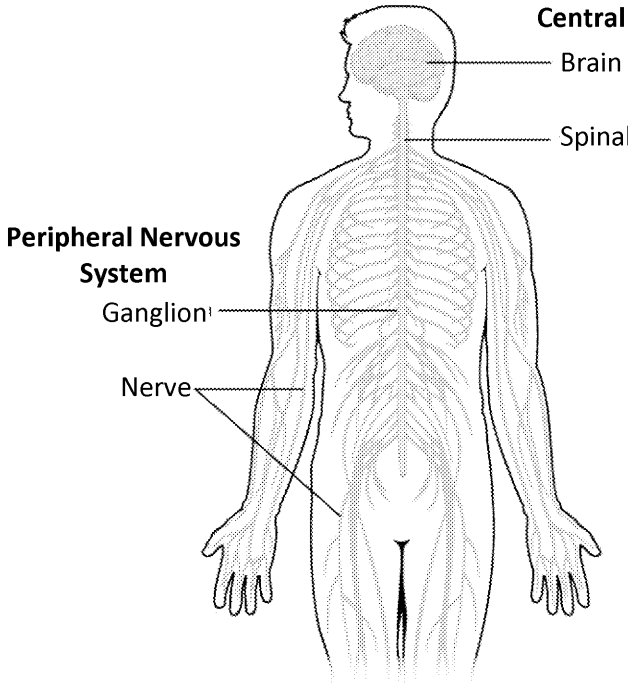
Key Terms

Action potential	A neuronal impulse that transmits information
Autonomic nervous system	Regulates involuntary actions, e.g. heartbeat
Axon	A long fibre which signals from the dendrites travel dov covered in myelin sheath
Cell body (soma)	Part of a nerve cell that keeps the cell functioning
Central nervous system	The brain and spinal cord; responsible for all of cognitic
Dendrites	Branches that receive signals from other neurons
Excitation	Encourages an action potential
Inhibition	Discourages an action potential
Motor neuron	Used to transmit information to muscles and glands
Myelin sheath	A fatty substance often covering axons, which insulates their transmission of impulses
Neuron	A nerve cell, responsible for communication between d between areas of the brain
Neurotransmitter	A chemical that transmits information between neuron
Parasympathetic branch	Is involved in normal resting state; inhibitory
Peripheral nervous system	Nerves that exist beyond the central nervous system ar organs to the central nervous system
Receptor site	An area on the receiving neuron that neurotransmitters
Reflex	A type of automatic response which does not involve th
Relay neuron	Used to transmit information between neurons
Reuptake	The process of reabsorbing the neurotransmitter back i
Sensory neuron	Used to transmit sensory information from receptors
Somatic nervous system	Transmits and receives sensory and motor information system
Sympathetic branch	Is involved in the fight or flight response; excitatory
Synapse	A junction between neurons where the neurotransmitt
Synaptic cleft	A gap between one neuron and the next over which ne information
Synaptic transmission	The communication process between neurons
Terminal buttons	The nerve endings where an action potential may be re

The Nervous System

The way our body is connected so that it can communicate information within itself through the use of neurons spread throughout the body

Formed of the brain and the spinal cord, the central nervous system is involved in the processing of information. It receives, interprets and sends information to the rest of the body via the peripheral nervous system.



The syst
with

he branch concerned with fight or flight

Revision Task

Revision task: After the end of this chapter go and create your own version of this map on an
important points of each system. Learn it and try to rewrite it from memory.

Scene-setting Questions

- Is the brain involved in all behaviour?
- How are messages transferred all around the body?
- How does our body differ from rest to extreme stress?

The Central Nervous System

The central nervous system includes the brain and the spinal cord; it is responsib
also involved in movement and interpretation of sensory stimuli. The central ne
approximately 100 billion neurons; approximately 80% of these are in the brain.

The brain

The brain is the most complex organ in the body and is vital for our ability to thin
billions of interconnected neurons, and while some functions may appear to be l
brain, it is difficult to determine whether the function may actually be the result o
Even when the body is at rest, the brain remains highly active. It requires more e
expected for an organ of its size.

The brain makes us who we are as individuals. It holds all of our memories, our p
communicate and our abilities to perform the most basic of tasks. Damage to the
life-changing consequences for the individual. When brain damage occurs at a y
for the brain to change and adapt to make up for any deficits (termed plasticity).

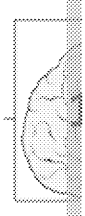
Forebrain

The forebrain is the largest section of the brain and contains the two large cereb
of the brain involved in higher thinking and conscious thought, and our overdeve
one of the key distinguishing features between us and other animals.

Cerebral hemispheres: The brain can be 'divided' into two hemispheres (left and
image of each other. These structures cover most of the other brain structures, n
standard view of the brain. The hemispheres are connected by the corpus callos
that allows the two hemispheres to communicate.

Cerebral cortex: The outer layer of tissue in the brain is the cerebral cortex. This is regarded as the most important structure in the brain. There are four lobes of the brain and these are related to certain areas and functions:

1. Frontal lobe = primary motor cortex (movement)
2. Parietal lobe = primary somatosensory cortex (touch)
3. Occipital lobe = primary visual cortex (vision)
4. Temporal lobe = primary auditory cortex (hearing)



Cerebrum (Forebrain)

Brains

All lobes have several important functions. For example, along with its involvem
lobe also has a well-accepted role in cognition. Frontal lobe damage can cause d
solving ability, flexible thinking, planning, language and social behaviour, suggest
are related to the frontal lobe. Additionally, functions may be related to multiple
manipulating objects also uses the parietal lobe.

While some of the cerebral cortex can be connected to particular sensory and m
not. These are termed 'association areas' and are believed to be involved in the
information and in higher mental abilities. Abilities such as thinking, planning an
localised than other abilities. These functions are not necessary for survival and

***Thalamus*:** Located near the centre of the brain; all sensory signals go through th role in integrating information received from the sensory organs, and different n sensory signal. The thalamus is also important in regulating sleep and wakefulne

Hypothalamus (under the thalamus): This small structure in the brain has many i important role in homeostasis, keeping the body's internal environment in balan behaviours such as eating and drinking, emotional arousal and motivation. The h signals to the autonomic nervous system (ANS) or by affecting the pituitary glan

***Basal ganglia*:** The basal ganglia are composed of the corpus striatum, amygdala particularly important role in voluntary motor movement. The neurological diso Huntington's disease, which both have severe motor symptoms, are associated v

Limbic system: The limbic system is a collection of structures which include the hypothalamus, hippocampus, amygdala and olfactory bulb (among others). These structures have been particularly tied to emotion and meeting basic needs such as feeding and mating. The set of structures making up the limbic system has been debated, and other researchers have argued that there is no 'emotion centre' of the brain and the term limbic system should no longer be used. Presently, most researchers relate their findings to individual structures rather than the limbic system.

The a importa a result o comple

Midbrain

The midbrain connects the forebrain to the spinal cord.

Hindbrain

The hindbrain is composed of the cerebellum, pons, and medulla oblongata, and that are vital for human survival.

Cerebellum: This is also split into two hemispheres and is a structure visible outside the cerebral hemispheres. It is involved in voluntary muscle movements, and signals formed during higher thinking are processed here before being sent to the muscles.

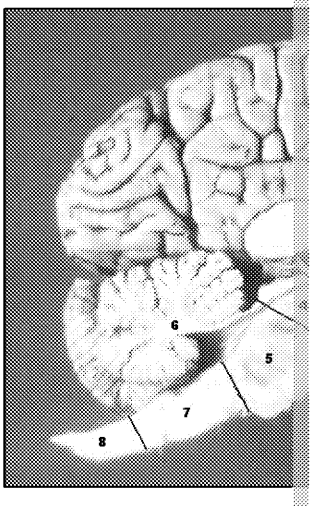
Pons: This structure is a 'bridge' towards the midbrain structures. Four cranial nerve nuclei are located in the pons and these nerves have sensory functions such as hearing, taste, eye movement and swallowing. The pons is considered to be important in balance and motor control.

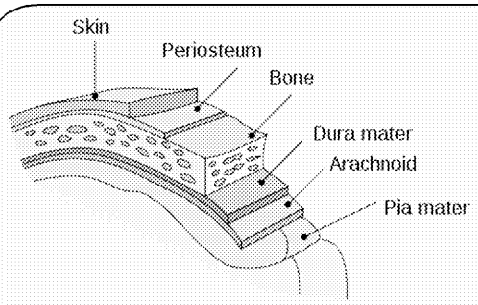
Medulla oblongata: This is a section of the lower brainstem and is in reality an extension of the spinal cord. It is the 'oldest' part of the brain and deals with autonomic behaviours such as breathing, coughing, vomiting and cardiac functions. Therefore, this structure is important for our basic needs and survival.

Much of our unc when things go symptom of cere gait. Individuals the cerebellum i coordinating the the function of t called neuropsy what brain injur

What does it look like in real life?

1. Cerebrum
2. Thalamus
3. Hypothalamus
4. Midbrain
5. Pons
6. Cerebellum
7. Medulla oblongata
8. Spinal cord





Protecting the brain…
The sheer importance of the brain ma of protection it receives. Not only is it the periosteum, a protective layer tha three different layers of protective tiss blood-brain barrier which protects the toxic blood.

Consider!
Our body, including our brain, has been evolutionarily designed over millions of aspects of our body might have been formed this way.

The spinal cord

The spinal cord receives information from the body and carries this information t brain. Information from organs related to specific senses (eyes, ears, nose mout skin), along with information from muscles, is carried to the brain.

The brain will then decide what to do with the information. For example, if you h been running for a while and the muscles in your legs are hurting your brain coul you to either ignore the pain and keep on running or stop and take a break. It m this pain to past memories of when you have been injured from too much runnin plan for you to take a break in five minutes' time. These instructions are receive your brain and travel down your spinal cord to the rest of your body.

Spinal cord damage

Damage to nerves in the spine can lead to loss of the ability to move limbs or det sensations in these parts of our bodies. Quadriplegia is a result of brain or spina injury and results in the loss of the use of limbs and senses below the injury. The individuals are unable to move much of their body and require round-the-clock c

However, while their quality of life is largely determined by the extent of their in is important to recognise that it is also moderated by psychological factors. For e if a person has a personality that promotes active problem-solving coping then t more likely to be involved in regular physiotherapy.

Reflexes: not all actions require the brain

Although the brain is vital in all cognition, it is not necessary in some actions. Refl
do not involve the brain, although the brain is notified during or after the respons
have heard of is the knee-jerk reflex. Hitting just below the knee produces a reflex

The pathway of actions that cause the behaviour is called a reflex arc. Here is ho
reaction works:

Hitting is detected by sensory receptors in the quad

↓

The impulses detected travel from the sensory neurons to th

↓

The impulses cross the gap from the spinal cord to the mo

↓

The motor neurons send impulses to the quadriceps which c
to extend the lower leg in the kicking motion

Note: Don't worry if you find it difficult to understand this at the moment, you w
later in this chapter.

Practical application: Doctors can use reflexes to test whether a person's nervou
People also demonstrate individual differences in their reactions and doctors hav
making their diagnosis.

The Peripheral Nervous System

The peripheral nervous system consists of the nerves other than the central nerv
connect the limbs and organs to the central nervous system.

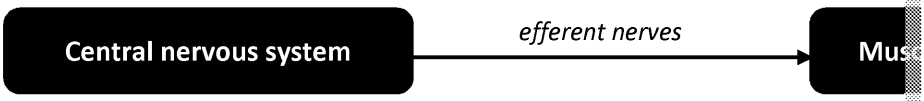
Neurons and nerves

A neuron is a type of cell which is specialised to communicate information throughout the body. They have a long fibre called an axon that carries the signal across the cell, and dendrites where the signal is received. Nerves are groups of axons from many neurons, and as such send and receive many impulses at once. There are 12 cranial nerves which connect to the brain and 31 spinal nerves which connect to the spine.

The somatic nervous system

The somatic nervous system receives and transmits sensory and motor informati
nervous system. This nerve system connects to the organs and limbs and allows
information via the spinal cord. The somatic nervous system is made of two kind
nerves and afferent (sensory) nerves.

Here the central nervous system sends signals for movement or action via effere
sensory organs:



Here the muscles and sensory organs send signals they have received about thei
nervous system via afferent nerves:

The somatic nervous system only deals with voluntary control of our muscles, th
stop moving.

Autonomic nervous system (ANS)

The autonomic nervous system is concerned with involuntary actions.

The autonomic nervous system is divided into two branches:

- Sympathetic branch: concerned with expending energy, particularly in the high-cost energy response of fight or flight
- Parasympathetic branch: concerned with saving and restoring energy; our re

The sympathetic branch tends to 'excite' functions and the parasympathetic bran

Homeostasis

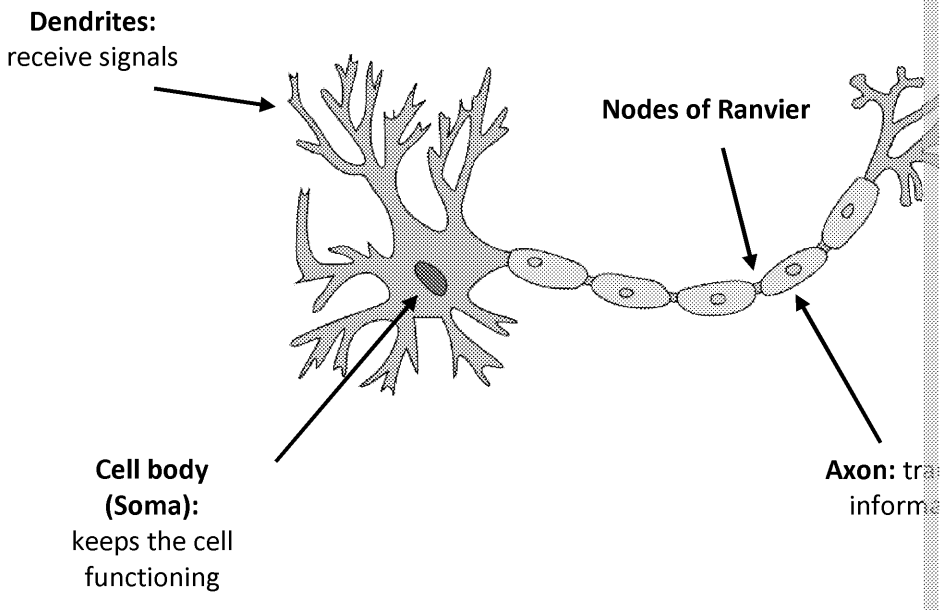
Although the sympathetic branch is concerned with the fight or flight, it is also ac
day in order to maintain a balance called homeostasis. In this way the sympathe
parasympathetic branches are complementary and promote balance when in a r
of rest. When in a highly stressed situation the sympathetic branch overrides ou
state to allow for the high-energy state that is fight or flight. Chronic stress can c
difficulties as the balance between the two branches is thrown out.

Neurons

The brain and body are covered by neurons or nerve cells that allow the differen
together. The majority of these neurons are in the brain, where billions of neuro
information.

The structure of a neuron

Here is the basic structure of a neuron:



The cell body

The soma or cell body is responsible for keeping the neuron functioning normally
information for how to build proteins, along with mitochondria that help provide

The dendrites

The dendrites are where the nerve cell receives signals from other neurons and p
often designed to provide a huge surface area so that the dendrites are able to re

The axon

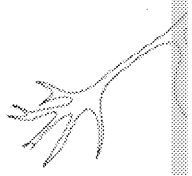
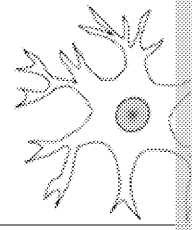
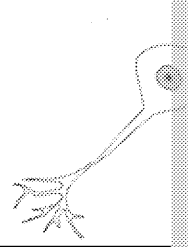
The axon is a long fibre that allows for communication between different parts o
is often split into branches to allow the axon to communicate with several differe
covered in a fatty substance called myelin sheath which insulates the axon; this h
speeds up transmission of impulses. Multiple sclerosis is a condition where the i
myelin sheath and this affects how well nerves can transmit information.

There are regular breaks in the cover of myelin sheath called nodes of Ranvier. T
node. This increases the speed of transmission compared to axons without myel

The terminal buttons

Terminal buttons are the end points of the neuron and this is where the transmis
neurons usually occurs.

Types of neurons and their different roles

Type of neuron	Role in communication	
Sensory	Transmit sensory information from receptors via the spinal cord to the brain. Receptors are different depending on the sense; for example, photoreceptors are found in the retinas of your eyes and these are sensitive to light. Photoreceptors convert the light into signals that then can be transmitted to and understood by the brain.	
Motor	Transmits information to muscles and glands from the central nervous system. Signals from the spinal cord travel to the muscle and this results in movement. Many of the neurons deal with voluntary (somatic) behaviour but some, called general visceral efferent (GVE) fibres, are neurons of the autonomic nervous system and deal with non-voluntary movements such as sending signals to the heart muscle.	
Relay (interneuron)	Transmits information between neurons to allow communication between different parts of the central nervous system. This type of neuron is found in the spinal cord and the brain and connects the sensory neurons to the motor neurons. With reflexes, such as pulling your hand away from something that is very hot, relay neurons allow for the signal to go directly from sensory neurons to the motor neurons, missing out the brain from the action.	

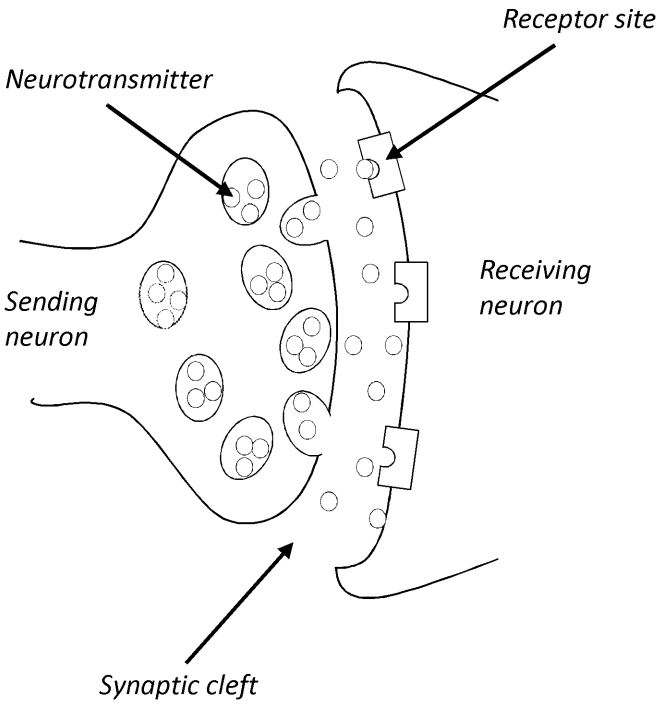
The function of neurotransmitters

While they are close to one another, neurons do not touch, and instead informat
them called the synaptic cleft. Chemicals called neurotransmitters are released f
across the synaptic cleft and bind to receptors on the receiving neuron.

The processes involved will be outlined and explained below:

What are neurotransmitters?

Neurotransmitters are chemicals that communicate information between two ne
released at one end of a neuron and goes across a gap called the synaptic cleft w
cells in the other neuron.



The rece
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Some key neurotransmitters

Dopamine

Dopamine has been implicated heavily in motor control. For example, L-dopa, a
Parkinson's disease, a degenerative disorder in which the person loses the ability
increasing the amount of dopamine (which suggests that Parkinson's may partial
dopamine).

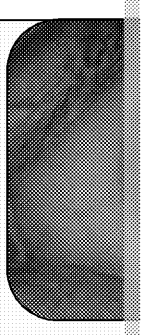
Dopamine imbalances have also been implicated in disorders such as schizophrenia. Excessive use of drugs (e.g. cocaine) that involve an increase of dopamine can cause paranoid psychosis with symptoms that mirror schizophrenia. Additionally, treatments that reduce the amount of dopamine (e.g. chlorpromazine) diminish the symptoms of schizophrenia, further implicating dopamine in the disorder.

Note: This is
hypothesis of
evidence sug
dopamine is i
very difficult
neurotransm
difficult to pr

Epinephrine

Epinephrine, more commonly known as adrenaline, has an important role in the stress response. Adrenaline produces changes in heart rate, breathing and muscle tension, among other changes that are designed to cope with physical stressors. As you may be aware, these changes occur even when we need to deal with non-physical demands such as exams.

While heightened physiological arousal may not be suitable for an exam, epinephrine does have other beneficial effects such as increasing our alertness and wakefulness. This is also part of the stress response, so that a person is aware of and able to quickly process their environment.



Our pupi
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informa

GABA

GABA's main function is to reduce or 'inhibit' other neurons by binding to recept
researched the effects of directly administrating GABA to 13 participants in a stre
administration of GABA reduced stress as compared to a placebo. This suggests
may be as a stress reducer.

Glutamate

While GABA is 'inhibitory', glutamate is the primary 'excitatory' neuron in the CNS.
the amount of glutamate are stimulants. As such, both GABA and glutamate balan
excitation in the brain. Too much excitement is toxic to neurons and is involved in

Acetylcholine

The first neurotransmitter to be discovered, acetylcholine is also generally excita
involved in muscle contraction, particularly in voluntary movement. It also belie
memory, particularly in encoding memories. Alzheimer's disease has been assoc
and some treatments target this by trying to stop the breakdown of acetylcholin

Neurotransmitters and mental health

An imbalance of neurotransmitters has been linked to many health disorders:

- Obsessive compulsive disorder and low levels of serotonin
- Schizophrenia and too much dopamine
- Anxiety disorders and low levels of GABA
- Depression and low levels of dopamine and serotonin

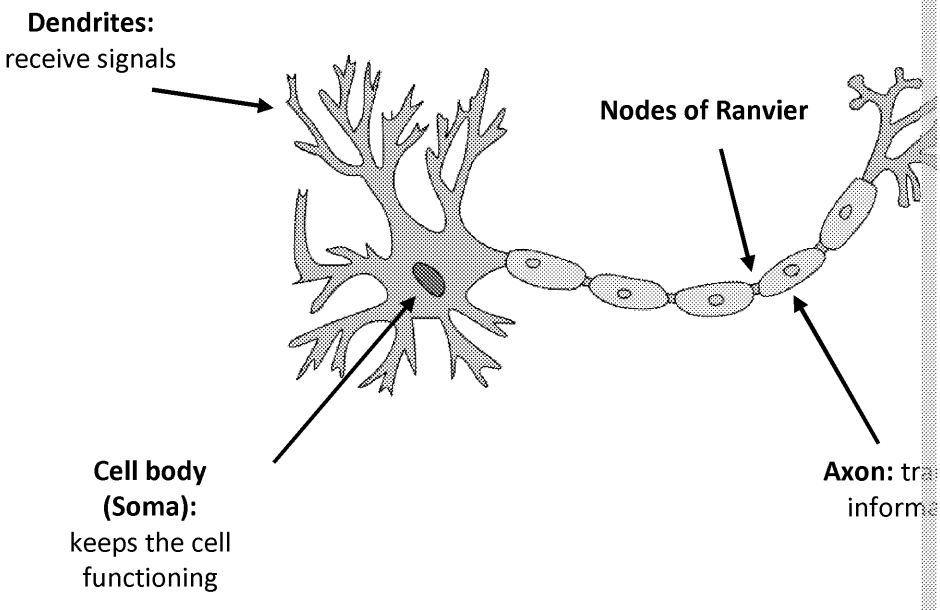
How clear is the link?

It is difficult to measure the levels of neurotransmitters in the brain directly wit
Examinations have revealed that in some cases there are more receptors in son
neurotransmitter than controls, whereas others have found no differences. Oth
than there being more receptors, the difference is in the sensitivity of the recep
there being a link between certain neurotransmitters and mental health comes
effective when targeting specific neurotransmitters.

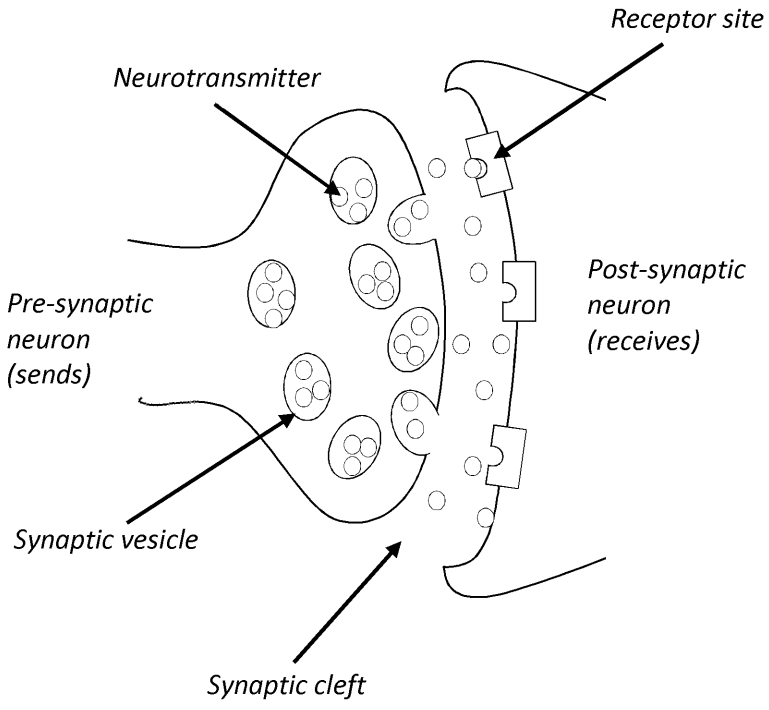
Communication between neurons: Synaptic tr

Synaptic transmission (also called neurotransmission) is the process of communi
another neuron. This is achieved by a neuron releasing neurotransmitters into th
neurotransmitters binding onto the receptor sites of the receiving neuron.

In the previous diagram we identified the terminal buttons as being responsible f
synaptic cleft.



The terminal buttons are filled with synaptic vesicles that store different neurotr
has been carried down the axon, causes the synaptic vesicles to release their neu
cleft.



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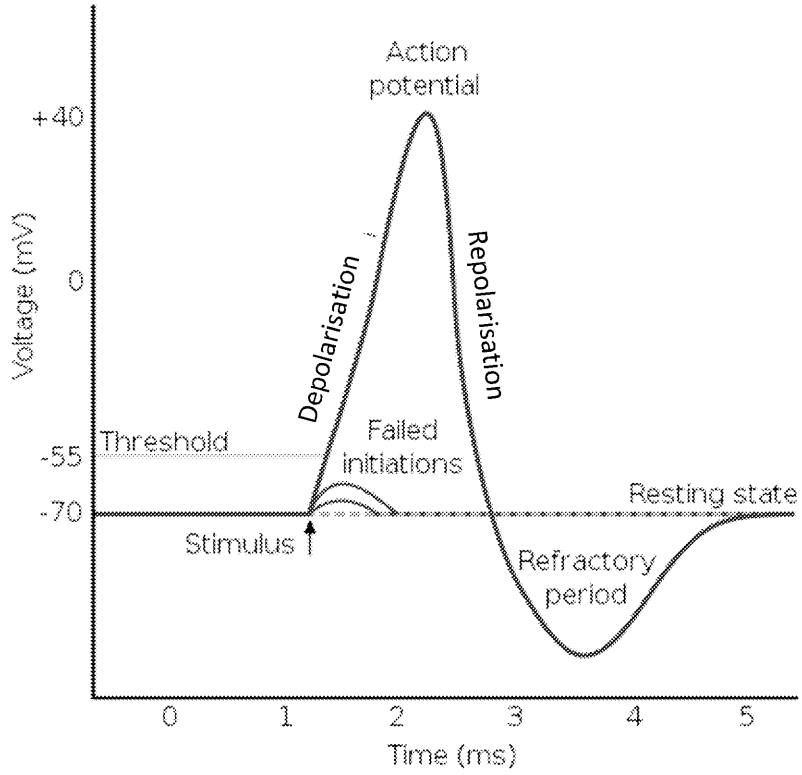
Action potentials

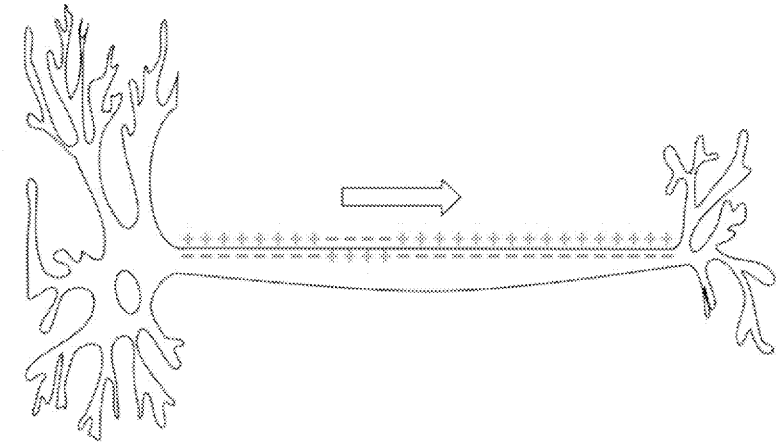
Neurotransmitters are released when an impulse is received in the terminal butt
impulses are messages that are sent through the neuron.

When a neuron is not sending a signal it is at a resting state and the inside is mor
outside. When the neuron is at resting state it is said to be at resting potential. A
neuron contains a high concentration of positively charged potassium ions (K^+ io
is a high concentration of positively charged sodium ions (Na^+ ions) and negative
contain proteins that create ion channels that are specific to different ions. At re
channel lets in more potassium than the sodium channel lets in sodium. This me
leaving the neuron than are entering and overall this leads the inside of the neur
charged than
the outside.

When the neurotransmitter binds with the receptor of this neuron it triggers for
positively charged sodium ions. This positive charge causes the inside of the cell
charged. If this charge meets a certain threshold then the action potential is fire



This triggers a reaction which leads the sodium channels to open along the axon,
ions enter, causing depolarisation. After each channel closes the potassium chan
neuron to its negatively charged state (repolarisation).



Excitation and inhibition
When the neurotransmitter reaches the other neuron it binds with the receptor s
decreases the chances of producing an action potential.

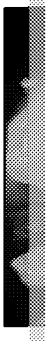
When the neurotransmitter binds to an excitatory receptor this makes it more lik
because the bindings lead to depolarisation and the membrane becomes more p
binds to an inhibitory receptor it is less likely to fire the action potential because t
negative.

The other neuron receives many different signals from several neurons, and whe
dependent on the number of excitatory and inhibitory bindings.

Reuptake
To avoid a never-ending number of action potentials the neurotransmitter is rea
and recycled so that it can be used again. This is known as reuptake. The memb
transporters to allow the neurotransmitters to cross the membrane and be reab
large to go through the membrane. There is also an additional process called en
enzymatic degradation) where enzymes bind to the neurotransmitter and break
the receptor site. Both of these processes are important to help regulate neuron

LINK TO CHAPTER 2

What happens if reuptake is prevented?
In chapter 2 we take a look at how different d
neurotransmission.



The pleasurable and euphoric feeling that drug users experience from many addictive drugs is the result of increased amounts of the neurotransmitter dopamine. Methamphetamine causes dopamine to be released and then blocks the transporters from reabsorbing dopamine back into the sending neuron.

The result is large amounts of dopamine in th
dopamine receptor sites and leading to more
a sustained and long-lasting feeling of euphor

Chapter 1 Activities

Check your understanding!

1. Describe the function of the dendrites in a neuron cell. (1 mark)

2. Distinguish between excitation and inhibition. (2 marks)

3. Describe the function of one neurotransmitter. (4 marks)

4. Describe the spinal cord's function in the central nervous system. (4 m

5. Describe the process of synaptic transmission. (6 marks)

6. Briefly describe the central nervous system. (6 marks)

Exam-style questions

1. Define the terms 'neuron' and 'neurotransmitter' as they are used in b psychology. (2 marks)

2. When Laura was crossing the road, a fast car turned, came around the quickly rushed out of the way. Laura's teacher said that epinephrine r respond to the situation.

   Explain, using knowledge of epinephrine, how epinephrine helped La (3 marks)

Chapter 2: Recreational Drugs and the Centra

Overview

In this chapter we will take a brief look at the effect of recreational drugs on the central nervous system. We will examine two recreational drugs (methamphetamine and alcohol) in greater detail and build on our understanding of neurotransmitters.

Learning outcom

After studying this chapter you sh

- ❑ Understand the relationship drugs and the reward syste
- ❑ Describe how two recreation central nervous system
- ❑ Evaluate these effects

Key Terms

CNS stimulant	A drug that increases the activity of the central n makes the user feel more alert and awake
CNS depressant	A drug that slows down the activity of the nervo on the user
Dopamine	A neurotransmitter involved in reward
Excitation	Encourages an action potential
Gamma-aminobutyric acid (GABA)	The primary inhibitory neurotransmitter in the b
Glutamate	The primary excitatory neurotransmitter
Glycine	The primary inhibitory neurotransmitter in the b
Inhibition	Discourages an action potential
Neurotransmitter	A chemical that transmits information between n
Post-synaptic neuron	The receiving neuron
Pre-synaptic neuron	The sending neuron
Receptor site	An area on the receiving neuron that neurotrans
Recreational drug	A drug taken for pleasure rather than for medica
Reuptake	The process of reabsorbing the neurotransmitte
Reward system	A group of structures and neural pathways in the cravings and in reinforcing behaviours
Synaptic vesicles	Store neurotransmitters in the axon

Scene-Setting Questions

- What do recreational drugs do to our behaviour?
- What do we mean by the terms 'stimulant' and 'depressant'?
- Which neurotransmitters are involved in reward?

What are recreational drugs?

Recreational drugs are used for enjoyment rather than for medical reasons. Alcohol, nicotine and caffeine are examples of recreational drugs that are legal in the United Kingdom. Most often when people refer to recreational drugs they are talking about drugs that are illegal. Examples of illegal recreational drugs include cocaine, ecstasy, heroin, cannabis and LSD. Although many of these drugs initially produce pleasurable feelings, over repeated use they can lead to addiction, health problems and damage to social relationships.

The reward system and the brain

The reward system is a group of structures and neural pathways in the brain that and in reinforcing behaviours.

Early insights: A reward centre in the brain

In 1954, Olds and Milner were interested in whether stimulating different areas of the brain would reinforce behaviour. An electrode was implanted into different areas of a rat's brain. The rat was placed in a box with a lever. If the rat pressed the lever it would result in the stimulation of the brain.

Is it m

If the rat continued to press the lever down many times then it was assumed that the stimulation was pleasurable and rewarding. Therefore, the rewarding feeling was reinforcing the behaviour of pushing down the lever and encouraging the rats to repeat the behaviour. In contrast, if the rat did not press the lever down again or avoided the lever, the stimulation was assumed to be unpleasant and punishing. The rat therefore would be motivated to avoid the lever.

Of the 15 rats tested, all four of the rats which had the electrode in the septal ar lever, suggesting that the septal area was producing pleasure and reinforcing the rates were also found for the cingulate cortex (two out of two rats) and mammill rat), which were also rewarding and reinforcing the lever pushing behaviour.

Olds and Milner suggested that there may be a set of structures in the brain resp activated these structures motivate us to repeat rewarding behaviours.

In the same way that the rats were motivated to repeat the lever-pressing behav the same pleasurable feeling created by the drug.

Consider!
This chapter looks at neural rewards for drug-use behaviour. What non-biologic an individual to use or continue to use drugs? Consider both legal and illegal dr

Dopamine and the reward system

The primary neurotransmitter in the reward system is dopamine. Dopamine is in
reinforcing our everyday behaviours by producing pleasurable feelings when we
example, eating a delicious meal is rewarding, and food is necessary for survival
behaviour is reinforced. These pleasurable feelings motivate us to repeat the be

In addition to rewarding normal everyday behaviours, dopamine is also responsi
we get when we use addictive drugs. Many recreational drugs produce feelings
often feel motivated to take the drug again and recreate the feelings they experi
dopamine and pleasure are not possible from everyday behaviours and so drug u
feeling by taking the drug again.

Classifying recreational drugs

There are many different types of drugs, which vary in their use, their effects, th
dangerous they are.

For the purpose of this chapter, we're going to classify drugs by their effect on th

CNS stimulants: Speed up the activity of your central nervous system and make you feel more alert and energised (e.g. caffeine)

CNS depressants: Slow the activity of the nervous system and make you feel relaxed and drowsy (e.g. alcohol)

This chapter is going to briefly look at stimulants and depressants. You will learn
do the Health Psychology topic next year.

CNS stimulants

CNS stimulants speed up the activity of the brain and body. Stimulants make you
Well-known CNS stimulants include caffeine, nicotine, cocaine and methamphet

Did you know?

Some CNS stimulants are used for medical reasons rather than recreational use. For example, narcol
characterised by excessive daytime sleepiness and falling asleep suddenly. CNS stimulants can help
throughout the day, reducing the chances of falling asleep, and improving the patient's quality of life

CNS stimulants have also been used in the treatment of Attention Deficit Hyperactivity Disorder (AD
However, due to the high potential for addiction and drug abuse, using stimulants as medicine rema
courses of treatment should be ruled ineffective before turning to stimulants.

Methamphetamine

Methamphetamine (aka meth) is a strong CNS stimulant that can be taken as a powder or in rock-crystal form (crystal meth). Users of methamphetamine experience a feeling of euphoria, an increase in alertness and wakefulness, and lowered inhibitions. However, less desirable effects include agitation, paranoia, aggression, confusion, mood swings and a rapid heart rate. Methamphetamine is highly addictive and there are anecdotal reports of people becoming addicted from a single use.

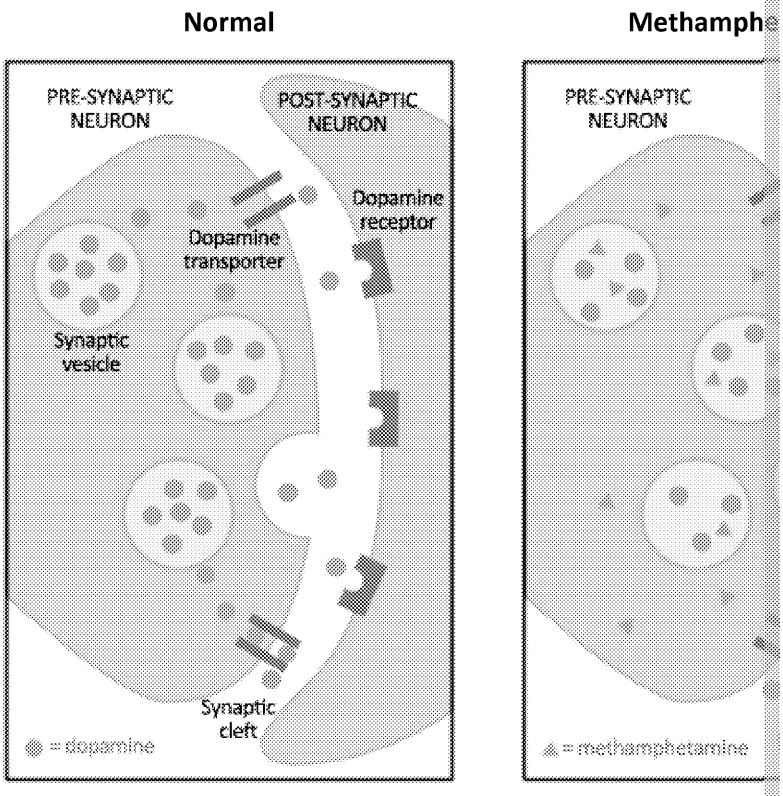
Methamphetamine and dopamine

Like other addictive drugs, the pleasurable feelings of using methamphetamine c dopamine. Methamphetamine enters the bloodstream and crosses the blood-br it acts on a neuronal level.

Methamphetamine works by causing dopamine to be released by the synaptic ve different neurotransmitters. The synaptic vesicles release dopamine into the syn with the dopamine receptors on the post-synaptic neuron.

Methamphetamine also blocks the reuptake of dopamine. Reuptake is a process neurotransmitter) is reabsorbed into the pre-synaptic neuron. Reuptake stops th is therefore important in regulating synaptic transmission.

The diagram below illustrates the changes:



Taking methamphetamine results in an initial rush and then a more sustained hig Increasing the effect of dopamine and blocking its reuptake results in large amou cleft and an increased number of bindings to dopamine receptors. Blocking reup effect of the drug as dopamine stays in the synapse for longer.

Methamphetamine and other neurotransmitters
Methamphetamine also affects norepinephrine and serotonin. Norepinephrine is an important neurotransmitter that is involved in stress responses such as fight-or-flight. It is responsible for the increased alertness and attention that a user experiences after taking the drug.

The neurotransmitter serotonin is affected also by using methamphetamine. Serotonin is important for a number of brain functions, but is particularly known for its involvement in mood regulation. Methamphetamine kills both dopamine and serotonin neurotransmitter cells which results in feelings of depression. Long-term users of methamphetamine become less and less able to feel joy. The intense reward produced by methamphetamine cannot be produced by normal behaviour and long-term users no longer find everyday behaviours rewarding.

Factors that alter the intensity of the drug
Methamphetamine can be smoked, swallowed, snorted or injected. How the dru experience of the user. Injecting and smoking methamphetamine give the user a because these methods deliver to the brain quickly. In contrast, swallowing the d because the drug is sent first to the stomach. Therefore, different methods of us neurotransmission.

CNS depressants

CNS depressants decrease the activity of the brain and body. Depressants are no called depressants because they make you depressed; the word depressant refe the slowing down and calming effect they have on the user. Examples of CNS depressants include alcohol, benzodiazepines (e.g. Valium used for anxiety disor and barbiturates (used for epilepsy). Just like CNS stimulants there are negative consequences to using too much of these drugs.

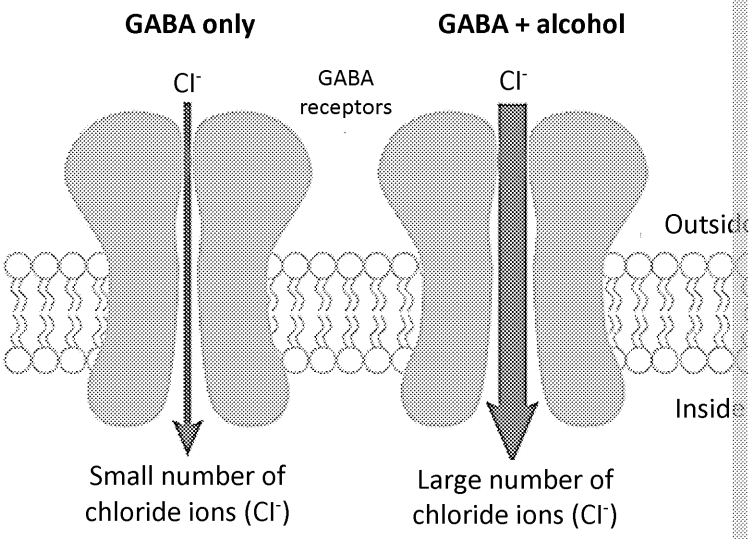
Alcohol

Alcohol is widely consumed across the world and in many cultures alcohol plays a important role in socialising. When consumed in moderation, alcohol causes an improvement in mood (euphoria), improved self-confidence, reduced anxiety an increase in sociability. However, larger amounts of alcohol can cause a significan impairment in judgement and coordination, blurred vision, slurred speech, drowsiness and memory problems. Heavy long-term use can cause damage to th liver and alcoholism.

Alcohol and inhibitory neurotransmission
In neurotransmission, there is a careful balance between inhibition and excitatio decrease how responsive other neurons are. In contrast, excitatory neurotransm other neurons are to other stimuli.

In the short-term, alcohol acts as a depressant by:

Increasing the effect of inhibitory neurotransmitters
Gamma-aminobutyric acid (GABA) is the primary inhibitory neurotransmitter in released into the synaptic cleft it binds to the GABA receptors on the post-synap chloride channel opens, negatively-charged chloride ions enter the neuron and t neuron to become negatively charged. A negatively-charged neuron will not fire does not meet the threshold of positive charge. This results in an inhibitory effe



Glycine is the primary inhibitory neurotransmitter in the brain stem and spinal co CNS) and is involved in sensory and motor functions. As with GABA, the inhibitor Glycine is thought to contribute to the psychomotor problems a person may exp (e.g. stumbling, poor fine motor coordination).

Decreasing the effect of excitatory neurotransmitters

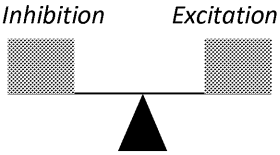
Glutamate is the most important excitatory neurotransmitter. When glutamate increases the movement of positive ions entering the cell which makes action po

Consumption of alcohol inhibits the excitatory effect of glutamate receptors. Lo very low alcohol concentrations (0.03%) inhibited the NMDA glutamate receptor that glutamate receptors are particularly sensitive to alcohol. Alcohol results in a contributes to the depressant effect on the CNS.

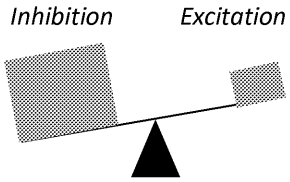
Issues and Debates: Psychology as a science

Synaptic transmission looks at how the brain communicates on a neuron-to-neuron level. This metho scientific as it focuses on electrical impulses and neuron cells. These concepts are well established w

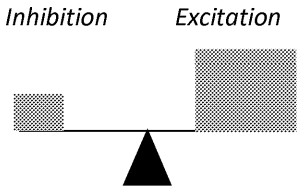
Long-term alcohol consumption and the inhibitory–excitatory balance



Without alcohol, neurotransmission is carefully
and excitatory system is in balance. This allows
but also regulates neurotransmission so that it



In the short term, when alcohol is consumed it
The number of action potentials is reduced and
the CNS.



Long-term consumption results in the body tryi
increasing the amount of excitation. When an
alcohol use they often experience withdrawal s
shaky hands and even seizures, and this is the r
in favour of excitation.

Evaluation of recreational drugs on the centra

Strengths

- **Supported by evidence:** Vast amounts of research are conducted into this a
findings (e.g. Olds and Milner, 1954) support the idea that there are particu
involved in pleasure, reward and addiction.
- **Deeper understanding**: Research in this area has led to a deeper understand
reward.
- **Useful applications**: Understanding how drugs work on a neural level can he
possible biological solutions to addiction and withdrawal.

Weaknesses

- **There are individual differences:** Our abilities to manage drug use are relate
factors (Wichers, et al., 2013) whereas this approach suggests that drugs aff
- **Drugs often involve several neurotransmitters**: Research tends to focus on
but in fact drugs involve multiple neurotransmitters that often influence on
- **Over-simplistic explanation:** Focusing purely on the neural side of drug use
understanding. For example, we have shown that drugs that affect the dop
pleasurable and addictive, but not why some individuals are more likely to b
- **Animal research may not be generalisable to humans:** Many studies invest
neurotransmission use animals in laboratory settings. It may not be possible
humans. Although the process of neurotransmission is the same for animal
far more complex in humans.
- **Difficult to study:** In some cases it can be difficult to study certain drugs, e.g.
using a multitude of different drugs and this makes it difficult to isolate the

Chapter 2 Activities

Check your understanding!

1. Describe the main difference between CNS stimulants and CNS depre

2. Identify and explain one weakness of Olds and Milner's (1954) study i

3. Briefly describe the role of GABA in the brain. (3 marks)

4. Briefly describe how one drug affects the central nervous system. (4 m

Exam-style questions:

1. Define the terms 'excitatory neurotransmitter' and 'inhibitory neurotr
   are used in biological psychology. (2 marks)

2. James watched a documentary on drug use and noticed that methamp
   James' teacher said that dopamine might be responsible.

   Explain, using knowledge of dopamine, why methamphetamine is ve

Chapter 3: The Brain

Overview

This chapter examines the different brain areas and their involvement in aggression. We also take a look at different brain-scanning techniques and what we can learn from them. This chapter includes the Classic Study, Raine et al. (1997).

Learning outcome

After studying this chapter you sho

- ❑ Describe the structure of the
- ❑ Describe and evaluate evidenc brain to aggression
- ❑ Describe and evaluate brain-s
- ❑ Describe and evaluate a classi

Key Terms

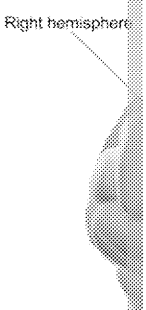
Computer axial tomography (CAT scans)	A scanning technique that uses a rot machine to learn about the brain's s
Computerised tomography (CT scans)	A more modern version of CAT scan X-ray machine to generate a 3D ima
Functional magnetic resonance imaging (fMRI)	A scanning technique that uses stron changes in blood oxygen level in diff activity
Limbic system	A collection of structures within the emotion and memory
Positron emission tomography (PET)	A scanning technique that uses a rad in different areas of the brain
Reductionism	Reducing a complex problem down a simpler but less complete understa
Social control	Regulating human behaviour, usuall

Scene-Setting Questions

- How do we describe the different parts of the brain?
- Why do psychologists study brain injuries?
- Can we generalise from animal studies of the brain to human b

The brain and our behaviour

The brain is responsible for almost all of our behaviour. Studies of brain damage show just how crucial our brain is for language, decision-making, moving and so much more. In this chapter we take a look at different areas of the brain and how they relate to our behaviour.



Two hemispheres

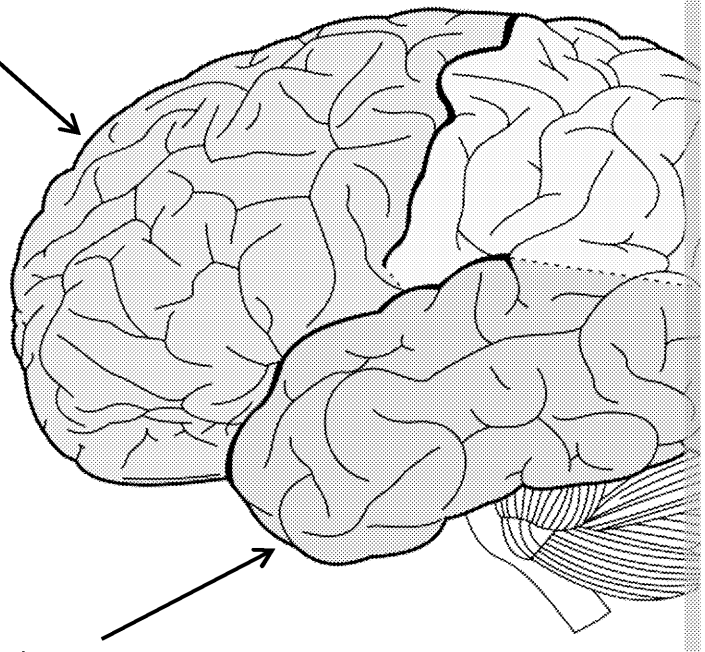
The brain is divided into two equal parts: a right hemisphere and a left hemisphere. The two hemispheres communicate via a band of nerve fibres called the corpus callosum. Although the two hemispheres look similar, there are subtle differences, for example, the Broca's and Wernicke's Areas which are involved in language are usually found in the left hemisphere.

The lobes of our brain

Our brain has been further subdivided into four lobes.

Frontal lobe
The largest lobe of the brain, the frontal lobe houses the primary motor cortex. The primary motor cortex is one of the most important areas of the brain for planning and executing movement. Organising our movement is surprisingly complex due to having to carefully control muscles, time movements and work out the correct amount of force needed (imagine holding a glass so tight it cracks!).

A lateral surface view of the brain



Temporal lobe
The temporal lobe is involved in processing sensory information, particularly auditory, and memory and recognition. The primary auditory cortex, which is part of the temporal lobe, is involved in organising and processing sound.

Cerebellum
The cerebellum is n
but an important st
in our voluntary mu
cerebellum helps u
fine muscle movem
of the brain results
and mistiming our m

Learning about the brain: Brain scanning tech

Our understanding of the brain is increasing in proportion to the advances in technology that are providing new ways to research the brain. Below we consider different brain scanning techniques:

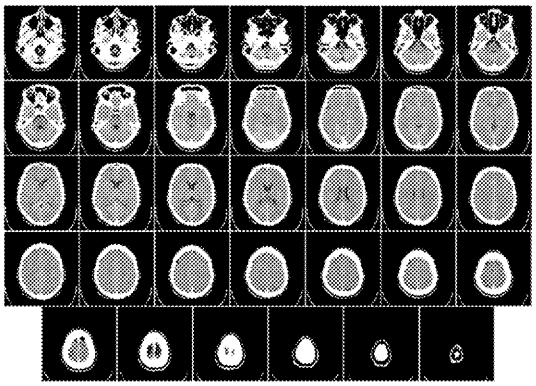
EXAM TIP: In
write down th
acronym in br

Computer axial tomography (CAT scans) and Computerised to

Computer axial tomography (CAT) scans were the first type of modern brain scan
ray machine to learn about **brain structure**.

How does it work?

The scan involves taking a series of x-ray images at different angles which are then combined to produce a 3D representation of the brain. Each image shows a 'slice' of the brain and when put together it forms a picture of the whole brain. To get a full picture of the brain, the participant lies down and the X-ray machine rotates around them.



The picture above shows CT scans of the human brain, going from the base of the skull to the top of the skull

X-ray machines form their image
density. When having a scan, the
and/or block x-rays in different a
densities. On a CT scan, areas of
different colours. For example, b
tissue is a medium grey and air is

Computerised tomography (CT) scans is an updated technique. In CT scans the m
around the subject to develop a 3D image. Nowadays, researchers use CT scans,
be used to refer to a CT scan.

Advantages	Di
Learn about the structure of the brain and skull CAT and CT scans can provide detailed information about the brain's structure. This can be useful in detecting brain abnormalities such as tumours.	**No insight into brain a** CAT and CT scanning t
insights into what is ha
example, which parts
particular task.
Objective Scanning is an objective measurement and cannot be influenced by the researcher's beliefs. As such it is a scientific method.	**Use of radiation** People should avoid h
it can damage the tiss
the risk of cancer. X-r
pregnant people.

Positron emission tomography (PET)

Positron emission tomography (PET) is a brain-scanning technique that researchers and medical professionals use to learn more about the brain and body. Using PET scans, psychologists can find out about **brain function**.

When investigating the brain, a radioactive isotope is added to glucose and injected into the person. The researcher has to wait until this tracer reaches the brain. Participants take part in two conditions, one to measure a baseline and another to investigate what the researcher is interested in.

How does it work?

The brain uses glucose as fuel and metabolises it to fuel synaptic transmission and to maintain resting potentials. The idea behind PET scans is that greater brain activity requires more glucose. Therefore, areas where the brain is working hard will show greater amounts of the tracer.

As the isotope decays, positrons (particles with a +1 charge) are released and the
with a -1 charge). They are destroyed with the result that gamma ray particles a
what the scanner reads. The greater the amount of activity in that region, the hi
that area.

Advantages	Di
Learn about the activity of the brain PET scans allow insight into our cognitive functions. Using PET scans we can learn about which areas are involved in different cognitive tasks and help localise brain function.	**Expensive** PET machines are very produce the isotopes i accessibility of the pro can be done.
Use in diagnosis PET scans are useful in diagnosing brain diseases where metabolism changes. Along with tumours and strokes, PET scans can be used to detect Alzheimer's in the early stages. This is an advantage over CT scans, where in the early stages of the disease there are often not enough structural changes to be detected.	**Short half-life** The short half-life of t researchers can only s the type of research th

Functional magnetic resonance imaging (fMRI)

When a person has an fMRI scan they enter a large scanner and complete a task that assesses a specific function, the researcher then looks at the active areas to find the location of the function. This is usually performed where the person is exposed to 20–30-second blocks of stimuli and the research compares the blocks.

How does it work?

An fMRI scanner works by applying very strong magnetic fields which cause the b
differently depending on whether it is oxygen-rich or oxygen-poor. The fMRI ma
and decreases in blood-oxygen level in different areas, which is called the blood-
measure. Areas that are more active need more oxygen and researchers can use
activity; essentially neural activity leads to blood becoming more oxygenated.

The fMRI technique allows the researcher to study the brain as a whole and exam
different areas. The technique, unlike a CT scan, is non-invasive, and no harmful
there is no risk when the same person is scanned several times.

The latest developments in fMRI

One of the disadvantages of fMRI is that it shows fairly large regions of activity of blood oxygen level, a new technique called vascular space occupancy (VASO) me vessel size. Only vessels that are very close to the activated neurons are identifie

Advantages	Disa
Non-invasive An fMRI machine is safe to use for both humans and animals meaning that the same scan can be done several times. This is an advantage as it can allow researchers to track changes across time; for example, if there are any improvements or changes that have occurred as a result of treatment.	**Not at an individual neur** An fMRI scanner does no but rather large groups o understanding more limit associated with multiple does not provide clear un
High spatial resolution A high resolution fMRI machine can identify the brain region up to an accuracy of 1 mm. This allows for a good accuracy of the region being activated by the task.	**Expensive** An fMRI machine is very e are very powerful, meani even a short time is very to study the brain using a

Note: fMRI scanning is an extremely popular method: a search on ScienceDire article database, found 6,115 different studies related to fMRIs were conducte number increasing yearly – what might this say about the acceptance of the fM

Issues and Debates: An understanding how psychological underst over time

Efforts to map the brain are the current preoccupation of neuroscientists. The development of a numb rapid expansion of information about the brain into what we know about the brain today:

- Since the 1970s, CAT scans have been used to learn more about injuries to the body and head. T researcher to learn about the structure of the brain and skull, and identify abnormalities. CAT s non-invasively, although the research does expose the patient to mild levels of radiation.
- Shortly after the invention of CAT scans, PET scans provided the first insight into activity of the flow in the brain. As the technique was refined, the researchers could learn more about which re certain tasks. This provided some insight into the function of particular areas of the brain.
- Raymond Vahan Damadian (1936–) was the first to perform a full body scan to investigate canc machine. Later Paul Bottomley performed the first localised scan on the human brain after adjus This technique produces detailed images of the brain's structure. MRI is more useful in diagnosi does not expose the patient to radiation.
- Seiji Ogawa (1934–) realised the importance of blood oxygen level in determining neural activity now possible to get accurate information about the location of activity in the brain.

Issues and Debates: Practical issues in the design and implemen

Although brain scanning is a popular technique for learning more about the brain, there are a numbe and measuring the complexity of the brain.

Some of the problems include:

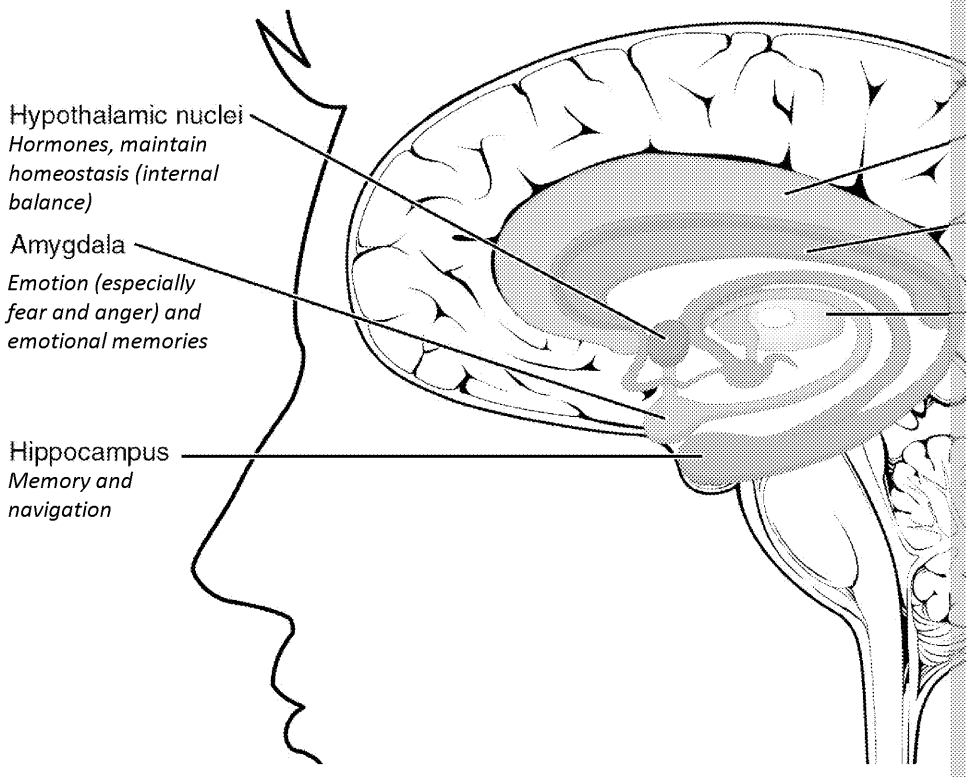
- Imaging resolution is often too poor to fully capture the complexity of the brain. Scanning tech at a millimetre level, but in reality, resolution needs to be much higher to understand such a c at the level of individual neurons which cannot be measured by scanning.
- When scanning for brain activity related to a particular task, there is also a lot of 'noise' (extra Some of this noise will be related to other activities of the brain, and other noise will not have separate the activity that is related to the task and noise.
- Within brain scanning studies there are problems reproducing the results, and repetitions oft This suggests that there may be problems in the sensitivity and accuracy of the technique.

Brain functioning and aggression

A growing body of research has linked particular areas of the brain to aggression

Role of the Limbic System

The limbic system is a collection of structures within the brain that are thought t memory. With recent advances in neuroscience, the structures of the limbic sys these changes. At present the limbic system consists of:



Some psychologists argue that the notion of there being a single system should b
thought of as an interconnected whole rather than formed of separate systems, b
to be referred to in textbooks and articles today.

Are neural explanations incompatible with other explanations?
The neural explanation can be viewed as another level of behaviour rather tha
explanation. In this sense, neural explanations are a reflection of behaviour at t
the same sense, in chemistry you can view behaviour at the level of single ato
compounds. This means that neural and behavioural explanations are compat
different views of behaviour.

The Amygdala

The amygdala is located within the temporal lobes and is often considered the b
'emotion centre'. It has particularly strong roles in the primal emotions of fear a
anger and is involved in our detection and evaluation of threats.

Corresponding behaviour:

Fear ⟶ Avoidance

Anger ⟶ Aggression

Animal studies
Animal research has suggested a strong role for the amygdala in aggression.

For example, in Primbram et al.'s (1954) study of eight male rhesus monkeys, a type of monkey that often uses aggression to maintain or establish social position, they made lesions to the most dominant monkey's amygdala in the hierarchy. The monkey became much less aggressive and as a result was demoted to the bottom of the hierarchy as it no longer reacted to challenges to its position.

In humans
Groves and Schlesinger (1982) found that removing the amygdala (an amygdalectomy) in humans who showed uncontrollable violent behaviour reduced the incidence of this behaviour, but also resulted in a lack of avoidance of fearful stimuli and a flat state of emotion.

Issues and Debates: Social Control
Aggression and violence is seen as an undesirable behaviour for society and there have been many a
behaviour. One method that has been used is psychosurgery. Psychosurgery is surgery of the brain
focus was on destroying certain brain tissues related to aggression. An amygdalotomy is a type of p
amygdala is destroyed using surgical methods. The amygdala plays an important role in aggression
amygdalotomies reduce the amount of aggression displayed. However, the amygdala also has other
may fail to show normal fear responses after the procedure. Psychosurgeries such as amygdalotomi
control because they take away the individual's ability to perform a societally undesirable behaviour

Today: Psychosurgeries such as lobotomies and amygdalectomies used to be carried out frequently but today they are only used as a last resort.

Matthies et al. (2012) used brain
without psychiatric illness to me
participants' amygdala. They fou
highest scores on a measure of l
amygdala volume that was 16–18

Determinism, reductionism and the law
Neural explanations can be seen as reductionist as they ignore that our behav
and environmental interactions and how learning can mediate our response t
neural explanations can determine behaviour it ignores the importance influe
factors interact to produce a person's behaviour.

Neuroscience is increasingly finding its way into criminal trials with defendant
can be explained by brain function abnormalities. This has significant implicat
research is applied to real life as the idea of biological determinants goes agai
individual responsibility for our actions.

Oscar Pistorius went on trial for killing his girlfriend after allegedly being start
intruder. The defence suggested that Pistorius experienced high levels of anxi
react more sensitively and activate the fight-or-flight response more readily.

Hypothalamus

The hypothalamus is another area that research has strongly suggested is involved in aggression.

Animal studies

In the 1920s Hess conducted a series of studies on cats where the hypothalamus was stimulated using electrodes implanted in the brain. He found that stimulation of the hypothalamus produced a reaction very similar to if they encountered a threat; for example, they would growl, hiss and their fur would stand on end. When they were further stimulated they would act out an attack on an invisible threat. When stimulation was stopped the cats went back to their original calm state.

Region- and type-specific aggression

Researchers often distinguish between two different types of aggression: predatory aggression and affective aggression. Predatory aggression occurs when an animal attacks with the purpose of gaining reward, such as food, whereas affective aggression occurs when there is a threat the animal reacts to. In the 1960s Flynn carried out experiments stimulating different areas of the hyp

Stimulated		Produced
Medial hypothalamus	→	affective aggression
Lateral hypothalamus	→	predatory aggression

When the cats were given the option to attack a nearby rat:

- Those who had their medial hypothalamus stimulated showed a strong reac
  but rarely attacked
- Those who had their lateral hypothalamus stimulated showed a much lesse
  the rat quietly

This suggests that there is a neural basis for the different forms of aggression!

In humans

The first research indicating a role for the hypothalamus in human aggression wa who lesioned the hypothalamus of violent patients. The lesioned area included p lateral hypothalamus. The result was a reduction of, or in some cases a complet

The area that Sano et al. lesioned later became known as the 'triangle of Sano' a many researchers since. For example, Bejjani et al. (2002) found that stimulatin Parkinson's disease produced aggressive behaviour.

Further support for the involvement of the triangle of Sano comes from Franzini electrodes in this area in two male patients who showed impulsive aggression, a for whom drug treatments had failed to work. The electrodes continuously stim patients aggressive behaviour was completely abolished.

Issues and Debates: Reductionism

The brain is a highly complex organ and focusing only on aggression fails to take into account the con brain. This approach of studying the brain is reductionist because it focuses only on what we are inte whole. In reality, the components of the brain do not work in isolation, however, when we study aggre By studying the brain this way we do not gain a full understanding of the brain or aggression.

Prefrontal cortex (PFC)

Compared to most other mammals, humans have a much larger and more developed prefrontal cortex.

The area is traditionally associated with complex cognitive functions such as decision-making, inhibition and planning. It is thought that the prefrontal cortex is involved in the planning of behaviour, particularly chosen or voluntary actions.

Damage to the frontal area of the brain is associated with problems with impulsive behaviour.

An early case study example of frontal brain damage is Phinea 1848 which resulted in a large iron tamping rod going through suggest that Gage experienced a number of personality chang impulsive, using profanities, making poor decisions and havin However, sources of information about these changes are not

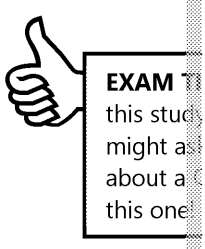
Individual differences: Brain damage

Individuals with brain damage are often studied after the event and it is assum of the damage. However, there may also be individual differences before the in their present behaviour, but because they are only studied post-accident this is instead assumed that there are no individual differences.

Later studies have confirmed a link between the prefrontal cortex and impulsive prefrontal cortex is involved in inhibiting impulses and delaying gratification.

Classic Study: Raine et al. (1997) Brain abnormalities in murde positron emission tomography

This study examined whether there were differences in the brains of people who and pleaded not guilty by reason of insanity, compared to normal controls. Any provide insight into aggression.



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Aims

The aim of the study was to investigate the differences between the brains of a group of people convicted of murder and a control group.

What did Raine et al. predict they would find?

Raine et al. (1997) predicted that the group convicted of murder would show br previous research on violent behaviour. In particular, they expected to see diffe cortex, amygdala, hippocampus and the corpus callosum.

Who were their participants?

The experimental group were 41 people (39 males and 2 females) who had been manslaughter but pleaded Not Guilty by Reason of Insanity (NGRI). The experim 34.3 and had been free of medication for two weeks before the brain scans took effects.

The experimental group was compared with a control group of 41 people who w similar age (mean 31.7). The control group did not take medication and were ps control group had schizophrenia and these were compared to the NGRIs who ha

Research methods: The use of control groups

Control groups are an important part of research, experimental psychology in p is compared to the control group which acts as a baseline. Control groups may b group so that the researcher can be sure that changes are the result of the topi variable, such as age or gender.

What was their method?

Both groups of participants were injected with a glucose-based tracer which resp metabolism. Both groups did a continuous performance task for 32 minutes and Two techniques were used to identify brain regions:

Cortical peel technique (lateral brain areas): The brain was scanned in 10 mm ho 10 slices which show the prefrontal, temporal, parietal and occipital areas of the four subdivisions for comparison. To identify brain regions, the researchers use t other regions in the slice. They worked out values for three prefrontal regions: s frontal gyrus and inferior frontal gyrus. Additional measures of bilateral tempora were averaged across the slices.

Box technique (medial brain areas): Using coordinates of the brain regions, a 3 x of interest (the pixels themselves were 2 mm^2). The metabolic rates for these ar different slices.

Issues and Debates: Psychology as a science

One key feature of science is that the findings should not be influenced by the researcher's beliefs or scanning is an objective method of studying the brain because the researcher cannot influence the im

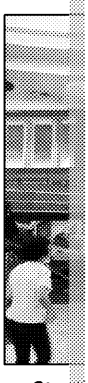
Key findings…

NGRIs had lower glucose metabolism in the lateral and medial prefrontal cortex

Damage to the prefrontal cortex has been linked to incr
behaviour. Those with damage to this area become foc
the action and lose sight of the negative future consequ
aggression because the individual does not focus on the
consequences of their aggression, e.g. arrest and impris

➔ **Evaluation**: We do not know if the participants' cri
makers distinguish between premeditated (planne
murder. It may have been that the murders comm
premeditated and therefore their aggression is no

Additionally, the prefrontal cortex has been linked to problems voluntarily regulating emotions. For example, you would not try to calm yourself down when you're angry. Phan et al. (2004) conducted a meta-analysis on PET and fMRI studies and found that the medial prefrontal cortex was activated in nearly 50% of studies investigating emotion and responses to positive and negative stimuli. This suggests that the medial prefrontal cortex may play a large role in emotional processing and regulating emotions.



Stud

NGRIs had lower glucose metabolism in parietal regions

The parietal cortex helps to integrate our sensory inform
abstract concepts, which may explain the cognitive and
deficits often found in violent offenders. The left angul
associated with deficits in reading and arithmetic. Viole
verbal skills and an increased number of learning deficit
may have predisposed them to failure in education and
could have encouraged them to turn to crime.

NGRIs showed an increased amygdala activity in the right hemisphere and decreased amygdala activity in the left hemisphere (relative to controls)

Studies on animals have found that stimulating the amy
aggression and sexual arousal.

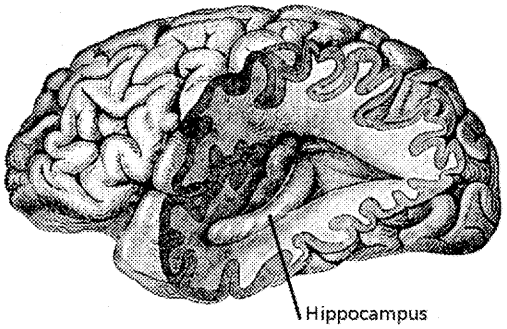
In 1966, Charles Whitman killed his mother, his wife and then a further 14 people in the area surrounding the main building of The University of Texas at Austin. A further person died as a result of their injuries much later and Whitman himself was shot by an officer.

Prior to the shooting, Whitman noticed that with the smallest provocation he would feel aggressive and hostile. He went to a doctor seeking help for his strong aggressive urges. In his suicide note, he requested that an autopsy be carried out to see if there was a biological cause for his recent aggressive impulses.

The autopsy revealed that Whitman had a brain tumour pressed up against his amygdala.

The corpus callosum connects the two hemispheres and allows them to communicate. The left hemisphere is thought to be linked to inhibiting behaviours, whereas the right hemisphere is dominant for negative emotions. The authors suggest that problems in the corpus callosum may mean that the left hemisphere does not properly regulate the negative emotions of the right, which could result in aggression. In rats, severing the corpus callosum results in an increase in mice-killing which suggests that the left hemisphere usually inhibits the right-hemisphere aggression.

These findings are supported by other brain scanning research by Zetzsche et al. (2007). Patients with borderline personality disorder often have problems with impulse control and aggression. Research by Zetzsche et al. (2007) using MRI scanning has found that lower hippocampal volume in the left hemisphere was associated with a history of lifetime aggression.

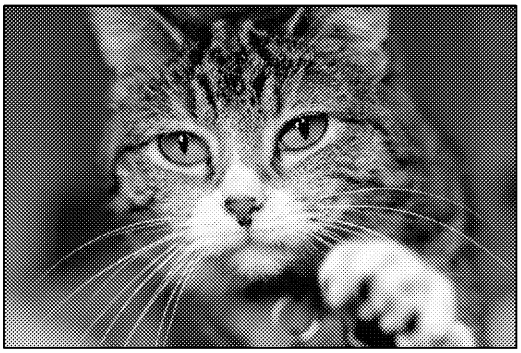


The hippocampus is part of the limbic system which is involved in emotion and memory.

The thalamus is thought to be involved in regulating aggressive behaviour. MacDonnell and Flynn (1964) found that electrical stimulation of the medial thalamus in cats lead them to attack rats, whereas stimulation of other areas of the thalamus inhibits attack.

The role of the thalamus in aggression is still poorly understood. Animal studies can stimulate or lesion the area to learn more about its function.

However, it seems likely that the thalamus is part of an interconnected network that is involved in modulating aggression. Therefore, these studies can only tell us so much.



:cipital lobe glucose metabolism
ences for midbrain and cerebellum activity
ence on the continuous performance task

authors concluded that multiple regions are involved in violent behaviour. They argue ces do not determine violent behaviour but instead violence is due to a combination of gical, cultural and situational factors which predispose the person to aggression.

Task 3.1: Evaluating Raine et al. (1997)

With the person next to you, discuss each evaluation point for Raine et al.'s study. Jot down a

Internal validity
Can the findings be accounted for by other explanations?

External validity
Are the findings generalisable?

Sa
Is the sampl who you a

Psychology as a science
Is the method scientific?

Reductionism
Is the approach reductionist?

Use
Are the fi

Chapter 3 Activities

Check your understanding!

1. Identify and explain one weakness of brain scanning studies. (3 mark

2. Identify and explain one problem with using research obtained from

3. Briefly describe one study that links a brain region to aggression. (3 m

4. Describe Raine et al.'s (1997) sample. (3 marks)

Exam-style questions:

1. Functional magnetic resonance imaging (fMRI) is a brain-scanning tec used to study the brain's activity.

   Describe functional magnetic resonance imaging (fMRI) as a brain-sca

2. Explain one strength and one weakness of using brain-scanning studi understanding of human behaviour. (4 marks)

3. Evaluate one classic study that has been used to explain human aggre

Chapter 4: Evolutionary and Natural Selectio
Aggression

Overview

In this chapter we take a close look at the evolutionary explanations of aggression. We focus on evolutionary explanations of rape, homicide and responses to infidelity. We also learn about Darwin's Natural Selection theory and how this relates to evolutionary theory.

Learning outcom

After studying this chapter you

- ❑ Explain different aggressi terms of evolutionary exp
- ❑ Understand Darwin's Natu
- ❑ Evaluate evolutionary exp

Key Terms

Adaptation	The evolutionary process of becoming more suited to our environment
Evolution	A theory of how our population has changed over a lo of time as the result of genetics
Infidelity	Cheating; can be emotional (e.g. love) or sexual
Intrasexual competition	Competition between the same sex (e.g. males and m
Mate poaching	The act of deliberately stealing another's mate
Natural selection	An evolutionary theory formed by Charles Darwin tha survival and reproductive benefits become more com
Parental investment theory	An evolutionary theory that argues that men and wor invest different amounts in their offspring
Survival of the fittest	A term from Herbert Spencer which describes how th are more likely to survive and reproduce

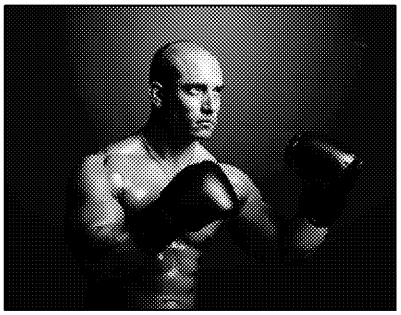
Scene-Setting Questions

- What is evolution?
- What would be the benefits of being aggressive in our evoluti
- What are the benefits of being aggressive in our modern-day

What are evolutionary explanations of behavio

Evolution is a theory of how our population has changed over a long period of ti
Evolutionary explanations look back at the lives of our first human ancestors and
they lived to explain our behaviours today. Evolutionary explanations argue that
helped our ancestors to survive and reproduce would have gone on to have both
our current behaviours.

The lives of our hunter-gatherer ancestors were very different from ours; withou
spend large amounts of their time trying to make sure they had enough food to s
would go out and hunt animals; work which was often very physically demanding
women would forage from vegetation in the landscape and raise the children.



One part of evolutionary theory is that these d
differences between men and women might e
behaviour.

For example, men are physically stronger and
to use physical aggression as a method of ach

What is natural selection?

Natural selection is a theory by Charles Darwin which he published in his book *O*
Origin of Species (1859). His theory argues that when a particular trait leads to
reproductive advantages (a higher rate of surviving and reproducing) then this tr
will, over time, become more common in the population. This is because individ
with these traits are more likely to reproduce and the genes for these traits are c
on into the next generation. Over several generations, many people will have th
same traits and if the process continues the entire population may have this
advantageous trait.

Note: Natural selection and evolution are not the same. Natural selection is a process or mechanism by which evolution occurs.

Survival of the fittest

'Survival of the fittest' is a phrase often used to mean natural selection. The phr
Spencer, who was commenting on Darwin's research, rather than Darwin himsel
physically fit, but rather that those who are best suited to their environment are
and reproduce.

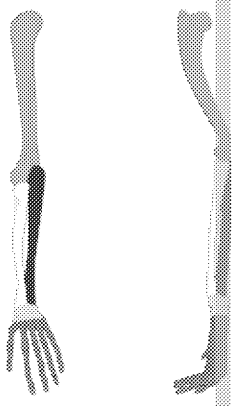
Consider!
What traits do humans possess that would make them well suited to their envi
survive their hunter-gatherer lifestyle? Are there any traits that other animals p
useful for humans to have?

Adaptation

Adaptation refers to the evolutionary process by which we become more suited to our environment and therefore more likely to survive.

According to natural selection theory, humans are more likely to inherit adaptive traits because those with those traits are more likely to reproduce.

Over a long period of time, humans have become well adapted to our environment.

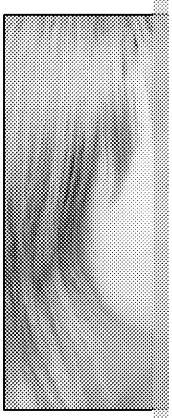


Human **Dog**

Different animals this is reflected in bodies have adap

Why are we not all the same?

Natural selection can only occur where there is genetic variation. Genetic variation occurs naturally, for example, some people will be taller or shorter, or have blue eyes rather than brown. Natural selection does not stop people from mating if their genes do not provide reproductive advantages. However, genes that lead to reproductive disadvantages may become extinct if the person does not survive long enough to reproduce.



We inherit parent, bu mutations w

Genetic variation can occur because of gene mutations. You may have heard of diseases, such as Huntington's Disease, which are caused by a gene mutation. Huntington's Disease affects cognition, emotion and movement, and gets progressively worse until the sufferer dies. Huntington's Disease is inherited and a parent with the gene for Huntington's will have a 50% chance of giving it to their offspring. However, many other genetic mutations are completely harmless and can account for our individual differences. Parents may pass down their genetic mutations to their children and this leads to genetic variance in our population.

Developmental psychology: The role of evolution in human development

According to evolutionary psychology, natural selection plays an important role developed across time. Natural selection argues that, by chance, some people that make them more likely to reproduce and survive. As such, these people ar genes and this trait to their offspring. Those without this trait are less likely to s genes are not passed on. Over a long time, the majority (or all) of the populatio Through this slow process, over many generations, humans have developed an now more likely to survive and reproduce.

Evolutionary Explanations of Human Aggressi

The evolutionary approach argues that our present-day behaviours have evolutic
are argued to have increased the chances of survival and reproduction, and led t

Investigating evolutionary explanations

Evolutionary approaches to explaining behaviour are often highly theoretical bec
about what our ancestors' lives were like. One possible method of investigation
tribes that have had relatively little contact with the modern world. However, th
investigating their behaviour; for example, the presence of researchers may char
language problems, and the danger of researchers imposing their own culture-fo
another culture's behaviour.

Since we cannot directly study our ancestors, evolutionary explanations often lac
desirable within modern psychology. However, one question that is frequently i
behaviour is universal. Evolutionarily adaptive behaviours should be found in all
(learnt) differences because they would be passed down through genes. Adaptiv
chance of survival and reproduction which over a period of millions of years wou
person inheriting this beneficial behaviour.

So for every behaviour discussed here, think: '*Is the behaviour universal*?'

Men and women are different

One of the core concepts of the evolutionary approach is that there will be sex differences because men and women have different reproductive challenges. Having different reproductive challenges leads men and women to behave and think differently because this will ensure their best chances of passing down their genes.

Apply th
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approach
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increase
reproduc

Parental investment theory

Men and women differ in the amount of parental investment they make in ensuring the existence and survival of their offspring.

Sex	Amount of parental investment
Males	Men have a very low level of parental investment, and only need to impregnate her and then are not obligated to do anything further. offspring a male might invest time and resources into looking after the same time, it is evolutionarily beneficial for males to mate with the chances of having many offspring.
Females	For females, having a child is very costly and parental investment is female only releases one egg per month and the woman carries the The pregnancy itself places strain on the woman's body and after b expect the child to be dependent on her for food and resources for

Men and women want different things

Due to these differences in parental investment, men and women often look for
Men are concerned with finding a partner that will produce healthy offspring wit
look for a partner that will commit to investing in her and her children and has th

Infidelity and Jealousy

Why are people unfaithful?

The evolutionary approach argues that infidelity occurs because it increases a pe
Rather than limiting ourselves to our own partner, we may seek partners who ca
of a higher status than our current partner.

Infidelity may be more likely to occur when a partner's status has changed. For e
unemployment), status change, physical decline (e.g. weight gain or signs of agin
partner a lower value than before.

Vanity?
Taking care of your appearance is o
Evolutionarily, men care more for t
genes and fertility) of their female
resources. Women may therefore b
on their appearances to ensure tha
providing mates. Make-up can be u
attractive traits such as large eyes (
skin (seen to be an indicator of goo

Why not leave?

While directly leaving a partner would result in reduced reproductive and surviva
seek a higher-value mate clandestinely and leave their partner once they have se
cases, the individual may never intend to leave their original partner.

A woman may seek a sexual partner with the hope of being impregnated by som
than their current partner but to maintain receiving their current partner's resou
given the limited parental investment, a man may try to impregnate multiple wo
having offspring. A man may not leave his current partner because he will lose o
already made.

Mate poaching

Newer research and theory has not only examined why people are unfaithful but
unfaithful partners. The evolutionary approach seeks to explain why some peop
Using Davies et al.'s (2006) stricter definition, mate poaching is when an individu
someone who is already in a relationship while knowing that they are not availab

Schmitt and Buss (2001) offered an evolutionary explanation for the phenomenon of mate poaching. They argued that mate poaching occurred because seeking both available and unavailable mates was more advantageous than seeking only available mates. By seeking only available mates it limits the number of possible mates which reduces the individual's chances of reproductive success.

Rememb
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become u
don't hav
reproduc

How common is mate poaching?
A study by Davies et al. (2005) found that 27% women admitted to having tried t
women had reported that someone else had tried to poach them.

What can we do about infidelity?

While infidelity increases the individual's reproductive success, it also reduces th
evolutionary behaviours have developed to discourage infidelity and to protect t

Jealousy occurs when a person believes that there is a threat to the relationship.
threat is real or imagined, jealousy can have serious and aggressive consequence
adaptive because it promotes activities that protect and secure the relationship

Infidelity in today's society

Infidelity is a highly stigmatised behaviour today. Even when the quality of a marriage is low and the partner may be on the receiving end of domestic abuse, infidelity carries harsh punishments.

In some countries infidelity is illegal; for example, in the USA adultery is illegal in 21 states, although laws are rarely implemented and punishments usually very minimal (usually a small fine). In other countries, infidelity can result in more serious and aggressive consequences. Although sometimes controversial, these consequences are often seen as understandable reactions to infidelity.

Honour killings

Honour killings are when a person is deliberately murdered by their family or community for bringing shame upon them. The honour killing is seen as a way to restore the family's status by being an open rejection of their
Infidelity is perhaps the most common reason for honour killings, but other rea
someone that the family does not approve of or asking for a divorce. Pakistan i
hundreds of honour killings occur every year, typically of women by men. Laws
honour killings are rarely implemented, with the killings being seen as a proble

Stoning

Stoning to death is one method of execution; designed to be slow and painfu
up to their head and rocks are thrown at them which are designed to be large
not large enough to kill quickly. It can be as a capital punishment in the offici
outside the law as implemented by community mobs. Iran is one country whe
punishment for adultery, but the punishment is rare compared to other punis
There must be strong evidence such as witnesses or confessions in order for t
Both men and women are punishable for adultery, but in reality it is more lik

Crimes of passion

A crime of passion is when a person is thrown into a rage and acts aggressively
about what they are doing, described often as 'seeing red'. In UK law under the
was seen as a defence for murder under the grounds that it was a provoked act
was repealed and now infidelity can no longer be seen as a complete defence f
that certain triggers cause a 'loss of control' which can result in murder. Infideli
but can only be a partial defence; this created controversy between judges who
sufficient to lead to a complete loss of control. Offenders who commit crimes c
reduced sentences because of the ingrained belief that the partner of the unfai

Sex differences in jealousy

Buss et al. (1992) investigated whether there were sex differences in jealousy inspired by either emotional or physical infidelity. They surveyed college students and asked them to imagine situations where either their partner was cheating on them sexually (sexual infidelity) or their partner was in love with another person (emotional infidelity). Which did they think was worse?

The findings:

- 60% of men found sexual infidelity worse
- 83% of women found emotional infidelity worse

Buss et al. also looked at physiological measures including pulse and skin conduct
stress) and found that their physiological reactions to the scenarios tended to agr

Universal differences?

Buunk et al. (1996) repeated Buss et al.'s approach but in three different cultures: the USA, Germany and the Netherlands. Despite the fact that there were differences in the cultures' attitudes towards infidelity (with the Netherlands having much more liberal attitudes), in all three cultures men were more concerned about sexual infidelity. The authors argued that this consistency across different cultures was evidence of universality. However, there were also some variations between the cultures; men were more concerned about sexual infidelity in the USA compared to the other two countrie
differences in jealousy may be universal, they are also sensitive to the norms of t

Alterna
Note th
sex diffe
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leads to

What causes sex differences?

Symons (1979) argued it was the different reproductive challenges that led to se

Contrary to the present day where medical tests can be done, men could previou
the father of the child. Men fear unwittingly investing their resources in the chil
'cuckolding') and therefore sexual fidelity would be seen as very important.

In contrast, women do not want to lose the support and resources of their partn
investment to be the biggest predictor to the continual supply of resources. Tha
promiscuous this does not mean that he will invest their resources in the offspri
woman sees emotional infidelity as a sign that she may lose her resources.

An alternative explanation

DeSteno and Salovey (1996) argue that while there are sex differences, the cause
Their 'double-shot' hypothesis argues that:

- For men a woman's sexual infidelity means likely emotional infidelity (i.e. the
  because they love them)
- For women a man's emotional infidelity means likely sexual infidelity (i.e. if
  also be having sex with them)

So in DeSteno and Salovey's view, both men and women are concerned with bot

Rape

The evolutionary explanation argues that rape occurs because the individual typically has insufficient resources to attract a desirable mate. High-value mates usually mate with those who have the greatest amount of resources.

Those with fewer resources have to settle for lower-value mates; for example, older mates who are therefore less fertile.

Many resources →	**High-value mate**
Older – more likely to have resources	Youthful – fertile
Physically attractive – good genes	Physically attractive – g
Physically strong – able to protect	Physical signs of fertili
Employed – resource security	Healthy – produce hea
Status – respected in the community	likely to survive

** Note that women's breast shape is not determined by milk but by fatty tissue; other ma that human females have evolved this way to attract mates.*

Few resources →	**Low-value mat**
Unemployed – less support and security	Older – less fert
Physically injured – perceived as weak, not able to provide physical protection	Less attractive – May have other
No status – women gained status through their mates	children, new ch

How can a male with few resources have a chance of having offspring with a high approach argues that rape is one option.

Parental choice: Parents often play an important role in the decision of who thei in India arranged marriages are a cultural norm and although both parties often h have a large influence in determining partner choice. In some cultures, either th money (a dowry) to their future partner's family as part of the marital agreemen traditional for the groom to pay a dowry to the family of the bride which increas bride. A bride that is high-status, a virgin and well educated are seen as desirabl more for.

Female choice: It is common in Western society for females to have autonomy o marry or have sexual relations with. Even marriage, as in the case of arranged m mean that a woman will have sex with her marriage partner.

Rape is one way of circumventing these barriers. This offers an explanation of why r

Rape within intimate relationships

Rape also occurs when a male has secured a female as a partner, and according t primary reason is suspected infidelity.

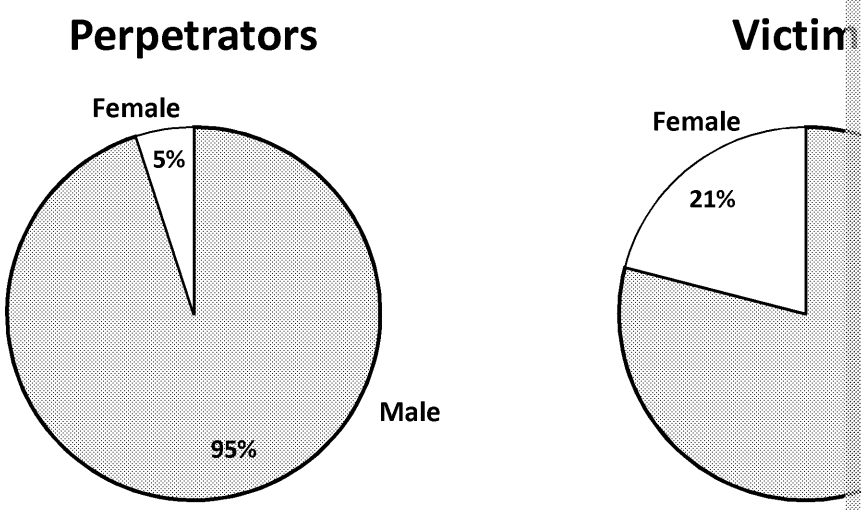
The evolutionary approach argues that for males, the cost of cuckoldry is high an comparison, relatively low. Suspected infidelity triggers male jealousy which cau measures against possible infidelity. Rape increases the chances of reproductive to impregnate the female. If successful, the male is protected against the female male for at least the duration of the pregnancy, along with the female now being several years to come.

Supporting this is research from Goetz and Shackelford (2006) who found that th
males believed that the risk of their partners being unfaithful was high. Since the
the female in rape, rape serves as a deterrent against future infidelity.

Since the cost of cuckoldry is so high in males, it makes evolutionary sense for m
any cues that may indicate infidelity and to become jealous quickly.

Homicide

Overwhelmingly, the majority of perpetrators and victims of homicide (the act o
males. Statistical analysis by the United Nations Office on Drugs and Crime foun
95% of the perpetrators and 79% of victims of homicide (UNODC, 2013).



Despite this, it should be noted that there are variances in the situation and met
within intimate relations, women make up two-thirds of the victims globally (UN

Competition can be split into two types: intersexual (between men and women)
same sex). Given that the majority of perpetrators and victims are male, it sugge
the result of intrasexual competition.

Why do men compete with other men?

The evolutionary approach argues that the main reason for intrasexual competit
that women only have a single egg per month and that parenthood requires high
choosier about who they select as mates.

A male needs to protect his status as threats to his status reduce how desirable h
appearance of weakness suggests that he will be unable to protect his mate fron
resources can be taken easily by others.

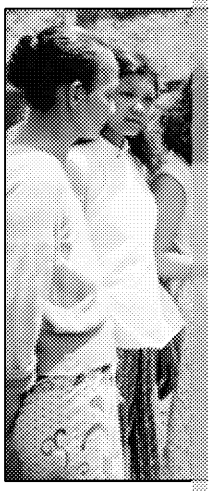
War

Humans are unique in that they are the only species to engage in war: organised
groups. Although there are some cultural variations and recent changes that are
front-line combat, war is predominantly a male enterprise.

The purpose of war is primarily to compete for territory, with the victor earning t
people in the territory and the resources the land provides.

Competition for mates

Since males have no obligation to provide for their mates or their offspring, wartime rape is an effective way of improving their reproductive success. Men, particularly those with few resources, may use war as a chance to impregnate many women and continue their genes on. Historically, there are numerous incidences of mass wartime rapes. For example, in World War Two, the Japanese Imperial Army made use of thousands of women and girls known as comfort women who were forced into sexual slavery.



Chinese and Mo
to w

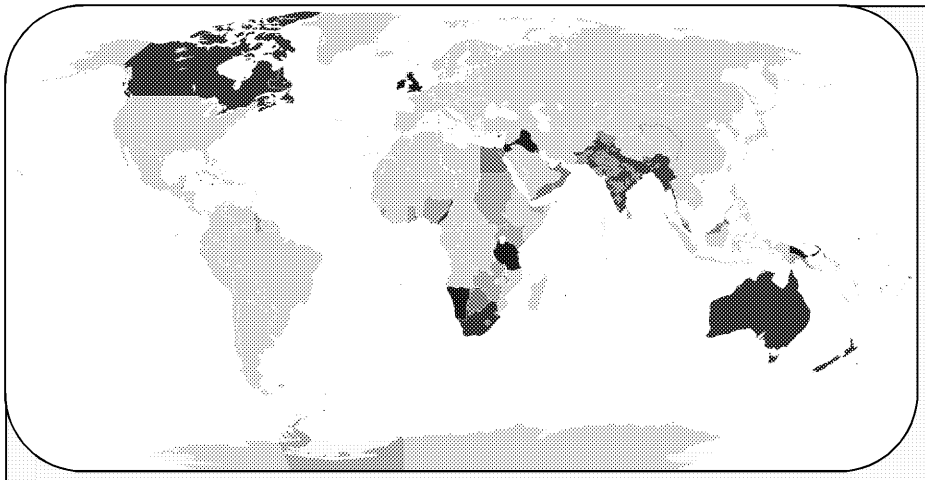
Repercussions for rape during wartime tend to be less severe. To this day, some Japanese political figures deny that there is any evidence for comfort women, while others argue that their use was necessary to the war effort.

Competition for resources

Just as men must compete with each other for access to the best mates, men mu
so that they have the best chance of survival. Territory provides additional resou
such as food are scarce, can provide the incentive for competition.

Evidence for this includes that homicide is most common among males who are
economic status (Kruger, 2010), and these are also typically the type of individua
the military.

As humans live in groups, males with low levels of resources can be seen as provider



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The costs of war can be illustrated by 'total war' during WWI and WWII wher
and abroad was contributing to and affected by war.

Compatible
Tinburgen (1963) argues against the idea that the evolutionary approach conflicts
views the evolutionary explanation as being just one level of explanation in a ser
representations. The evolutionary approach is the ultimate reason for a particul
explanation with other explanations being more proximal (closer). For example,
because we find the taste enjoyable, but the ultimate reason for eating is to prov
life. Both of these explanations of eating are equally valid and both should be ac

Task 2.1

Can you draw a diagram to try to represent how there can be different lev
to explain the same thing?

Face validity
Face validity is whether the measure appears to measure what it intends to. On
approach appears to have good face validity as the explanations make sense abo
differences in both male and female aggression and reproduction.

Unfalsifiable
The evolutionary approach is theory-based and makes post hoc (after) assumptio
behaviour. It is not possible to see the effects of evolution and therefore the evo
supportive empirical evidence.

Often ignores individual and cultural differences
Although some research indicates that on the whole there are trends such as ma
infidelity, there were also considerable within-sex variations suggesting that aggr
we cannot go against. Individuals can react differently to the same situation and
aggressively to infidelity. For example, in an open relationship, or non-monogam
partners may have sex with other people while maintaining the relationship stru

There are also cultural differences in aggression; for example, the !Kung San of K
do not show aggressive behaviour, suggesting violence is not universal and the
differences may be due to socialisation.

Gender stereotypes
The focus on gender differences reinforces gender stereotypes. While it is true t
there may be different reproductive costs for men and women, society is now pu
greater emphasis on equal rights. Males now have the option of taking maternity
while the women return to work, there is greater equality for women to be provi
and women can gain social status without being married.

Are evolutionary theories still applicable today?

There is a danger of overemphasising gender differences (gender bias) when it m
that there are no gender differences.

Chapter 4 Activities

Check your understanding!

1. Briefly describe Charles Darwin's theory of natural selection. (3 mark

2. Describe a real-life example of how infidelity is discouraged. (3 mark

3. Explain how war might be explained as competition for resources. (3

4. Identify and explain one weakness of the evolutionary explanation of

5. Describe parental investment theory. (4 marks)

Exam-style questions

1. *Nick and Tara have been together for a long time and they have a child togeth attractive woman and often receives compliments and attention from other m has been spending a lot of time with a male co-worker and Nick has been feeli*

   a) From your understanding of evolutionary explanations of aggres features of this situation that could lead to Nick being aggressive.

   Nick decided that it was not a good idea to be aggressive.

   b) Explain one factor, using the evolutionary explanations of psycho account for Nick's behaviour. (2 marks)

2. Tony found that he and his male friends behaved differently whenev them. Tony's teacher said that evolutionary explanations could expla

   Explain, using evolutionary explanations, why Tony and his male frie (3 marks)

Chapter 5: The Biological Explanation o

Overview

This chapter provides an overview of the different biological explanations of aggression. It introduces Freudian psychodynamic explanations of aggression and looks at the comparison between the two.

Learning outcomes

After studying this chapter you should b

- ❑ Describe and evaluate biological ex
- ❑ Describe, evaluate and compare Fre aggression to biological explanatio

Key Terms

Catharsis	The process of releasing pent up or unconscious em
Defence mechanisms	A protective unconscious process designed to reduc
Dopamine	A neurotransmitter involved in reward
Ego	A structure of personality that balances the demand
Hormones	Chemicals that regulate the body
Id	A structure of personality that is concerned with me and seeks immediate gratification
Monoamine Oxidase A (MAO-A)	An enzyme that breaks down serotonin, dopamine, (adrenaline)
Repression	A defence mechanism in which unacceptable thoug
Serotonin	A particular neurotransmitter; low levels of seroton
Superego	A structure of personality concerned with societal ic reality
Testosterone	A male sex hormone produced in the testes that is i development in males
Unconscious	What is unknown to us and difficult to access

Scene-Setting Questions

- Can you inherit aggression?
- What can studying twins tell us about the influence of genes a
- Should someone with a predisposition for aggression receive commit a violent crime?

Biological explanations of aggression

Biological explanations focus on biological causes, including genetics, evolution, explanations. This chapter will provide an overview of each of these topics and t concepts for comparison.

Are aggressive tendencies inherited?

One biological explanation of aggression is that there is a genetic component to aggressive behaviour and that certain individuals may be predisposed to aggressive behaviour as a result of their genes.

How do we study the genetic explanation?

Studies examining whether aggression has a genetic basis have compared identical and non-identical twins. Identical twins are expected to be more likely to both be aggressive than non-identical twins as they share twice as many genes.

Twin studies

Biological research methods: How do twin studies work?

There are two types of twins: monozygotic (identical) and dizygotic (non-identi twins share 100% of the same genes, whereas, dizygotic twins share 50% of the

In a twin study, the researcher decides which traits or behaviours they are inte types of twins for:

- The similarity of monozygotic twins for that trait or behaviour
- The similarity of dizygotic twins for that trait or behaviour
- The two similarity ratings

What does this information tell us?

If the similarity of monozygotic twins is much greater than the similarity of dizy the trait or behaviour has a strong genetic component. This is because the mon their genes and therefore the difference is attributed to genetics. If the trait or genetics we would expect to see a 100% similarity rating in the monozygotic tw

If aggression is inherited then… identical twins are expected to be more likely to than non-identical twins as they share twice as many genes. If aggression was co expect identical twins to be 100% the same as one another in regard to aggressio and this suggests that other factors are also important in aggression.

The majority of studies look at criminal behaviour rather than measuring aggressi criminal behaviour goes undetected, for example. More research needs to attem

Issues and Debates: Nature-nurture

The nurture side of the Nature-Nurture debate argues that behaviour is the result of learning and th concordance rates in twin studies suggests that there are environmental influences in aggression. Th argues that aggressive impulses are more likely to be acted on if they are frustrated. For example, a more likely to show signs of 'road rage' than a driver who has nowhere he or she needs to be. When unable to change the situation and this promotes frustration as it prevents problem-solving strategi suggests that the environment triggered the aggression.

Adoption studies

One factor that may be responsible for the higher amount of shared aggression i identical twins is that they share a more similar environment. Identical twins are more likely to be treated similarly and exposed to the same environment, and th may be something in this environment that leads them to become aggressive.

Adoption studies look at the levels of aggression in adopted children and compar to their biological and adoptive parents.

Hutchings and Mednick (1975) used Danish criminal registers to investigate the e to which criminal behaviour was the result of hereditary or environmental factor They found that the number of convictions biological fathers had and the numbe convictions their sons had were correlated, despite the fact that the sons had be adopted into another family. This suggests that it is not environmental factors (e modelling the parent's behaviour) but genetics.

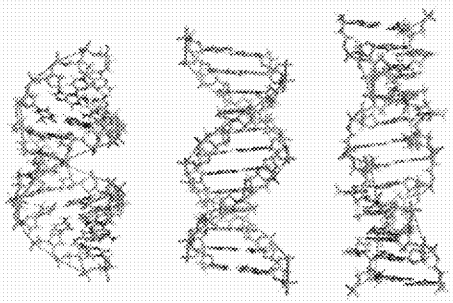
In addition, they found no correlation between the number of convictions of the adopted children and those of their non-biologically related siblings, suggesting i not something in the adoptive environment that caused the aggression.

Overall

Miles and Carey (1997) conducted a meta-analysis of 24 twin and adoption studi significant genetic component to aggression, but as the children got older the inf more important. A review by Tuvblad and Baker (2011) of twin and adoption stu 50% of the differences in aggressive behaviour could be explained by genes, the

Issues and Debates: Issues related to socially sensitive research

One of the founding principles of ethical research is the avoidance of psychological harm. It is importan to avoid harming the research participant, their family/friends and others who may be implicated in the violent aggression it is important to maintain confidentiality. It may be harmful for the aggressor's fam aggression because they share the same genes.



Contemporary study: Brendgen et al. (2005) Examining genet effects on social aggression: A study of six-year-old twins.

This study investigates social aggression in six-year-old twins.

Background information

When people think of aggression they often think of physical aggression. You mi of extreme scenarios such as gang rivalry, domestic violence or murder. Howeve are other types of aggression in which the harm done is to another person's rela social standing, and self-esteem, rather than their body.

There are three types:

- Indirect aggression is a form of covert aggression (e.g. spreading nasty rumo about someone)
- Relational aggression can be covert and overt (e.g. threatening to tell secret
- Social aggression includes both covert and overt aggression, and nonverbal aggression behaviour (e.g. refusing to speak to or acknowledge someone)

Brendgen et al. (2005) were interested in social aggression in six-year-old twins.

There is much interest in whether physical aggression or social aggression is due The consensus is that it is a combination of both. Researchers are interested in t genetics and the environment. One method used to investigate this is twin studi

Aims

- Investigate whether the difference in social aggression can be attributed to
- Investigate if there is a relationship between physical and social aggression

Participants

Participants were drawn from an ongoin Newborn Twin Study) which had recruit Twins were recruited at birth between N

To determine if the twins were monozyg same-sex twins were assessed using the appearance. A subset of 123 same-sex t DNA sample which compared them on 8 94% agreement between the two measu

At the study's start there were 322 twin pairs.

By age six this had dropped to 234 pairs of twins. Of these there were:

- 44 sets of monozygotic male twins
- 50 sets of monozygotic female twins
- 41 sets of dizygotic male twins
- 32 sets of dizygotic female twins
- 67 sets of dizygotic mixed-gender twins

Evaluation of sample:

- Only representative of 6-year-olds
- It is not always accurate to assess whether twins are identical/non-identical based on their appearance and therefore some twins may have been placed in the wrong category
- Sample attrition (88 pairs left) – are these pairs different?

Method

The researcher asked teachers and peers to provide ratings for each twin.

Teacher ratings
A questionnaire in English/French (both languages are spoken in Quebec) was given to the teachers. In the questionnaire teachers had to rate each child on the following six statements: • Tries to make other children dislike a child • Becomes friends with another child for revenge • Says bad things or spreads nasty rumours about another child • Gets into fights • Physically attacks others • Hits, bites or kicks others Teachers rated them with a score of 0 (never), 1 (sometimes), or 2 (often). The first three statements measure social aggression and the scores for these were added together to produce an overall score for social aggression. The last three statements measured physical aggression and these were added to produce a physical aggression score.

Children were give provided with phot told to circle the pl who best fit a giver The descriptors we • Tells others n • Tells mean se • Gets into figh • Hits, bites, or The first two descr aggression, and the physical aggressio For each descripto nominations was c then adjusted to ac

Evaluation of method:

- Questionnaires make it possible to replicate the study
- There may be slight differences in the wording between French and English
- Ethics: May have a negative impact on friendships

Some peers might be reluctant to tell the truth if their friends are behaving badly

Results…

Brendgen et al. found that:

- Teachers rated boys more physically aggressive than girls
- Teachers rated girls more socially aggressive than boys
- Peers rated boys more physically and socially aggressive than girls
- Monozygotic twins were rated to be twice as physically aggressive as same-sex dizygotic twins

Overall:

- 50–60% of **physical aggression** could be attributed to **genes**
- 40% of **physical aggression** could be attributed to the **non-shared environment** (e.g. different friends)
- 20% of **social aggression** could be attributed to **genes**
- 20% of **social aggression** could be attributed to the **shared environment** (e.g. parenting strategies)
- 40% of **social aggression** could be attributed to the **non-shared environmen**

Evaluation of results:

- Correlations do not prove causation
- In cases where both children were in the same class, other children may hav based on stereotypes about them being the same
- Looks at genetics and environment (more holistic than reductionistic)

Conclusions

They concluded that physical aggression is mostly genetics (nature) and social ag (nurture). Genetics may predispose a child to be social aggressive, but this will o encourages it.

Real-life application: Bullying

The knowledge that social aggression does not have a strong biological influence suggests that social aggression and bullying can be reduced if the environment is right. If family and friends are an important influence on social aggression then group-based interventions could help children alter their behaviour. Children are likely to model those they see around them and therefore it's important that parents and older siblings act in a positive way with each other.

Task 5.1: Discussion on Brendgen et al. (2005)

Samantha and her teacher are having a discussion about Brendgen et al.'s (2005) study. By tak
consider the merits and weaknesses of the study.

I think Brendgen et al. (2005) is a POOR study because…

I thi

Teacher

Is there a gene for aggression?

Monoamine Oxidise-A (or MAO-A) is an enzyme that breaks down neurotransmi
therefore important in influencing aggression. The 'warrior gene' or the MAO-A g
increased aggression; there are several variants, and variants that produce a low
higher amount of serotonin and other neurotransmitters) are associated with ag

Evidence

McDermott et al. (2009) found that the warrior gene produced more frequent and intense aggression when participants were placed in a situation that provoked aggression as compared to controls. However, a situation which was less provoking did not predict greater aggression.

Further evidence comes from a Dutch family who had a high incidence of habitual violent offenders, and members of this family were found to have a mutation of the MAO-A gene (Brunner et al., 1993).

Issues and Debates: Ethics

While certain genes such as those that affect MAO-A may be associated with increased aggression ar
remember that this is only an association. The evidence is far too insubstantial to be support for biolo
sterilisation, and researchers need to be very careful about how their results are used and interprete

Gene–environment interaction

Caspi et al. (2002) investigated several variants of the MAO-A gene and examine
correlation with antisocial behaviour (measurements of convictions for violent cr
several antisocial disorders and an assessment of their acceptance of violence).
and examined over 1,037 male babies over regular intervals until 26 years of age

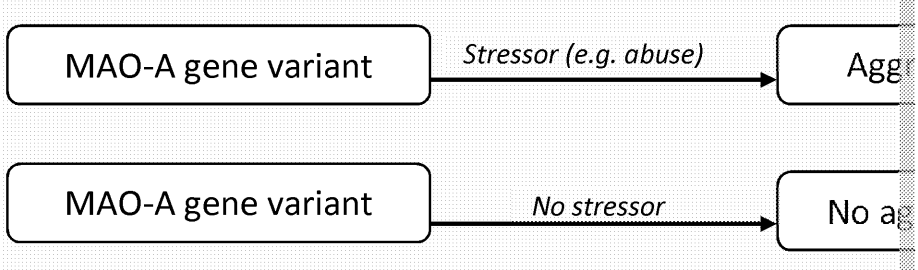
They found no association between the types and antisocial behaviour, but those
and the variant of the MAO-A gene that led to lower levels of MAO-A showed mo
those who were maltreated and had the variant of the gene that led to higher le

Those who had the low-MAO-A gene variant and experienced maltreatment mac
accounted for 44% of violent crime convictions.

The Diathesis–Stress Model

This research on MAO-A brings up a core problem of the biological approach...

Genes rarely act alone but interact with the environment. The diathesis–stres
environment interaction can explain the offenders' behaviour:



Task 5.2: Debate

Start a short debate on: Should those with the MAO-A gene variant that p
individual to aggressive behaviour be given special consideration in crimi

There have been several attempts to use the MAO-A gene as a defence for
- **Mobley (1995)**: the defendant was charged with murder and genotyp
mutations of the MAO-A gene. Genotyping was refused and the defe
- **Waldroup (2009)**: charge of murder, attempted murder and kidnappi
was found. The defendant also experienced childhood abuse (enviro
sentenced for 32 years rather than execution.
- **Bayout (2009)**: defendant was previously assaulted and bought a knif
attacking the assailants. Killed the wrong person by mistake which m
possible schizophrenia (environmental consideration). MAO-A defen
being reduced by a year.

One point to consider is that predispositions do not make it impossible to
Often crimes involve a deliberate and voluntary component. If you have t
possible to resist?

MAO-A and socially sensitive research
Socially sensitive research is any research that has wider implications for t
population involved, beyond those that are typically considered on ethics
protection from harm, right to withdraw, etc.).

MAO-A and genetics research may have significant implications for the fa

Imagine the scenario: a family member is on trial for a violent attack and g
he or she has a variant of the MAO-A gene associated with aggression. W
- The person has the gene, so their aggression is completely justified
- A person cannot go against genetics – they were doomed to aggress t
- If I have the gene then if I behave aggressively that's acceptable
- The law has no right to prosecute those who have the gene

The debate: Should socially sensitive research be conducted?

Yes – it should be conducted!	No – it sho
• Most research that psychologists are interested in could be considered socially sensitive • This type of research could have considerable benefits to our understanding and sometimes policy • Psychologists do not interpret the results in a way that has negative impact; this is the work of the media	• Psychologists sh way their researc • Research that su been 'proven' (e.g sample size) coul impact, e.g. in cri • The drawbacks o outweigh the adv

Evolutionary explanations of aggression

Evolutionary explanations argue that aggression is rooted in behaviour that would have helped our anc
explanations are difficult to falsify and therefore these explanations lack validity. Go back to **Chapter 4**

Homicide
The majority of perpetrators and victims are male. This suggests that homicide might be explained by competition between the sexes. Competition could be for the same mate (love triangle killing) or to gain status within the community.

Support: United Nations Office on Drugs and Crime found that, globally, males made up 95% of the perpetrators and 79% of victims of homicide (UNODC, 2013).

Male sexual jealousy
Males are worried about investing their resources in a woman's children only to find out that they are not his own (cuckoldry). Men use threats of / actual violence to discourage women from being unfaithful as this reduces the risk of cuckoldry.

Support: Buss et al. (1992) survey found that men found sexual infidelity worse and women found emotional infidelity worse.

Support: Buunk et al. (1996) found Buss et al.'s results were similar in the USA, Germany and the Netherlands, suggesting universality.

Hormones and aggression

This section is a brief introduction to hormones. Hormones and their influence o
particular, will be covered in depth in the **next chapter**.

Hormones are chemicals that play an important role in regulating the functions of our body. For example, the hormones leptin and ghrelin help to regulate our feelings of hunger and satiety.

The hormone explanation of aggression argues that having too much or too little of certain hormones could increase the likelihood of aggressive behaviour.

One hormone that you may have heard of in relation to aggression is **testosteron**

Key question: Does testosterone *cause* aggression?

Testosterone in animals

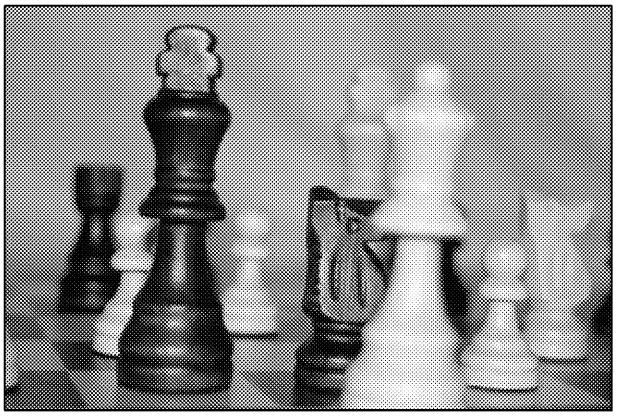
Castration results in a reduction of testosterone. Wagner et al. (1979) found that if you castrated mice their aggression levels dropped. When testosterone was injected into the castrated mice, their aggression levels rose. They became more likely to bite other mice.

This is strong evidence that testosterone may cause aggression in mice… but what about humans?

Testosterone in criminal males

Dabbs et al. (1995) wanted to research whether testosterone was related to the
or non-violent). They took saliva samples of 692 male prisoners and used this to
levels. They then compared this to records about what type of crimes the prison

They found that higher levels of testosterone were associated with more violent
homicide. Those with high testosterone were also more likely to behave aggress



However, this research is c
prove cause! It might be th
is an effect of aggressive b

In addition, Mazur et al. (1
was higher in chess player
players that lost. This sugg
more about winning and c

The brain and aggression

This is a brief overview of what we covered in **chapter 3,** go back there to find fu

Key question: Which areas of the brain are *respon*

Animal research

It easier to study the brain in animals because researchers are able to use methods that would not be ethical to use on humans. For example, they might deliberately damage a certain area of the brain to see if it increases or decreases aggression.

Example: Primbram et al (1954) conducted a study of eight male rhesus monkey Rhesus monkeys use aggression to maintain or establish social position. They found the most dominant monkey in their social hierarchy and made lesions to the monkey's amygdala. The result was that the monkey became much less aggressive and eventually fell to the bottom of the social hierarchy. It no longer responded when other monkeys tried to take over its position. This suggests tha the **amygdala** is an important region in the brain for aggression.

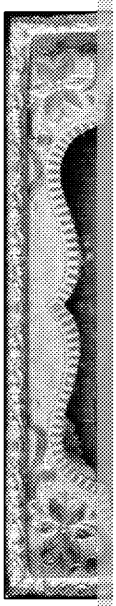
Problems with this method:

- Some, but not all, humans use aggression to maintain social position.
- There are structural and functional differences between animal and human
- Humans can often choose whether to aggress or not to aggress, whereas an impulses.

Human research

Although researchers cannot deliberately damage the brain, they can study brain causes to aggression.

Example: In the 1840s, Phineas Gage damaged the frontal lobe of his brain in an accident that pushed a metal rod through his skull. People remarked on his personality changes since his accident. He became more impulsive, made poor decisions and used profanity. These changes were attributed to damaging his **prefrontal cortex** which is involved in the regulation of impulsive behaviour.



Problems with this method:

- When humans damage their brains they often hurt more than one area. This makes it difficult to narrow down the cause of their behaviour.
- The human brain works in a very interconnected way and this makes it difficult to see the function of individual components.
- Damage to the human brain does not necessarily tell us about how it works when it is functioning normally.
- Damage to the brain is individual and no two cases are the same.

Neural explanations

Role of serotonin

Although several neurotransmitters have been linked with aggression, the one that has received the most attention and empirical support is the link with serotonin.

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Serotonin seems to function as an inhibitor of aggression; the higher the levels of serotonin, the fewer the aggressive behaviours. It is likely that serotonin regulates our day-to-day levels of aggression to ensure that while we may feel angry, this does not transla the costs of behaving this way are high.

Evidence

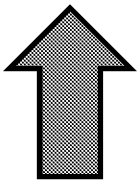
The drug fluoxetine, used to treat depression and obsessive-compulsive disorder inhibitor. By preventing reabsorption (reuptake) of serotonin this leads to there serotonin in the synapse. Individuals on this drug experience reduced levels of a that aggression is inhibited by serotonin.

Research on serotonin has suggested that it is involved in impulsivity and impuls male rats showed intense aggression and impulsivity when the system that regul disrupted (Chiavegatto et al., 2001).

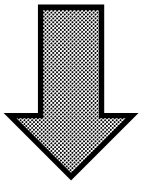
Virkkunen et al. (1995) found that impulsive offenders who behave aggressively were related to low serotonin turnover.

Interacts with testosterone

While serotonin inhibits aggression, testosterone facilitates aggression. The inte a large role in determining whether we act on our aggressive behaviours. Low le with high levels of testosterone produce a tendency for aggressive behaviour.



Increases in testosterone



Decreases in serotonin

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Giotakos et al. (2003) studied rapists and found that the levels of testosterone w related to the production of serotonin was lower than controls.

Adaptive: Imagine that we did not control our aggressive impulses and always a greatly reduce our survival chances if we tried to aggress an animal or person w beating.

Role of dopamine

Along with low levels of serotonin, there is also evidence suggesting that high lev
in aggression. For example, aggression in psychotic patients is reduced by drugs
receptors (Chengappa et al., 1999).

Interacts with serotonin

A review by Seo and Patrick (2008) concluded that it was probable that low level
higher levels of dopamine. Thus, both serotonin and dopamine were associated
serotonin exacerbated this effect due to its modulation of the dopamine system.

Link to the prefrontal cortex (PFC)

The prefrontal cortex is an area that is associated with aggression and is thought to be involved in the inhibition of emotional behaviour. Davidson et al. (2000) proposed that impulsive aggression was the result of 'faulty emotional regulation' and implicated the prefrontal cortex as an important area in this.

It is proposed that the interactions between serotonin and dopamine in the prefrontal cortex may be responsible for this decrease in prefrontal cortex activity. However, more research is needed on the interactions in this brain area.

Free will and determinism (AO3)

Biological approaches are highly deterministic; for example, stimulating the hy
a clear aggressive response. However, in humans it may not be so determinist
exercise greater control over their impulses. In reality human behaviour is a co
including biology, past experiences, environmental conditions and our own de

Biological explanations completely undermine the idea that we have free will,
views that we are responsible for our own behaviour. If we take the biological
then we would not be accountable for our own behaviour.

Issues and Debates: Nature-nurture

The nature side of the Nature-Nurture debate argues that behaviour is the result of biology, genetic
areas of the brain to aggression (localisation) suggest that aggression has a strong biological comp
our brains and damaging certain areas such as the prefrontal cortex results in higher levels of aggre

Freud's psychodynamic explanation of aggres

Sigmund Freud believed that behaviour, including aggression, could be explained argued that often we do not understand or recognise our own true motives for b information is below our consciousness. Although much of this information is be argued that unconscious conflicts could influence real life and even produce psyc believed that by bringing our unconscious conflicts to our awareness you could c

The structure of personality

Freud believed that personality was divided into three structures which interact:

Id – The id strives to satisfy the individual's basic needs, such as to survive and reproduce. The id is unconscious and operates on the pleasure principle and seeks immediate gratification.

Superego – The superego represents the ideals and societal norms we have beer taught and have accepted. These are not necessarily bound by reality and may not be suitable in real life, for example, the ideal to be generous and charitable may conflict with having little means for yourself. It should also be noted that societal ideals and norms are changeable which can result in a change in behaviour.

Ego – The ego acts as a mediator between the id, the superego and reality. It is r the reality principle, and controls the id in order to meet the demands of reality. strength in adolescence and the individual can now defer gratification.

EXAM TIP: Remember
You could help remember the different structures of personality by imaging them of person would they be? Do they remind you of anyone you know?

Real-life example:

You were minding your own business when someone shoves you out of the way you hit your arm on the wall. What is your reaction?
Id: I'm angry! I want to yell at them and shove them back.
Superego: I should always avoid unnecessary violence and aggression.
Reality: Starting a fight may result in getting hurt further.
Ego: Although I am angry I should not act on this as this will not achieve anything

In this example the ego makes the reasoned decision that brings the individual th least damage. However, there are plenty of incidences when we act on impulse despite our better intentions. In these situations, our ego has failed to control o and delay gratification. In some cases, the id, superego and reality will align and will also allow extreme responses. For example, a person may have internalised norms that promote anger or aggression in certain circumstances, such as aggres towards the supporters of the opposite football team.

Individual differences: Aggression and ego strength
Ego strength is the ability of the ego to deal with inner conflicts and challenges have difficulties controlling the aggressive and sexual impulses of their Id. Thos calm quickly and react strongly (and often poorly) to bad situations. In contrast unwaveringly calm in the face of adversity. They handle situations which might calmness and use problem solving to overcome challenges. While aggressive ur immediate gratification, those with a strong ego can defer gratification and foc long-term goals.

Aggression: An instinct
Freud believed that aggression was an instinctive drive rather than being caused
inevitable and it was just a matter of controlling and channelling it. He thought t
of the Id, and the ego, superego, and the reality of the situation, were involved i
Without a developed ego and superego, a person could become aggressive with
may have aggressive temper tantrums because the ego and superego are not ful

The role of the unconscious

Freud believed that our behaviour is often driven by unconscious forces and that
reason. A Freudian slip is when we make a verbal mistake that reveals our true f
example, you might call your new boyfriend by your ex's name. Freud believed t
but revealed unconscious beliefs.

Freud believed that there were three stages of consciousness:
Conscious: Everything that we are aware of
Preconscious: Unconscious at the moment but available to be recalled
Unconscious: Memories, thoughts, and feelings we are not aware of and are diff

The majority of our thoughts, feelings and memories are unconscious.

A good way to think about consciousness is to imagine an island surrounded by water.

The island represents consciousness and what we are aware of

Shallow water represents preconsciousness and when the tide changes we become aware of the preconscious

The deep water represents our unconsciousness; what is vast and inaccessible to us and which we can only explore with help
Note that the deep water is much vaster than the island itself.

Task

Draw a diagram to represent the above concept and make sure to label an
what each level is

When we experience sexual or aggressive urges that are not appropriate for us t
unconscious as a protective measure. This is termed repression. However, even
unconscious they motivate our behaviour in ways that we are not aware of.

Repression and aggression
In our lives, there are many opportunities for conflict and yet we rarely act on ou
argued that people often repress aggressive impulses and place that desire in the
number of conflicts that result in physical or verbal aggression.

However, Freud also argued that repressed aggression also influences our behav
Freud thought that depression was one result of repressed aggression and that t
been directed towards the self. For example, self-criticism is a form of aggressio
the self. Unlike physical aggression, aggression towards the self is a more accept
aggression.

Defence mechanisms

Defence mechanisms are unconscious processes to reduce the experience of anx
useful in coping with events that are unexpected or cause us disappointment, bu
beneficial outcomes. Defence mechanisms are important in regulating and preve
Just some of his defence mechanisms are illustrated below:

Repression: When we exclude unacceptable thoughts or feelings from conscious
unconsciousness.

For example, a person with a severe phobia of snakes had a traumatic snake exp
how they came to develop their phobia.

Denial: Maintaining that things are not what they seem to be.

For example, for a long time an alcoholic may deny that their drinking behaviour
others' lives.

Displacement: When we transfer impulses that are unacceptable onto non-threa

For example, a man who is angry at being fired now spends one or two hours pla

Catharsis

Catharsis is the process of expressing pent up emotions, such as aggression. Freu
component of his therapy. He believed that behaviour was influenced by repres
to mental illness. His therapy involved accessing the unconscious and expressing
Freud, this led to immediate relief of the symptoms.

Later theories focus on catharsis as a way of releasing the pressure of emotions t
acted on. For example, Scheff (2001) argued that crying helps us deal with hurtfu
suppress these emotions could have negative consequences. Playing aggressive s
used to help release the build-up of anger in a safe way.

Evaluation of the psychodynamic approach of aggression

Defence mechanisms
People do show evidence of defence using defence mechanisms, such as denial. such as repression have been called into question. Cases of childhood abuse wh repressed memories with the assistance of a therapist have had difficulty holding often the patient has recalled false memories, which while the patient believes s likely the result of their therapy.

Support for repression of aggression
Megargee (1966) found that criminals who had committed extremely aggressive emotions. They were often polite and good-natured and the act of aggression w argued that they had repressed their anger and this had led to a build-up of tens the aggressive act.

Mixed evidence for catharsis
Frustration acting as catharsis is supported by Verona and Sullivan (2008) who fo the opportunity to shock a frustrating confederate showed reduced heart rate, s arousal. However, Bushman et al. (1999) found that release of aggression actua aggression, suggesting that frustration does not act as catharsis.

Unfalsifiable
Some of Freud's theory is not possible to test, such as his idea of repression. It is unconscious so it is difficult to know what has been repressed and what never ha

Small homogenous sample
Most of the evidence for this approach comes from a small number of case studi showed disorders of neurosis (disorders that cause distress but typically concern is difficult to generalise these results to people in general.

Expanded on
Dollard et al.'s (1939) frustration-aggression hypothesis is an extension of Freud' with the idea of frustration being innate but argued that aggression would only o trigger. This theory acknowledges both the role of biology and the environment, Freud's original theory.

Issues and debates: Comparison of ways of explaining aggressive behaviour

Biological approach

By multiple different biological factors:

- Genetic predisposition to aggression
- Hormone levels in the body
- Stimulation of certain brain areas and damage to the brain (e.g. the prefrontal cortex)
- Evolutionary motivations

Some drugs have been found to reduce aggression levels, for example, chlozapine, which is often used in patients who show extreme aggression and violent behaviour. However, on the whole many of the biological approach's causes cannot be modified, for example, genetic predisposition or evolutionary motivations.

Individuals differ in their genes and hormone levels and this contributes to differences in aggression. Cases of brain damage are individual and no two cases are the same.

Numerous studies have provided strong evidence for the influence of biological factors in aggression. However, biological factors do not account for aggression completely and other factors such as social and environmental are also important in explaining aggression.

Much of the research supporting the biological approach has used animals. It may not be appropriate to generalise the findings of animal research to humans because we have different motivations for aggression. In addition, studies on brain damage can only be generalised to the individual and not the normal healthy population.

Freud's psychodynamic theory

An instinctive drive which is part of the Id and controlled and suppressed by the Ego and Superego. Failure to adequately control the impulses can result in aggression. Repression or other defence mechanisms can result in aggression being expressed in different ways.

Controlling aggression is the job of the ego and superego. The superego opposes aggression on moral grounds, whereas the ego tries to account for all aspects of personality and the demands of the situation (reality). Aggressive impulses can be repressed rather than acted on. Catharsis can also allow for the release of aggressive tension in a more manageable way.

Individuals vary in their ability to control aggression. Individuals with a strong ego can successfully manage their aggressive impulses, whereas those with a weak ego are controlled by their Id.

It has been difficult to establish the internal validity of Freud's theory. For example, the idea of repression is not testable because we cannot easily access the unconscious. There is some evidence for the use of defence mechanisms such as denial. On the whole, Freud's theories are considered to have poor internal validity.

Much of Freud's ideas and observations come from case studies of his patients. His patients were middle-class Viennese people who had come to him for treatment. Therefore, his theories may not be generalisable to the general population.

Chapter 5 Activities

Check your understanding!

1. Identify and explain one weakness of Brendgen et al.'s (2005) study. (

2. Explain why research into the MAO-A gene can be considered sociall

3. Briefly describe Freud's theory of personality. (4 marks)

4. Identify and explain one way in which the biological and psychodyna aggression differ. (3 marks)

Exam-style questions

1. Jessica is a new employee and she's been working very hard for her fi She has taken little or no time to relax or look after herself. When she home on Friday evening, her boss turns up with a stack of paperwork heading home.

   a) From your understanding of the psychodynamic explanation of a features of this situation that could lead to Jessica being aggressiv

   Jessica decided that the best thing to do was to get on with the work a

   b) Explain one factor, using knowledge of psychodynamic explanati might account for Jessica's behaviour. (2 marks)

2. Twin studies are used to investigate the heritability of behaviours.

   a) Describe twin studies as a method of investigating the heritability

   Brendgen et al. (2005) conducted a twin study.

   b) Give one aim of Brendgen et al.'s (2005) study. (1 mark)

   c) Give one conclusion of Brendgen et al.'s (2005) study. (1 mark)

   d) Explain two weaknesses of the methodology used in Brendgen et

Chapter 6: The Role of Hormones in Hum

Overview

In this chapter, we look at hormones, the body's chemical messengers, and how they influence our behaviour. We look at hormones involved in aggression in more detail, for example, testosterone. After examining a wide range of evidence, we consider to what extent different hormones do influence aggression.

Learning outc

After studying this chapter

- ❑ Understand what a ho does in the body
- ❑ Explain aggression as hormones
- ❑ Evaluate the impact of aggression

Key Terms

Androgens	A group of hormones (for example, testosterone) that pla the development of male characteristics; male sex hormo
Correlation	A relationship between two variables; does not indicate c
Cortisol	A type of glucocorticoid hormone which is linked to stres
Fight-or-flight response	A biological response we make in extreme situations whe flee to survive; adapted over the process of evolution
Glands	Part of the endocrine system that produces and regulates
Glucocorticoids	A group of steroid hormones which are involved in the im
Hormone	A slower-acting chemical messenger that regulates functi transported by the blood (endocrine hormones)
Testosterone	A male sex hormone produced in the testes that is impor development in males

Scene-Setting Questions

- What are hormones?
- Does testosterone cause aggression?
- What makes women less aggressive than men?

Hormones

A hormone is a chemical that helps to regulate different functions of the body. It long-lasting changes or regular cycles as the effects of hormones are not immedi familiar with include insulin, growth hormone, adrenaline, testosterone, melato

Hormones and the endocrine system

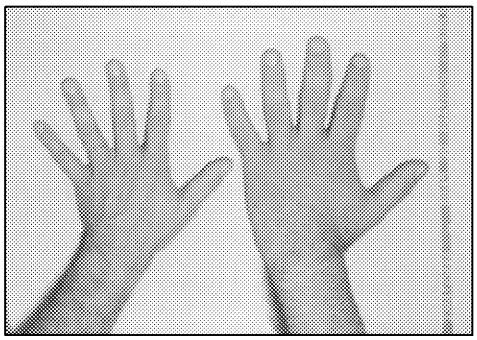
The endocrine system concerns the hormones in our body and the glands that pr them. Hormones transmit information to cells via the bloodstream and the endo system is responsible for regulating the levels of these hormones. Hormones ad activity of specific organs or functions by binding to specific receptors on the org cells, much like a lock and key process. Like a balancing act, when there is too lit hormone, the glands stimulate its production to increase the amount and when t too much, the glands stop producing the hormone.

Other chemical messengers

Unlike neurotransmitters, the body's other chemical messengers, hormones can transmit over a much wider area but take seconds or minutes rather than millise because they have to travel through the blood.

What do hormones do?

Just some of the functions of hormones are listed below:



On the left is a normal hand and on the right a hand belonging to someone with acromegaly, a disorder in which too much growth hormone is produced.

- **Growth**: Human Growth Hormone is reach their natural height and also p by affecting protein metabolism
- **Sexual development**: Hormones suc and oestrogen are important in the d both in the foetus and later in life
- **Fight or flight**: Hormones such as ac important in the evolutionary survi ensuring the body has enough availa
- **Heart rate**: Heart rate is affected by pregnancy the female hormones ma (heart palpitations)

Developmental psychology: The role of hormones in human development

Hormones influence our development throughout our lifespan. For example, h formation of sex differences in the brain. During foetal development males are testosterone levels which has an effect on the newly developing brain cells. Fo sexually dimorphic nucleus is 2.5 times larger in men than in women. Brain diff into behavioural differences until later in life.

Glands

A gland is an organ that produces hormones.

There are a number of different (endocrine) glands in the body; here are some o

Hypothalamus

Sat just above the brain stem (an area that connects the brain to the spinal cord and, therefore, the rest of the body), the hypothalamus is important for regulati the pituitary gland. It releases hormones that transport through an artery to the pituitary gland and, therefore, its importance lies in influencing other glands. Th hypothalamus also plays an important role in homeostasis, a state of equilibrium which is needed for survival.

Pituitary gland

Also called the master gland, the pituitary gland is responsible for the productio of many hormones and is considered the most important part of the endocrine system. The pituitary gland secretes growth hormone which targets many cells i the body and is important in determining height in children. In adults, growth hormone is important for increasing muscle mass, among other functions.

Thyroid gland

The pituitary gland is also very important for influencing other glands. For example, the pituitary gland stimulates the thyroid gland, of which the hormone influence cell metabolism (speed). Hyperthyroidism is when our thyroid gland is producing too few thyroid hormones (so our cells are working too slowly), and hypothyroidism is when our thyroid gland is producing too many thyroid hormones (so our cells are working too quickly), and this is an example of misregulation by the pituitary gland.

Our thyroid is found below our Adam's apple, although some individuals are bor without one. This is called congenital hypothyroidism and is treated as soon as diagnosed as it can lead to failure to grow.

Hormones and aggression

One hormone you might have heard of being associated with aggression is the m

Role of testosterone

To the lay person testosterone is linked to the idea of 'masculineness' along with along with masculine traits, might be said to be 'testosterone fuelled'.

… But how much truth is there to this?

Animal studies

Research conducted on animals has provided enough evidence to conclude that there is a link between testosterone and aggression.

The typical method of investigation is through castration and replacement of testosterone. For example, the testes when removed in rats reduce aggression and when testosterone is replaced their levels of aggressive behaviour return (Albert et al., 1987).

Et
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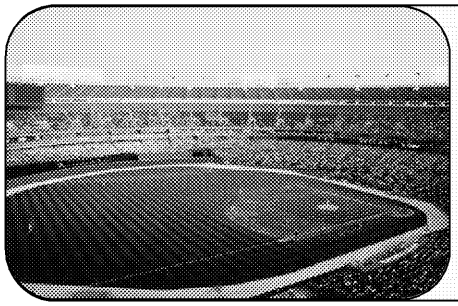
In humans

The current research findings on humans about the proposed link between testo
clear than the popular perception.

Dabbs et al. (1995) examined 692 male prison inmates and measured their saliva levels of testosterone. Prisoners who had committed more aggressive and violent crimes (e.g. rape and murder) showed higher levels of testosterone compared to those who had committed less aggressive crimes (e.g. theft). These inmates were also more likely to behave aggressively while in prison and break rules.

Archer et al. (2005) conducted a meta-analysis of 30 testosterone and aggressio
positive, correlation of r = 08 suggesting that there is a link between the hormon
aggression.



An evolutionary function

Bernhardt et al. (1998) found that testost
watching sporting events. Following a wi
testosterone, and following a loss there is
Since testosterone is said to facilitate agg
following defeat promotes withdrawal fr
aggress against a stronger opponent, whi

Halpern et al. (1993) examined the relationship between aggression in 100 teenage males and the increase of testosterone they experience at this time. Th
found no significant relationship between testosterone and aggression.

In contrast, Finkelstein et al. (1997) conducted a randomised, double-blind, placebo-controlled study of children who were experiencing delayed puberty. Th
found that hormone replacement therapy resulted in an increase in self-reporte
aggression in both sexes. However, not all types of aggression led to an increase
verbal aggression did not change whereas physical aggression was reported to h
increased, along with impulsiveness.

Research methods: Randomising to groups

In some studies it is necessary to allocate people to different groups. Where possible, participants should be allocated randomly to ensure that there are not differences between the attributes of the participants in each group.

Aggression or dominance?

Mazur and Booth (1997) argue that a distinction should be drawn between dominance and aggression. They argue that the motive for many aggressive acts
influence other people and gain status. They argue that there are relatively few
aggression is not dominance; examples include euthanasia, surgery and suicide.
exerted without the use of aggression, for example in sports events and political
competing for dominance produced changes in male testosterone; it increased w
challenge and afterwards the winner's testosterone increased while the loser's d
testosterone may not be as clearly linked with aggression as once thought, highli
context.

The definition of 'aggression' itself is not black and white, and different definitio

Testosterone and sex differences

A review by Bettencourt and Miller (1996) agreed that men are more physically a
are also more likely to commit aggressive crimes (Stephenson, 1995).

Is testosterone responsible?

Girls born with congenital adrenal hyperplasia (CAH) have a higher-than-normal l
androgens. Androgens are also known as male sex hormones and this group of h
development of male characteristics. This leads CAH girls to develop a more mas
also develop the more masculine trait of aggression? Research by Pasterski et al
11 with CAH show more aggressive behaviour than their siblings without CAH. C
showed higher levels of aggressive behaviour, along with being more active in ge

However, is there really a sex differ
When aggression is operationalised i
physical aggression then in Western c
aggressive than females. While men s
physical aggression, women show gr
aggression (for example, gossiping).

Evolutionarily speaking, males and fe
aggressive but females lack the same
such, it makes evolutionary sense fo
aggression differently, for example i
of conflict resolution.

Glucocorticoids

Along with androgens (such as testosterone), glucocorticoids fall under a class of
hormones. One glucocorticoid hormone you have already come across is cortiso
of many important functions; for example, stress responses and the amount of g

Animal studies

In animal studies, it has been found that chronically high levels of glucocorticoids
(Summers et al., 2005), whereas reduced levels in rats produce increased aggres
suggests there are inter-species differences, making it difficult to generalise any f
another.

In humans

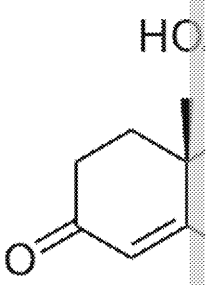
The first study investigating glucocorticoid hormones was Virkkunen (1985) who
found that frequent violent offenders had lower levels of glucocorticoids than frequent non-violent offenders. One criticism is that this study examines the offender's past aggressive history but measures the present level of glucocorticoids, which may change to reflect their environment; for example, no
violent offenders and violent offenders may be placed in different institutional conditions.

Issues and Debates: Gender

Most people would argue that men are more aggressive than women and may even cite testosteron
suggests, testosterone is related to aggression. However, it may be that testosterone is related to
shown that women aggress equally but indirectly. There are many more male violent offenders than
gender aggresses may account for this.

A closer look at cortisol…

In a pilot study by Brown et al. (2008) looking at salivary samples from five university students, they found that high levels of testosterone and low levels of cortisol showed higher self-reported anger. One proposed explanation is that low levels of cortisol result in inappropriate fear responses. This results in a display of aggression rather than the aggression being inhibited.

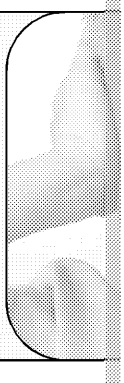


However, not all research suggests that aggression is associated with low levels of cortisol. For example, van Bokhoven et al. (2009) conducted a longitudinal study of cortisol levels in adolescent boys. They compared the levels of boys who had co not. Conduct disorder is a disorder where children show a persistent pattern of behaviour often includes aggressive actions such as fighting and cruelty to peopl frequent lying, and violating norms and rules. They found that cortisol levels we conduct disorder compared to those who did not. Additionally, cortisol levels w aggressive forms of conduct disorder compared to those who had less aggressive cortisol in aggression.

Moffitt (1993) identifies that the age of onset of conduct disorder may be an imp examining aggression in this group. Those who develop the disorder in childhoo of aggression across their life than those who develop the disorder in adolescenc within this population may vary.

What is conduct disorder?

Conduct disorder is a behavioural and emotional disorder that can only be diagnosed during childhood and adolescence. One of the key features of the disorder is aggressive behaviour. It is diagnosed by looking at previous behaviour that breaks the law or seriously violates social norms or rules (also called 'antisocial behaviour'). There is a high comorbidity with ADHD, substance use disorders and learning disabilities which suggests a complex interaction of factors.



Issues and Debates: The use of psychological knowledge within s

A better understanding of the causes of aggression can be beneficial for society. Society sees most f tries to prevent and reduce incidences of aggression. The research study above found that higher lev associated with more aggressive forms of conduct disorder. Cortisol is a hormone that increases in re information we may be able to reduce the amount of aggression by encouraging less stressful enviro or teaching these young people how to cope with stress.

Key question: What are the implications for soci found to be caused by nature not nurture?

The 'nature' approach is the idea that our behaviour is the result of biological for This argues that we inherit genes which are formed over the process of evolution In contrast, the 'nurture' approach is the idea that our behaviour is the result of experiences.

The issue

In our society most forms of aggression and violence are discouraged and often p The common punishment for violent aggression is to be sentenced to prison. Our system is strongly influenced by the idea that we have a choice in our actions (nu and therefore if we choose to behave in a violent and aggressive manner and hu people then we should be punished for our actions.

In this course companion we have focused on the biological explanation of aggre evidence that biology has a role in aggression. Biological explanations are firmly biological factors we have discussed, such as genetics, cannot be changed. This c society because we could be punishing people for behaviour that is not out of th

Should we punish those whose biology plays a part in their aggressive behaviour?

Punish?	Applying concepts and research from this cours
✗	Research into genetics has found a link between genetics and aggr al. (1993) found that those with the MAO-A gene had a high incide cannot be changed and therefore it would be wrong to punish thos their genetics predispose them to it.
✓	Caspi et al. (2002) examined the gene-environment interaction in a found that those who had been maltreated as children had the low more likely to go onto commit violent crimes. However, the gene v interaction make it more likely to aggress, but do not mean it inevi
✗	Some hormones, for example testosterone, have been associated w Pasterski et al. (2007) found that girls born with congenital adrena than normal androgens (male sex hormones) including testosteron their siblings who did not have congenital adrenal hyperplasia. Peo hormone levels and should not be punished.
✓	Research by van Bokhoven et al. (2005) found that boys with aggre (a disorder characterised by persistent antisocial behaviour) had hi hormone) than those who had a less aggressive forms of the disor and therefore the individual may have some control over the level stressful situations.
✗	Evolutionary explanations argue that people are driven by motivat ancestors. For example, males may use aggression to compete wit mates or for limited resources. Our evolutionary motivations are c chosen.
✓	The evolutionary explanations ignore individual differences. Differ the same situation and respond differently. This goes against the i insurmountable and suggests that we have choice in our behaviou

There are certainly great amounts of evidence that biology plays a role in aggres that biology predisposes us to aggression, rather than causes it. Genes, hormon not force us to behave aggressively but make it more likely. The person's past hi likely to influence whether aggression actually occurs. Therefore, both nature an aggression.

Our law system currently favours the nurture idea that aggression and violent be evidence confirms this but also suggests that the choice is influenced by biology. should place a greater value in biological influences than they do at present.

Chapter 6 Activities

Check your understanding!

1. What do animal studies reveal about the influence of testosterone? (1
2. Identify and explain one problem with using research obtained from
3. Describe the main role of the hypothalamus in the endocrine system.
4. Briefly describe one study that investigates the relationship between g
(3 marks)
5. Discuss the use of animals in aggression research. (6 marks)

Exam-style questions

1. Explain one strength and one weakness of using studies of violent crim
our understanding of aggression. (4 marks)
2. Explain two strengths of the methodology used in animal research. (4

Chapter 7: Research Methods in Biological P
Practical Investigation

Overview

In this chapter we learn about correlational research and then design our own practical investigation which examines the relationship between two variables. For our investigation we learn how to design and conduct our correlational research and how to analyse and interpret the results.

Learning outc

After studying this chapte

- ❑ Understand correlati
- ❑ Design and conduct
- ❑ Analyse and interpre

Key Terms

Abstract	A section of a research article or report in whic provides a brief overview of their research
Alternate/experimental hypothesis	A prediction on the outcome of the research
Cause and effect	The idea that changing one variable causes a c accurate prediction possible
Closed questions	A question with a fixed response, e.g. 'yes', 'nc how a person can respond to the question
Confidentiality	Experimenters are not to disclose confidential stored in such a way that the participant is not example, participant names are replaced by nu
Confounding variables	A variable that has not been controlled for tha shown in the DV instead of being caused by the
Correlation	A measure of the association between two var
Correlation coefficient	A number that describes the strength and dire
Correlational research	A type of research which aims to uncover a rel does not manipulate either of these variables t
Covariables	The variables measured in correlational resear
Critical value	The value we use to determine whether to acc
Dependent variable	A variable which measures the presumed effec
Directional hypothesis	The researcher predicts the direction of the eff
Discussion	A section of a research article or report where back to past research and evaluates their own
Independent variable	A variable which is manipulated to produce a p variable
Informed consent	The participant knows exactly what is going to take part. Differs from just consent when the p the exact experiment but agrees to take part.
Interval data	Equally spaced data
Levels of measurement	A way of classifying types of data based on the
Likert scale	A type of closed question where a person resp continuum scale
Linear correlation	A relationship between covariables that forms scatter graph; the ratio of change is constant
Negative correlation	As one variable increases, the other variable de
Nominal data	Categorical type data
Non-directional hypothesis	The researcher predicts that there will be an ef which direction the effects will be
Non-linear correlation	A relationship between covariables where the

Key Terms

Null hypothesis	States there will be no effect
Observed value	The value we obtain from carrying out an inferential t
One-tailed test	A test that only looks in the direction of interest
Open questions	A question that allows the person to respond with the qualitative data
Ordinal data	Ordered or ranked data that may not have an equal d
Positive correlation	As one variable increases, the other variable also incr
Protection from ham	Participants should be protected from psychological a made aware of anything that may present a risk to th
Right to withdraw	It should be made clear to participants that they have point and that any data from the study can be destroy
Sampling	The method of selecting participants from the require your study
Scatter graph	A graph that shows correlational data where each poi
Statistically significant	A result that researchers have interpreted to be true r
Spearman's rho	An inferential test used to measure the relationship b interval level
Two-tailed test	A test that looks at both directions because the resea the result
Type I error	When we reject the null hypothesis when we should h
Type II error	When we accept the null hypothesis when we should

Scene-Setting Questions

- What is a correlation?
- What do researchers mean by 'significant'?
- How can we conduct ethical research?

The practical investigation

As part of your course you will design and conduct a practical investigation into a
chapter we will examine how to design and conduct a correlational study into a t
psychology.

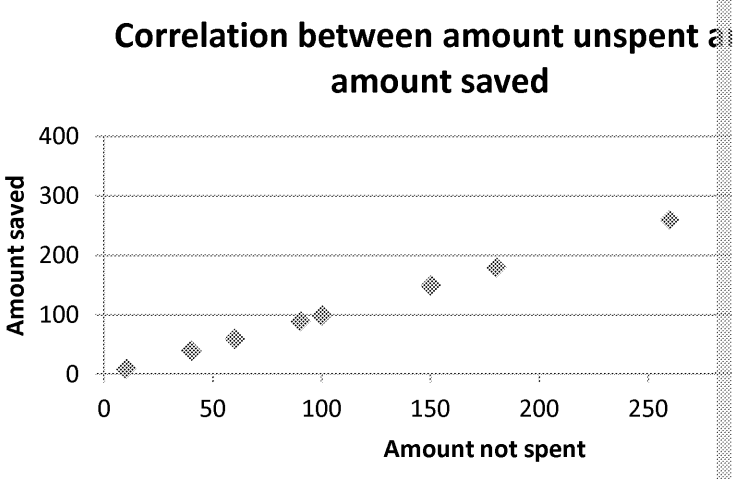
To design a high quality study, you must fully understand how correlational rese
we will apply the concepts to our study as we go along.

Throughout this chapter, we will be working through the example of investigatin
between height and self-rating of aggressive tendencies.

Correlational research

A relationship or link between two variables is termed a correlation. The two va
covariables because the study measures the changes in both variables. This con
where the researcher changes one variable (the independent variable) and meas
(the dependent variable).

A correlation can help us predict results. For example, in the graph below, if you
not spent, you would expect a large amount of money saved.



This graph shows a correlation between amount of money not spent and the am

Perfect correlations

Above is an example of a perfect correlation.

If you can draw a straight line and it goes through the centre of every point you h
that you know the value of one variable, a perfect correlation allows you to predi

Very few correlations are perfect in research because usually one variable may b
However, in real life, there are several examples.

For example, if every penny you did not spend went into your savings, the amou
amount you saved would form a perfect correlation.

Correlation coefficients

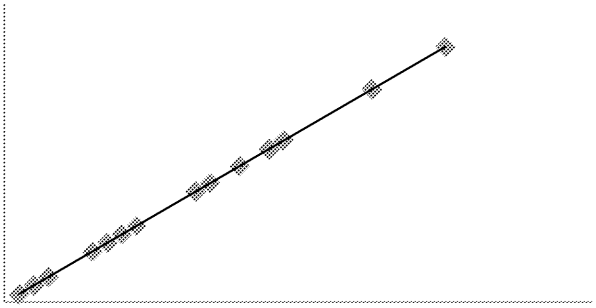
Correlation coefficients tell us about the strength of the correlation. Using a gra
if a correlation exists and the strength of it by looking at how close the data poin
closer the points are to the line, the stronger the correlation.

As a general rule of thumb, for A Level Psychology you should consider correlatio
following strengths:

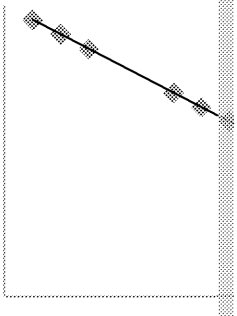
Correlation coefficient	Strength of correlati
0.1 to 0.3	Weak
0.4 to 0.6	Moderate
0.7 to 1	Strong

Perfect correlations have a correlation coefficient of 1. This is extremely rare in r
come across research that has a coefficient of 1.

A perfect positive correlation (coefficient +1)

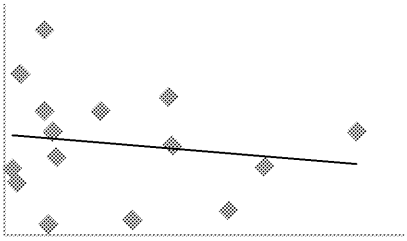


A perfect negativ

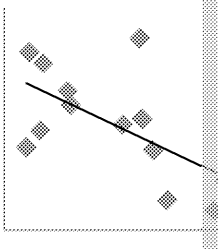


The majority of correlations found in research are not perfect. Using a graph you
correlation exists and the strength of it by looking at how close the data points a
the points are to the line, the stronger the correlation.

Correlation coefficient = -0.15



Correlation coeff



Sometimes we might have points that differ a lot from the other points, these ar
sometimes excluded from the results to avoid the data being affected by extrem

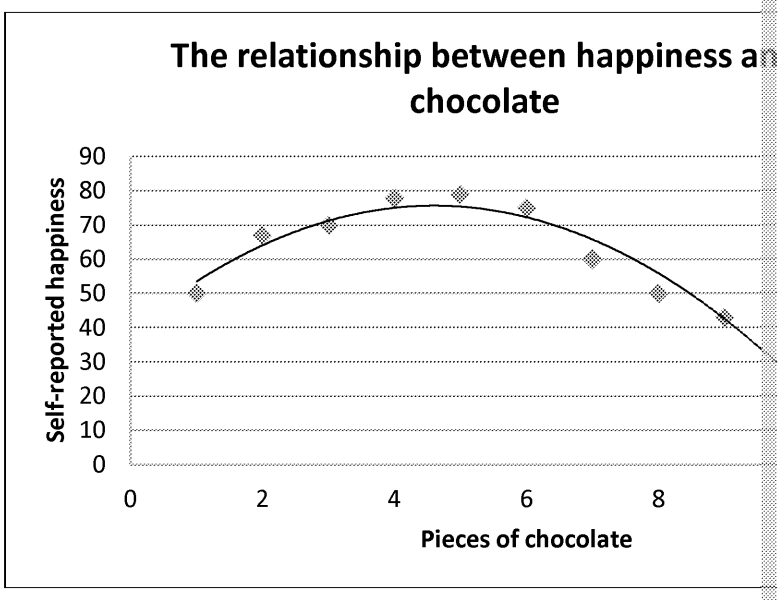
In real research the strength of a correlation is dependent on how big the sample
even a small trend is quite important, but if a sample is very small, then even hav
heading in the same direction could form a fairly strong correlation.

Zero correlations

Sometimes the data is completely random, that is, there is no relationship betwe

In the example above, the points are widely distributed with no apparent order c
having 'zero correlation'.

Something to consider: Non-linear correlations



The correlations shown so far have been linear, that is, they form a straight line.

Something to bear in mind, a correlation does not have to be linear; it is about th
variables. In the example above it is very clear that there is a strong relationship
chocolate eaten and self-reported happiness.

You may expect the relationship to be linear – that the more chocolate you eat, t
reality the first few pieces produce pleasure and the pieces following after becor
(This has been shown on brain scans, after eating too much chocolate the reward
lighting up!)

Issues surrounding the use of correlations in psychology

Correlations and experiments are different on a number of key matters:

- **Cause and effect**: Experiments are able to determine cause and effect becau variables that may influence the results. Experiments attempt to ensure tha the same environment so that the only change is the change they make to t contrast, correlations do not directly manipulate the independent variable a variables, which makes it impossible to infer cause and effect.

> **Important note!** Experiments can rarely truly prove cause and effect be variables that cannot be controlled and accounted for. This is even mor where it is not possible to control for the participant's history, persona other factors. Therefore, experiments at best can form 'causal relation the cause.

- **Lack of control and confounding variables**: Unlike experimental research, co attempt to control all the other variables. An unfortunate result of this is th of other variables. A confounding variable is a hidden third variable that pro dependent variable. If confounding variables are not controlled then a stud

  A memorable example that illustrates this is:

  Ice cream sales ⟷ Number of homicides

  Ice cream sales ⟵ Heat ⟶ Number of homicides

  The number of ice creams sold and the number of homicides is positively co really related? It is likely that the extraneous variable heat is to blame. Hea creams sold and increases the likelihood of aggression.

- **Interpreting correlation coefficients**: Correlations may not be linear and thi testing for the strength of the correlation. In addition, sample size needs to at the strength of the correlation, for example, a small sample size may not strength.

Designing and conducting a correlational stud

As part of your practical investigation you will be designing a correlational study. This section will walk you through the process using the example of investigating there is a relationship between height and self-rating of aggressive tendencies.

Deciding on a research question

Your research question is the question you are trying to answer with your study. You will need to narrow down your field of interest to a more precise topic that you can investigate.

For this Biopsychology module, your research question should be linked to aggression or attitudes to drug use.

Practical investigation: An investigation into whether there is a relationship b aggressive tendencies
Our research question is: Is there a relationship between height and self-rated

This question is clearly linked to aggression as one of our covariables is self-rat can use our research findings to consider how our research compares to other

Forming a hypothesis/prediction

Experiments

Before we conduct an experiment we form a hypothesis. A hypothesis is a precis testable prediction about what the researchers expect to happen in their study. For an experiment, researchers define the hypothesis in terms of the independen variable and the dependent variable. The independent variable is the variable th being changed (e.g. temperature of a room) and the dependent variable is the va we expect to measure change on (e.g. displays of anger during a frustrating task).

Two hypotheses are written:

1. **Alternate/experimental hypothesis** is a hypothesis that there will be an eff the independent variable on the dependent variable.
2. **Null hypothesis** is a hypothesis that says that there will be no effect of the independent variable on the dependent variable.

The researcher hopes that the research findings will allow him/her to reject the n experimental hypothesis.

Alternate/experimental hypotheses can be either **directional** or **non-directional**. hypothesis if previous research has suggested that there will be a particular effec research or conflicting research then you should write a non-directional hypothe

- Directional example: I hypothesise that the hotter the room is, the more like anger during a frustrating task.
- Non-directional example: I hypothesise that room temperature will have an display anger during a frustrating task.

Correlational studies

Some researchers do not like using the term 'hypothesis' when you are conducti
because in correlational research you do not manipulate the variables and there
experimental hypothesis. Instead, you might prefer to use the term 'prediction'.

Correlational studies express the hypothesis/prediction in terms of covariables. C
between which you expect to see a relationship.

Here are some examples:

- 'I hypothesise/predict there will be a positive correlation between the number of previous criminal convictions and the likelihood of a person going to prison in the next two years.' (directional)
- 'I hypothesise/predict there will be a negative correlation between the amount of counselling a person receives for anger and the number of aggressive incidents.' (directional)
- 'I hypothesise/predict there will be a correlation between regularly doing aggressive sports (e.g. boxing) and physical aggression in real life'. (non-directional)

Like in experimental research, you should also form a null hypothesis. For correl
hypothesis will state that you expect **no relationship** between your two covariab

**Practical investigation: An investigation into whether there is a relationship b
aggressive tendencies**

There has been little research into the relationship between height and aggres
focused on our physical traits, for example, previous research found that facial
related to aggression. This suggests that there could be a relationship between
and aggression. However, there is insufficient previous research to state the di
don't know if shorter people might be more aggressive or if taller people might

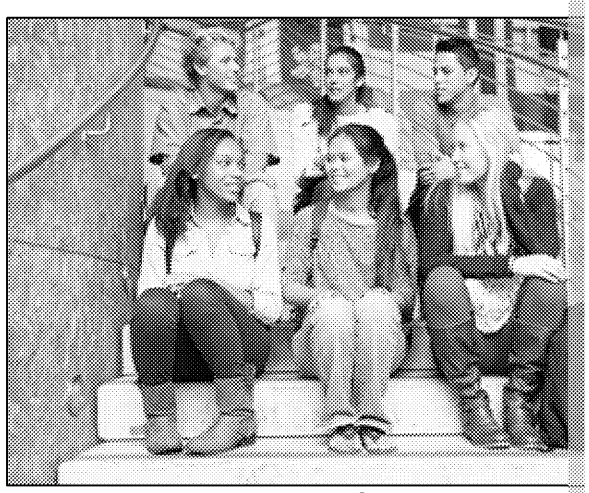
Here is our prediction/hypothesis:
There will be a correlation between height and self-rated aggressive tendencie

Our null hypothesis:
There will be no relationship between height and self-rated aggressive tendenc

Sampling

Sampling is the method we use to select people to participate in our study. There are a number of diff

The aim of sampling is to make sure your sa represents the people (the population) you interested in.



Opportunity sample
Choose whoever is available at the time.
Pros: Easy, good for universal processes
Cons: Biased sample by not accounting for the types of people who are not present

Volunteer sample
People respond to an advert or invitation to participate.
Pros: Allows for a wider sample, suitable for universal processes
Cons: Restricted to those who have seen the advert; those who self-select may be different from those who choose not to respond

Systematic sample
Using a list and selecting people at a fixe interval (e.g. every third person). Start fr random point on the list.
Pros: Less time-consuming than random sampling, good coverage of the populati
Cons: Sample is not necessarily random

Special criteria/exclusion criteria

Along with your sampling choice, you need to think about any special criteria tha
or anything that should exclude them from the study. For example, if you are co
memory, you should exclude people who have impairments in their memories. F
might act as a confounding variable if they are the true reason behind your resul

**Practical investigation: An investigation into whether there is a relationship b
aggressive tendencies**

For our study we are going to use an **opportunity sample**. An opportunity sam
collect data and we do not expect the topic we are studying to vary within the p

In choosing our participants, we have chosen three important criteria:

1. **Participants are all males**: Some past research has found that differen
exist between how males and females aggress and/or their levels of
aggression. Therefore, this study will just focus on males to avoid the
potential confounding variable of gender on our results.

2. **Participants have not been diagnosed with a disorder that is associat
with high levels of aggression** (e.g. antisocial personality disorder, auti
substance-related disorders, etc.): If our participants have a disorder w
known connection to aggression this could be a confounding variable
because the aggression scores may be the result of the disorder rather
height.

3. **Participants must be over 18**: Participants younger than 18 require the
parental consent and special ethical consideration because they are a
vulnerable group. For this reason, we have decided to use adult
participants. Additionally, it is likely that children and teenagers aggres
differently from adults and physical playing could be confused with
aggression. Finally, at age 18, many people will have reached their
maximum height. This may be a more important biological marker tha
current, but ever changing, height of a child or teenager.

Note: By restricting who can be a participant in our study we are improving the
affecting our external validity. Our results are now less generalisable to the ge
participants do not represent the general population; for example, we cannot a

Ethical considerations

Psychologists have a moral and professional responsibility to conduct ethical res
been published to help inform and guide psychologists in their research.

Issues and Debates: Ethics

The five main ethical guidelines are:

1. Protection from harm: The research should not cause long-term psychological or physical har
2. Informed consent: The participant should know about the nature of the study and agree to t
3. Deception: The participant should not be unnecessarily deceived about the study. If deceptio
   true nature of the study afterwards.
4. Right to withdraw: The participant has the right to leave the study at any time and have any
5. Confidentiality: The information the participant provides the researcher with should be kept

Task 7.1: Ethical considerations

Using the table below, consider how we can make sure our investigation r
guidelines for psychological research.

Ethical guideline	How will we uphold this e
Protection from harm	
Informed consent	
Deception	
Right to withdraw	
Confidentiality	

Data collection tools

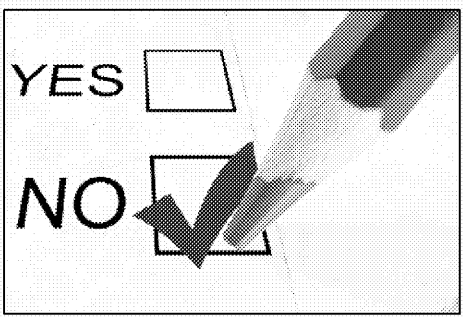
Now that we know what we want to investigate, we have to choose how we coll

Here are some of the methods that psychologists use to collect data:

- **Experiments**: Experiments manipulate a variable termed the independent v if this manipulation produces a change in another variable termed the depe experiments carefully control all other factors and the environment of the s natural.
- **Observations**: Observations involve observing a person or group of people i the setting is natural and in other cases it is a controlled setting. It is terme participants do not know they are being observed, and 'overt observation' v part and be observed.
- **Questionnaires:** Questionnaires involve a written list of questions that are answered by the participant and provide information on a particular topic. Questionnaires usually concern the participant's experiences or opinions and often some level of demographic information (age, gender, ethnicity, etc.).
- **Interviews:** Interviews involve asking a person a list of questions, and this is typically done face-to-face. Unlike questionnaires, which involve fixed questions, some styles of interview allow the interviewer to form new questions as the interview progresses.
- **Case studies:** A case study is an in-depth study of a particular individual or group of individuals. Unlike most experiments, case studies do not manipulate the independent variable but rather look at the effects of natural variation in th event. Case studies look at how the individual differs from either their past regarded as normal or typical behaviour by the majority of the population.

Each metho weaknesses. Fo be likely t a

Practical investigation: An investigation into whether there is a relationship b aggressive tendencies



As mentioned previously, we are i of aggression. For the purpose of c collecting self-report data.

Our two types of data collection m data are questionnaires and interv use questionnaires because it is m itself well to correlational analysis.

Questionnaire design

There are two different question types:

Open questions

Open questions allow the responder to provide their own answer to a question.

Examples on the topics of gender and stereotypes:

- *Why do you think that men and women often do different types of jobs?*
- *What can be done to encourage young women to pursue careers in 'male' di*
- *What would you think of a male nurse?*
- *What do you know about feminism?*

This last question tests the knowledge of the responders. Open questions can b reduces the risk of correctly guessing.

You can also have open questions regarding quantities.

For example, '*How many times do you exercise during a week?*'

This could have various answers such as:

- 'Three to four times a week'
- 'It depends on my work schedule, usually about twice a week'
- 'I alternate weeks, one week I'll exercise four to five times a week and othe times a week'

These can often be more valid than categories for measuring quantities as they r category the behaviour should go in.

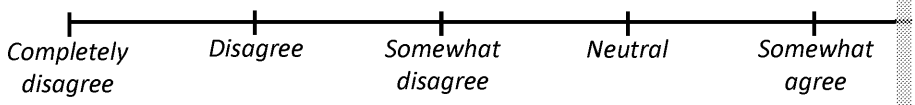
Closed questions

Closed questions involve the responder choosing from a fixed set of answers. Fo 'yes'/'no' questions, fixed categories such as ages 18–25, or scale responses.

Likert scale

Closed questions often employ the use of Likert scales; the responder is shown a which of the identified points best match their attitude.

For example:
To what extent do you agree that happiness is determined by the individual them



In order for scales to be effective, they must cover the whole possible range of a that participants may have mentioned if they had been given an open question.

Open questions provide rich detail and give the responder the chance to say wha closed questions are easier to answer and analyse.

Practical investigation: An investigation into whether there is a relationship bet aggressive tendencies

Here is our questionnaire.

INSTRUCTIONS: For each question tick the option that best describes your behav responses are confidential and it will not be possible to identify you from your re

In the last seven days I have:		Never	Rarely	Sometime
1	Physically hurt someone with the intent to harm them (e.g. slapping, pushing, etc.)	○	○	○
2	Deliberately caused physical injury to someone (e.g. bruising, cuts, etc.)	○	○	○
3	Verbally threatened someone with violence	○	○	○
4	Verbally threatened someone with damage to their reputation	○	○	○
5	Called someone names or harshly teased them with the aim of hurting them	○	○	○
6	Used sarcasm to ridicule someone	○	○	○
7	Deliberately ignored or excluded someone	○	○	○
8	Spread malicious rumours or lies about someone	○	○	○
9	Encouraged others to dislike someone	○	○	○
10	Encouraged others to ignore or exclude someone	○	○	○
11	How tall are you?			

When we have collected our results they will be scored. A response of never will etc. A score of 0 will be the minimum score indicating no self-reported aggressio the maximum and indicates extreme aggression.

All heights will be converted into the nearest whole centimetre so that they can b

Practical investigation: An investigation into whether there is a relationship b aggressive tendencies

Considerations when we designed our questionnaire:

- **Number of questions**: 10 questions can provide us with detail on our r long that people lose interest and choose randomly
- **Likert scale**: Likert scales provide more detail than yes/no questions an that they have 'rarely' or 'sometimes' behaved aggressively than 'yes' t
- **Considered variety of different types of aggression**: Aggression is not j for different types of aggressive behaviours (i.e. physical, verbal and in target each type
- **Specified time frame**: This provides details about time frame that peop time frame is not so long that people might forget about their aggressi

Raw data

Now that you have conducted your study, you can collate the data in a table.

If you have used a self-rated measurement, you need to produce a single score f this by scoring the results and then totalling them.

Reverse scoring: Note that if your questions vary in what a high score means (e.g means very aggressive and others a high score means non-aggressive) you need t questions so that the meaning of a high score is consistent.

Practical investigation: An investigation into whether there is a relationship b aggressive tendencies

Table 1

Participant data on height and overall self-rated aggres

Participant	Self-rated aggression score	Height (c
1	9	172
2	2	160
3	4	171
4	11	168
5	1	170
6	16	179
7	8	169
8	15	180
9	8	175
10	24	187

Note: Minimum self-rated aggression score is 0; maximum is 40.

Presenting your data: Scatter graphs

Correlational information is typically presented in a scatter graph.

One variable is placed on the x-axis and the other on the y-axis. It does not matt
go. Each participant is represented by a single point.

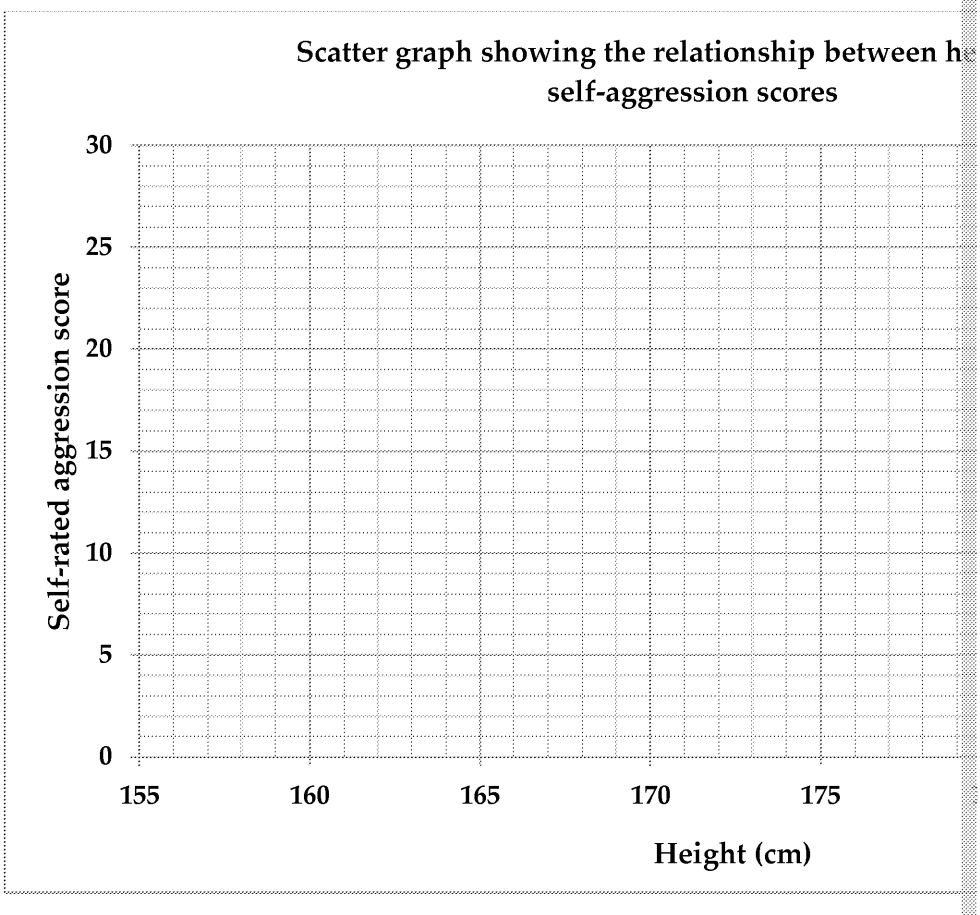
By using a scatter graph we should be able to gain some insight into **descriptive s**
are used to summarise the data. For correlations we are interested in the **streng**
direction of the correlation.

A strong correlation will have all the points close to the line of best. A perfect co
type of correlation, will have all the points exactly on the line. You should not ex
in your research. The direction of the correlation refers to whether it is positive o
correlation, as one variable increases, so will the other. In a negative correlation
other variable decreases.

Task 7.2: Presenting results in a scatter graph

Use the table of our results to produce a scatter graph.

Once you have plotted all the points, draw a line of best fit.



Delete words as appropriate:
The scatter graph shows ***no/weak/moderate/strong*** correlation. The correl
the participant's height increases, their self-reported aggression score ***incr***

Analysis of correlational data: Spearman's rho

For your practical investigation, you need to know how to use Spearman's rho (a correlation coefficient).

Choosing Spearman's rho

When you are interested in the relationship between two variables

Spearman's rho is used for correlational data. It tells you the strength and direct two variables.

Spearman's rho only works for monotonic relationships.
In a monotonic relationship:

- As one variable increases, the other variable increases
  OR
- As one variable increases, the other variable decreases

Spearman's rho works for both linear and non-linear relationships. In a linear re straight and a strong relationship will have the points near this straight line. In a of best fit can be curved and a strong relationship will have the points near the c

Levels of measurement: When you have ordinal or interval data

You can only use Spearman's rho if you have data that is ordinal or interval level.

Data can be described as different levels of measurement:

Nominal

- Data that is split into categories
- Measurement is by counting the frequency of each category
- For example, you could count the number of each of the answers to a 'yes' or 'no' question

Interval

- Scale that has equally spaced data
- For example, temperature is equally spaced; the space between 29 and 32 d equal

Ordinal

- Data is ordered or ranked
- Distance between the data may not be equal
- For example, a list of your favourite subjects may be in a ranked order but th subject and the next might vary

Data for Spearman's rho needs to be interval or nominal or ordinal so that it can by which we give our data values (ranks) based on their relative position. For ex a size 5 shoe; it would be possible to rank these sizes.

Here is a guided example of how to carry out Spearman's rho…

Practical investigation: An investigation into whether there is a relationship b aggressive tendencies

Step 1: Set up a table, such as the one below:

Participant	Self-rated aggression	Rank 1	Height (in cm)	Rank 2
1	9		172cm	
2	2		160cm	
3	4		171cm	
4	11		168cm	
5	1		170cm	
6	16		179cm	
7	8		169cm	
8	15		180cm	
9	8		175cm	
10	24		187cm	

Rank 1 is our column for our ranking of self-rated aggression
Rank 2 is our column for our ranking of height
d is our difference (Rank 2 – Rank 1)
d^2 is our difference squared

Next we are going to rank our data.

Step 2: To rank your scores, start with the lowest number and give that a rank o so on.

Participant	Self-rated aggression	Rank 1	Height (in cm)	Rank 2
1	9	6	172cm	6
2	2	2	160cm	1
3	4	3	171cm	5
4	11	7	168cm	2
5	1	1	170cm	4
6	16	9	179cm	8
7	8	4.5	169cm	3
8	15	8	180cm	9
9	8	4.5	175cm	7
10	24	10	187cm	10

If two of your results are the same you give a joint ranking. We have two 8s, wh 4 and 5, so we give them both a ranking of 4.5. The next lowest score will be 6.

Note: Multiple joint rankings, especially in a small sample size, decreases the a

Step 3: To work out d (the difference) we subtract our rank 1 scores from the ra

Rank 2 – Rank 1 = difference

Participant	Self-rated aggression	Rank 1	Height (in cm)	Rank 2	
1	9	6	172cm	6	
2	2	2	160cm	1	
3	4	3	171cm	5	
4	11	7	168cm	2	
5	1	1	170cm	4	
6	16	9	179cm	8	
7	8	4.5	169cm	3	
8	15	8	180cm	9	
9	8	4.5	175cm	7	
10	24	10	187cm	10	

So work out d^2 (difference squared) we simply square our d result.

Remember that you are squaring the sign too $(-5)^2 = 25$
A negative multiplied by a negative gives us a positive.

All of our answers should be positive.

Step 4: Calculate $\sum d^2$

$\sum d^2$ means the 'sum of' all of our d^2 results. To do this we have to add them all

$$\sum d^2 = 0 + 1 + 4 + 25 + 9 + 1 + 1 + 1 + 6.25 + 0$$

$$\sum d^2 = 48.25$$

Step 5: Work out N

Your N value is your number of participants.

$N = 10$

Step 6: Put the information in the formula

Here is the formula for Spearman's rho:

$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

Remember that $\sum d^2 = 48.25$ and n=10

$$r_s = 1 - \frac{6 \times 48.25}{10(10^2-1)}$$

$$r_s = 1 - \frac{289.5}{990}$$

$r_s = 0.71$ (2 d.p.)

0.71 is our **observed value**

Note: Our observed value is +0.71 which indicates a moderate/strong positive c
our scatter graph suggested.

Significance and levels of significance

Our observed value is the result we got from performing our Spearman's rho tes
our observed value is statistically significant.

In correlational research, 'statistically significant' means that the relationship be
certain threshold and that we can reject our null hypothesis and accept our alter

To find out whether our result is significant we compare our observed value to a
observed value is equal to or greater than the critical value then we reject our nu
alternate hypothesis.

To use critical value tables you need to understand two concepts:

1. **Levels of significance**
   For most research conducted you use a level of significance of 0.05. This me
   the result is not due to chance. When it is very important that the result is n
   might use 0.01 as their level of significance. This means that they are 99% s
   chance. For example, it can be important to make sure that medicines are r
   that the changes seen are not simply due to chance.
2. **One-tailed/two-tailed tests**
   To understand this you need to think back to our directional and non-direct
   testing a directional hypothesis you choose a one-tailed test. This is becaus
   direction you are interested in. If you wrote a non-directional hypothesis yo
   means you are testing in both directions.

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Here are the critical values for Spearman's rho:

	Level of significance for a one-tailed test				
	0.05	**0.025**	**0.01**	**0.005**	**0.0025**
	Level of significance for a two-tailed test				
N	**0.10**	**0.05**	**0.025**	**0.01**	**0.005**
5	0.900	1.000	1.000	1.000	1.000
6	0.829	0.886	0.943	1.000	1.000
7	0.714	0.786	0.893	0.929	0.964
8	0.643	0.738	0.833	0.881	0.905
9	0.600	0.700	0.783	0.833	0.867
10	0.564	**0.648**	0.745	0.794	0.830
11	0.536	0.618	0.709	0.755	0.800
12	0.503	0.587	0.678	0.727	0.769
13	0.484	0.560	0.648	0.703	0.747
14	0.464	0.538	0.626	0.679	0.723
15	0.446	0.521	0.604	0.654	0.700
16	0.429	0.503	0.582	0.635	0.679
17	0.414	0.485	0.566	0.615	0.662
18	0.401	0.472	0.550	0.600	0.643
19	0.391	0.460	0.535	0.584	0.628
20	0.380	0.447	0.520	0.570	0.612
21	0.370	0.435	0.508	0.556	0.599
22	0.361	0.425	0.496	0.544	0.586
23	0.353	0.415	0.486	0.532	0.573
24	0.344	0.406	0.476	0.521	0.562
25	0.337	0.398	0.466	0.511	0.551
26	0.331	0.390	0.457	0.501	0.541
27	0.324	0.382	0.448	0.491	0.531
28	0.317	0.375	0.440	0.483	0.522
29	0.312	0.368	0.433	0.475	0.513
30	0.306	0.362	0.425	0.467	0.504

The calculated value must be equal to or exceed the critical value in this table f

Our value was 0.71, which is greater than 0.648. Therefore, our result is signific

This means that we can **reject our null hypothesis** that there would be no relat rated aggression. Therefore, we can **accept our alternate hypothesis** that there height and self-rated aggression.

Issues of statistical significance

Many researchers will rejoice when they find out their result is significant, but w

There are two types of error you need to be aware of:
Type I error (false positive): When we reject the null hypothesis, but we should h
finding is not significant! This is more likely when we choose a less strict level of s
This is because our result does not have to be as large to meet the threshold.

Type II error (false negative): When we accept our null hypothesis, but we shoul
is significant! This is more likely to happen when we choose a strict level of signi

Discussing your study and writing it up

Strengths and weaknesses

Here is some general evaluation of correlational research. This information is im
practical investigation.

Strengths	W
Uncovers relationships: Correlations can be an excellent place to start researching a new area and identifying relationships. As evidence for the existence of a relationship between two variables, correlations can help promote later experimental research.	**Not cause and effect:** researcher whether ch change in another. Co association between t third hidden variable i between the variables
High mundane realism: The raw data used in correlational analysis is usually produced in natural rather than experimental settings. Unlike an experiment, variables are highly relevant to real life.	**Directionality**: It can b direction of the correl being nice to strangers correlated, it is difficu happy makes you mor or being nice to strang
Self-report: Much of the data used in correlational analysis comes from self-report techniques such as questionnaires. Using questionnaires can be advantageous as it allows the researcher to gain a lot of data quickly and affordably. Completing a questionnaire is seen as being less effortful than taking part in an experiment, so it may be easier to get data from a greater number of participants which improves generalisation.	**Self-report:** Self-repor disadvantages. Unlike have low levels of con participants are being questionnaires, which the results.

You need to be able to apply these to your own investigation. Here are some ex

**Practical investigation: An investigation into whether there is a relationship b
aggressive tendencies**

One weakness of our design is the use of a self-reported measure of aggressio
disapproves of displays of aggression and therefore participants may not have
behaviour. They may have tried to downplay their aggressive behaviour by givi
affect the validity of our findings.

However, we felt that the use of a self-report questionnaire was preferable ov
There are ethical qualms with inducing aggression and self-report measures av
Additionally, participants may not aggress openly in an experimental situation
disapproval.

Possible improvements

It is important to acknowledge any shortcomings in your design and just as impo
them. You should consider how changing aspects of your design could improve y

**Practical investigation: An investigation into whether there is a relationship be
aggressive tendencies**

Problem		Improvement
Participants may lie on self-reported measures if the topic is sensitive	→	Hide target questions among filler questions to conceal topic of interest
Use of only men means that the findings cannot be generalised to women.	→	Conduct a future study that includes women as well as men.

Writing the abstract

When researchers are looking to find out more information about a topic they of research rather than reading about it in a textbook! To help decide if they want they can read a short summary called an abstract.

An abstract is at the very beginning of the research paper and provides a very brief overview of the research that has been conducted. It includes information such as the research question, design used (experimental, correlational, etc.), and the key findings. Other researchers can quickly read this information and decide if it will be relevant to what they want to know.

EXAM T
abstract
some of
compar
availabl

As part of your practical investigation you need to be able to write an abstract.

The task below will guide you through the process.

Task 7.3: Writing an abstract

Using the table below, write an abstract to summarise our investigation in rated aggression. Aim to be brief but write your answers in prose rather t

Subsection	Write one or two sentences on eac
What background research is there to our topic? Or if there is none, why did we decide to investigate this topic?	
What topic did we investigate?	
What method did we use? What are our (co)variables? How did we measure them?	
What was our main finding?	
What was our main conclusion?	

Writing the discussion

The last section of a research report or article is the discussion section. In the di
what your research means.

There are a number of different sections to a good discussion:

1) Remind the reader of your hypothesis and describe your resu

This section should be short and to the point:
Example: *The goal of this study was to investigate whether there is an associat
rated aggression. We found that there was a moderate-to-strong positive rela
self-rated aggression scores. The findings confirm our prediction that there wo
the two covariables.*

2) Link your research to other research in the area and try to exp

This should be a large section of your discussion. If this is a new area of resear
You should try to explain your findings in the light of other research.
Example: *Previous research into facial-width-to-height ratio suggested to us ti
physical biological markers for aggression. We proposed that height could be
confirmed that there was a positive relationship between height and aggressio
research suggesting a link between testosterone and aggression and it is furth
testosterone can result in stunted growth in males. Therefore it is possible tha
may be linked to both higher levels of aggression and taller heights.*

3) Evaluate your study: Strengths, weaknesses and impr

As we were practising earlier, you need to be able to apply evaluation to your
apart your research and also talk about strengths and how problems can be re
Example: *One weakness of our study design was the use of only male particip
generalise our findings. We saw this as a necessary precaution because of the
of having a mixture of male and female participants on aggression and height
could make would be to conduct research using both males and females and c
females, and mixed sex.*

4) Conclusions, implications and future researc

In the final section of the report we wrap up by reminding the reader of our fi
possible implications (why are our findings important?) and suggesting future
Example: *Our research found a positive correlation between height and self-ra
implication for this is the use of biological markers as predictors for aggressio
replicate this study on a larger scale and use both males and females to allow*

* A Level exam-style questions

1. Describe the central nervous system. (4 marks)

2. Recreational drugs affect the central nervous system.
   Explain how one drug affects the central nervous system. (3 marks)

3. Describe brain scanning as a method of investigating brain activity. (4

4. Describe the theory of natural selection. (4 marks)

5. Joseph is trying to revise for his exams. The material is difficult and h
   next door neighbour is having construction work done and the noise i
   window he sees his neighbour. Joseph decides to go and do his revisi

   Using Freudian personality theory, explain why Joseph did not behav
   towards his neighbour. (4 marks)

6. *In the eyes of the law people are responsible for their criminal actions and sho*
   However, research has increasingly shown the role of biological factors in agg
   Some proponents argue that if aggression is the result of nature not nurture i
   change.

   Discuss the key issue for society of the implications if aggression is fou
   nature not nurture, using concepts, theories and/or research from biol
   You must make reference to the context in your answer. (8 marks)

Chapter 1

Check your understanding!

1. ***Describe the function of the dendrites in a neuron cell (1 mark)***
   The dendrites are the parts of the neuron that receive signals from other neurons

   1 mark for signals

2. ***Distinguish between excitation and inhibition (2 marks)***
   Excitation refers to bindings made to the excitatory receptor sites, where binding in an action potential (1). In contrast, inhibitory refers to bindings made with the inhi decreases the likelihood of releasing an action potential (1).

   1 mark for each definition

3. ***Describe the function of one neurotransmitter (4 marks)***
   One neurotransmitter is epinephrine, which is involved in the stress response (1). H implicated in the state of extreme heightened physiological arousal known as the fi response results in a series of changes that prepare our body to deal with physical s dangerous in our evolutionary past (1). For example, heart rate increases as a respo more blood being pumped round the body and, therefore, faster transportation of

   4 marks for description of the role of one neurotransmitter, possible points include the person and what effect it has on the body

4. ***Describe the spinal cord's function in the central nervous system (4 marks)***
   The spinal cord is part of the central nervous system and links information from the vice versa (1). Sensory information is interpreted by the brain and then the orders f from the spinal nerves to the motor neurons (1). Evidence of this role comes from t cord can result in quadriplegia, where the person cannot move or detect sensations can no longer communicate with the body (1). The spinal cord also plays an importa performs an action (e.g. removal from source) in response to a stimulus (e.g. touchi brain's involvement (1).

   Marks for discussion of the spine's role, could include: connection to peripheral ner how it interacts with the brain, reflex actions, damage and resulting effects

5. ***Describe the process of synaptic transmission (6 marks)***
   Synaptic transmission is the process of communicating information between two ne An action potential arises due to depolarisation of the neuron's membrane and trav leads to the release of the neurotransmitter across the synaptic cleft from the send (1). The neurotransmitter is released from the terminal buttons and crosses the syn on the receiving neuron (1). The receptor is shaped specifically for a certain type of neuron receives many different impulses and if the number of excitatory impulses r potential will be released and the signal will travel up the neuron (1). This process c to be spread across to different regions of the brain (1).

   6 marks for covering the process of synaptic transmission, possible points include: r information between neurons, neurons have a gap between them called the synapt occurs at the terminal buttons, neurotransmitters bind to receptors on the other ne dendrites which have a greater surface area to receive signals

6. ***Briefly describe the central nervous system (6 marks)***

The central nervous system consists of the brain and the spinal cord and is responsi
brain is composed of millions of interconnected neurons which allow for transmissi
and to areas of the body (1). Sensory signals are interpreted here, for example, the
this can help determine the direction of sound (1). The spinal cord is responsible fo
of the body to the brain and the brain will connect this information to the appropri
cord is damaged, the brain no longer receives signals from the rest of body and is n
body either (1). This means that the individual is unable to move the lower section
from it (1).

6 marks for consideration of the main features of the central nervous system; point
and movement, spinal cord and motor movement, brain damage and spinal cord da
central nervous system, how the system works as a whole

Exam-style questions:

Question number	Answer
Q1.	**AO1 (2 marks)** 1 mark for a definition of 'neuron' and 1 mark for a definition of 'neuro For example: **Neuron** • A type of cell that is found in the brain and body that is used to com throughout the body (1) **Neurotransmitter** • A chemical which is released by the axon terminals of neurons and c information to other neurons (1) Credit other appropriate points

Question number	Answer
Q2.	**AO2 (1 mark), AO3 (2 marks)** 1 mark for identification of a reason (AO2) Up to 2 marks for an explanation of the reason (AO3) Examples: • Epinephrine causes an increase in alertness and primes the body fo • This would have helped Laura to process her environment quickly a move (1) • The body was also physically primed to move quickly which helped La Credit other appropriate points

Chapter 2

Check your understanding!

1. ***Describe the main difference between CNS stimulants and CNS depressants (2 ma***
CNS stimulants increase the activity of the central nervous system and result in the
(1). In contrast, CNS depressants reduce or slow down the activity of the central ne
calming effect (1).

1 mark each for descriptions of how CNS stimulants and depressants work

2. ***Identify and explain one weakness of Olds and Milner's (1954) study into reward (***
One weakness of Olds and Milner's study is that they used animals rather than hum
unlikely to have the same motivations for behaviour because humans have greater
humans are unlikely to perform a behaviour simply because it is pleasurable and ins
motivations into account (e.g. possible consequences) (1).

1 mark for identification of a weakness, up to 2 marks for explanation of the weakn

3. ***Briefly describe the role of GABA in the brain (3 marks)***
GABA is an inhibitory neurotransmitter and as such it inhibits action potentials (1).
receptors it results in the negatively charged chloride ions entering the neuron, thus
(1). This prevents the action potential from being released which stops nearby neu
potentials (1).

3 marks for three points related to the role or function of GABA in the brain.

4. ***Briefly describe how one drug affects the central nervous system (4 marks)***
Methamphetamine increases the activity of the central nervous system (CNS stimul
in increased dopamine transmission by causing dopamine to be released by the syn
methamphetamine prevents the normal functioning of neurotransmitter transporte
dopamine into the pre-synaptic neuron (1). The result is that there is a far greater a
cleft and a greater number of bindings to dopamine receptors than there would be
working normally (1).

4 marks for four points that describe how one drug (likely methamphetamine/alcohol)
system functions

Exam-style questions

Question number	Answer
Q1.	**AO1 (2 marks)** 1 mark for a definition of 'excitatory neurotransmitter' and 1 mark for a neurotransmitter' For example: **Excitatory neurotransmitter** • A type of neurotransmitter which encourages action potentials by positive (1) **Inhibitory neurotransmitter** • A type of neurotransmitter which discourages action potentials by negative (1) Credit other appropriate points

Answer	Mark
AO2 (1 mark), AO3 (2 marks) 1 mark for identification of a reason (AO2) Up to 2 marks for an explanation of the reason (AO3) Examples: • Dopamine is a neurotransmitter that feels pleasurable and methamphetamine increases dopamine (1) • Methamphetamine increases the amount of dopamine to much higher levels than a person can experience from normal behaviours (1) • The only way for the user to feel the same level of pleasure again is by taking the drug again which can lead to addiction (1) Credit other appropriate points	3

uating Raine et al. (1997)

nts.

ty:

pair design allows for comparison

other common factors in NGRIs (e.g. low IQ, verbal problems, educational problems, past abuse)

t explain different brains

ity:

ralisable to other types of aggression

ralisable to normal, healthy population

mple size limits generalisability

mple (normal for brain scanning studies)

en included

ticipants had schizophrenia

sentative of normal population

sentative of other crimes/forms of aggression

andardised procedure

nning techniques often have problems with replicability

a science:

nning is highly scientific

as beliefs/expectations cannot influence images

:

n biological causes

ocial/environmental factors

tion

ons limited to NGRIs

aw applications

for biological involvement in crimes/aggression

nts agreed to take part

were fully informed

ieved would help them with their case

Check your understanding!

1. ***Identify and explain one weakness of brain scanning studies. (3 marks)***
   One weakness of brain scanning studies is that the poor image resolution limits the activity happens at the neuronal level whereas current brain scanning methods can larger) (1). This means that current braining scanning methods are getting an incor of the brain (1).

   1 mark identification, 2 marks explanation of the weakness

2. ***Identify and explain one problem with using research obtained from offenders. (3***
   Research using offenders is not generalisable to all people as the aggression is muc aggression (1). For example, there is a high incidence of mental health problems w influence on why they are being aggressive (1). These findings, therefore, cannot b aggression and explanations formed using findings from offenders may not be appl

   1 mark identify (e.g. not representative population sample, usually male, mental he children), 1 mark example or elaboration, 1 mark explanation of point

3. ***Briefly describe one study that links a brain region to aggression. (3 marks)***
   Matthies et al. (2012) used brain scanning to measure the volume of the amygdala who had did not have a psychiatric illness and compared their amygdala volume to aggression (1). They found that those who had the highest scores on a measure of volume that was 16–18% lower (1).

   3 marks for a three-point description of a relevant study linking a region to aggressi findings to aggression, etc.)

4. ***Describe Raine et al.'s (1997) sample. (3 marks)***
   Raine et al. (1997) used a sample of 41 people (39 males and 2 females) who had b murder/manslaughter and had pleaded Not Guilty by Reason of Insanity (1). A cont matched to the experimental group for age, sex and psychiatric illness (1). All parti weeks before the brain scans (1).

   3 marks for three-point description of Raine et al.'s sample. Points may include: nur average ages, control groups, six in both groups with schizophrenia, medication

Exam-style questions:

Question number	Answer
Q1.	**AO1 (3 marks)** 1 mark per point related to fMRI which together forms a coherent desc studies the brain's activity as that is in the question), up to 3 marks For example: A fMRI scan can provide detailed information about which regions of th different tasks are performed (1). A fMRI uses strong magnetic fields t oxygen-rich or oxygen-poor (1). Areas that are more active require mo are being activated by the task (2). Credit other appropriate points

Answer	Mark
AO1 (2 marks), AO3 (2 marks) 1 mark for the identification of each strength/weakness (AO1) 1 mark for justification of the identified strength/weakness (AO3) A maximum of 2 marks if only a strength OR weakness is identified and justified For example: **Strength** • Brain-scanning studies use an objective measurement of brain activity/function (1). The machine determines the results and therefore the findings are not affected by the confounding variable of the researcher's own beliefs and expectations (1). **Weakness** • Brain-scanning studies focus solely on the biological side of behaviour and therefore are reductionist (1). These studies do not acknowledge the role of other important factors in behaviour and thus present an incomplete understanding of behaviour. Credit other appropriate points	4

Answer	Mark
AO1 (4 marks), AO3 (4 marks) This mark scheme corresponds to using the classic study identified by the specification (Raine et al. (1997) Brain abnormalities in murderers indicated by positron emission tomography) **Raine et al.(1997)** **AO1** • Compared the brains of those who had been charged with murder and pleaded not guilty by reason of insanity (NGRIs) to controls • Controls were matched for sex and age • Injected with a glucose tracer and completed a continuous performance task, followed by a PET scan • Found that NGRIs had lower glucose metabolism in the prefrontal cortex, parietal cortex and corpus callosum • Found that NGRIs had asymmetric glucose metabolism for amygdala and hippocampus (increased activity in right and decreased in left) • Found that NGRIs had asymmetric glucose metabolism for thalamus (increased activity in the right, no difference in the left) • Found NGRIs had higher occipital glucose metabolism in occipital lobe • Conclusion: Multiple areas of the brain are related to violent behaviour. Brain areas predispose an individual to aggressive behaviour but other factors influence whether this predisposition is acted on. **AO3** • PET scans are an objective and scientific method of learning about the brain • The use of a well-matched control group allows better comparison • Focuses on the biological causes and not accounting for other factors is a reductionist approach • Raine et al. acknowledge that aggression is not purely biological and that other factors (e.g. social) influence aggression • There may be differences in how the murders were committed (e.g. premeditated/impulse or violent/non-violent) • Findings cannot be generalised to all violent behaviour, just people who were charged for murder and pleaded not guilty for reason of insanity • The sample size is small which limits generalisability (but small sample sizes are common for brain scanning studies) • There are strong implications for society and law if we explain violent crimes in terms of biological causes Credit other appropriate points	8

Mark	Descriptor
AO1 (4 marks), AO3 (4 marks) Candidates should focus equally on knowledge and their evaluation/conclusion.	
0	No credit-worthy material.
1 – 2 marks	Candidate shows limited knowledge and understanding. (AO1) A generic conclusion may be present. Evidence supporting the argument will be limited. There is a partial attempt to answer the question. (AO3)
3 – 4 marks	Candidate shows largely accurate knowledge and understanding. (AO1) Argument uses statement rather than logical chains of reasoning. There is some support for the argument using generally accurate factual details. A shallow conclusion is formed. (AO3)
5 – 6 marks	Candidate shows accurate knowledge and understanding. (AO1) Arguments show mostly sound reasoning. Reasoning leads to the formation of a conclusion. The answer shows knowledge of different arguments but the evaluation may not be balanced. (AO3)
7 – 8 marks	Candidate shows accurate and comprehensive knowledge and understanding. (AO1) The evaluation is logical and shows sound reasoning. The candidate shows a comprehensive knowledge of different arguments and forms a balanced conclusion. (AO3)

ıderstanding!

scribe Charles Darwin's theory of natural selection. (3 marks)

lection is a theory to explain the process of evolution (1). Natural selection argues that some of our ancestors n traits that made them more likely to survive, reproduce and pass on their genes to their offspring (1). Over e traits become common in the population because those who possess them are more likely to reproduce to those who do not (1).

or three points that together provide a coherent description of natural selection

ı real-life example of how infidelity is discouraged. (3 marks)

, infidelity is discouraged by extreme acts of violence against those who commit infidelity which serve as an of what could happen if a person chooses the same path (1). For example, honour killings are sometimes d by the family of someone who has shown infidelity in order to restore the family's honour by showing that completely rejects the individual and their actions (1). Honour killings and other acts of extreme violence urage this behaviour because the reduced prosecution of the perpetrators indicates society's acceptance of ıment (1).

or description of violence and how it leads to a reduction of infidelity, does not necessarily refer to a cultural t could refer to a specific couple and domestic violence

ow war might be explained as competition for resources. (3 marks)

arily speaking, females are attracted to high-resource-bearing males and war provides a method of males ore resources (1). As humans live in groups, successful acquisition of territory can increase the amount of the group has (1). Males who often lack their own resources are more likely to go to war and through attles they can be seen as providers and therefore more desirable (1).

or linking resources and low-resource-bearing males, female desire for resources and this increasing males' f attracting females

nd explain one weakness of the evolutionary explanation of aggression. (3 marks)

ness of the evolutionary explanation of aggression is that is difficult or impossible to falsify (1). Evolutionary based on the lives of our ancestors who lived thousands of years ago and it is not possible to go back in time them (1). Instead, evolutionary theory is based on assumptions of how they lived and information about ay hunter-gatherers, but this does not allow researchers to prove or disprove evolutionary theories (1).

identifying a weakness, up to 2 marks for explanation of this weakness

5. ***Describe parental investment theory. (4 marks)***

Parental investment theory argues that men and women behave differently accord
each sex makes in their offspring (1). Men require minimal investment and accordi
many different partners, and this increases their chances of reproductive success (1
invest very heavily in their offspring and require a partner who can provide them th
may explain differences in jealousy, a protective mechanism against infidelity; men
infidelity and females over emotional infidelity (1).

Marks for highlighting difference in sex, that it changes behaviour, could link to agg

Exam-style questions

Question number	Answer
Q1 a)	**AO2 (2 marks)** 1 mark for each feature that is identified, up to 2 marks maximum. • Nick has invested heavily in Tara and their child (1) • Nick is competing with the male co-worker for Tara (1) • Tara is attractive and a high-value mate (1) Credit other appropriate points

Question number	Answer
Q1 b)	**AO2 (1 mark), AO3 (1 mark)** 1 mark for identification of a factor (AO2) 1 mark for an explanation of the factor (AO3) Examples: • The male co-worker may not be a threat if he has few resources t Nick does not need to worry about competition (1) • Tara wants to protect her child and receive Nick's resources (1), th Tara will not leave him (1) Credit other appropriate points

Question number	Answer
Q2	**AO2 (1 mark), AO3 (2 mark)** 1 mark for identification of a reason (AO2) 1 mark for an explanation of the reason (AO3) Examples: • Evolutionary explanations argue that males compete with one anot • Each male will want to come across as the best possible mate cho boasting of their achievements (1) • Therefore, males will change their behaviour when in front of a po Credit other appropriate points

Chapter 5

Task 5. 1: Discussion on Brendgen et al. (2005)
Suggested points:
I think Brendgen et al. (2005) is a POOR study because…

- Some twins may have been wrongly allocated
- May have caused problems in children's friendships
- Only generalisable to 6-year-olds
- French and English questionnaires may have been asking slightly different th
- Correlational research does not prove causation, there may have been othe friends negatively
- A large number of pairs dropped out (attrition)

I think Brendgen et al. (2005) is a GREAT study because…

- Looks at genetic and environmental factors
- Used both peer and teacher ratings of aggression
- First study looking at social aggression in twins
- Easy to replicate – a larger study could be done in the future
- Real-life application: bullying could be reduced if it is environmental

Check your understanding!

1. ***Identify and explain one weakness of Brendgen et al.'s (2005) study (3 marks)***
   One weakness of Brendgen et al.'s study is that the findings are only generalisable t usefulness of the findings because levels and methods of social aggression change a Brendgen et al.'s findings may only hold true for a short period of time (1).

   1 mark for identification of a weakness, 2 marks for explanation of the weakness

2. ***Explain why research into the MAO-A gene can be considered socially sensitive re***
   Research into the MAO-A gene can be considered socially sensitive research becaus the law and the way that violence is viewed by society (1). Our legal system is base responsible for their actions but MAO-A gene research contradicts this with finding role in aggressive behaviour (1). Therefore, MAO-A gene research has implications laws, and those who commit aggressive crimes (1).

   3 marks for a three-point explanation of MAO-A as a socially sensitive research topi making, influence on societal attitudes towards aggression, effect on family membe

3. ***Briefly describe Freud's theory of personality (4 marks)***
   Freud believed personality was formed of three structures which interact with one person's basic needs and seeks immediate gratification of those needs (1). The sup norms and ideals that we have accepted (1). The ego tries to manage the needs of addition to paying attention to the constraints of reality (1). Very young children or older they develop a superego and ego and learn to delay gratification and focus or

   4 marks for a coherent description of Freud's personality theory, including mention superego) and the way they interact

4. ***Identify and explain one way in which the biological and psychodynamic explanat***
   The biological approach to aggression has much higher internal validity in comparis (1). The biological approach relies on highly-controlled and scientific experiments t results in good internal validity (1). In contrast, much of the psychodynamic explan repression) and evidence comes from case studies which Freud has analysed and in

   1 mark for identification of a difference, 2 marks for explanation of the difference

Exam-style questions

Question number	Answer
Q1 a)	**AO2 (2 marks)** 1 mark for each feature that is identified, up to 2 marks maximum • Jessica's id demands that she goes home now (1) • Feeling of frustration acts as a trigger to aggression (1) • Jessica has had little opportunity for catharsis (e.g. exercise) (1) Credit other appropriate points

Question number	Answer
Q1 b)	**AO2 (1 mark), AO3 (1 mark)** 1 mark for identification of a factor (AO2) 1 mark for an explanation of the factor (AO3) Examples: • Jessica's ego is controlling the impulses of her id (1), therefore she idea to be aggressive towards her boss (1) • The feeling of frustration is insufficient to trigger aggression (1), th not to act on her aggressive impulses (1) • Jessica cannot be aggressive because she might lose her job (1), th a defence mechanism to manage this conflict (1) Credit other appropriate points

Question number	Answer
Q2 a)	**AO1 (3 marks)** 1 mark per point related to twin studies which together form a coheren that it is used to investigate heritability as that is in the question), up to For example: Twin studies compare the similarity of monozygotic twins (identical) an identical/fraternal) for particular behaviours or traits (1). If the rate for much higher than dizygotic twins this suggests that the behaviour is str genetics (1). If the similarity of monozygotic twins is 100% it suggests th completely genetic (1).

Question number	Answer
Q2 b)	**AO1 (1 mark)** 1 mark for providing an aim related to Brendgen et al.'s (2005) study For example: • To investigate the extent to which differences in social aggression genetic, shared environmental or non-shared environmental facto OR • To investigate if there is a relationship between social aggression Credit other appropriate points

Answer	Mark
AO1 (1 mark) 1 mark for providing a conclusion of Brendgen et al.'s (2005) study For example: • Genetics/biology is important in physical aggression, whereas environmental factors are important in social aggression OR • Children who were physically aggressive were more likely to be socially aggressive (interaction of genes and environment) OR • As children age, they are more likely to use social aggression rather than physical aggression (due to social pressures) Credit other appropriate points	1

Answer	Mark
AO1 (2 marks), AO3 (2 marks) 1 mark for each weakness identified (2 AO1) 1 mark for justification of each weakness (2 AO3) A maximum of 2 marks if only one weakness is identified and justified For example: • Brendgen et al. (2005) used teachers' ratings of the school children's aggression which may not be accurate (1). Teachers only see the child some of the time and may not accurately recall past information, therefore the rating may be incorrect (1). • Brendgen et al. (2005) used twins from the Quebec Newborn Twin Study which had grouped the twins into monozygotic and dizygotic based on how physically similar they looked (1). Therefore, when allocating the twins to the dizygotic and monozygotic groups, some may have been placed in the wrong condition (1). Credit other appropriate points	4

Chapter 6

Check your understanding!

1. ***What do animal studies reveal about the influence of testosterone? (1 mark)***
Animal studies reveal a causal relationship between testosterone and aggression in

1 mark relationship between testosterone and aggression

2. ***Identify and explain one problem with using research obtained from offenders. (3***
Research using offenders is not generalisable to all people as the aggression is muc
aggression (1). For example, there is a high incidence of mental health problems w
influence on why they are being aggressive (1). These findings, therefore, cannot b
aggression and explanations formed using findings from offenders may not be appl

*1 mark identify (e.g. not representative population sample, usually male, mental he
children), 1 mark example or elaboration, 1 mark explanation of point*

3. ***Describe the main role of the hypothalamus in the endocrine system (2 marks)***
The main role of the hypothalamus in the endocrine system is to control the pituita
The pituitary gland controls many of the hormones in the body, so the hypothalam
the other glands (1).

1 mark pituitary gland, 1 mark influencing other glands or referring to an example

4. ***Briefly describe one study that investigates the relationship between glucocortico***
Van Bokhoven et al. (2005) investigated the glucocorticoid cortisol and how levels o
aggression (1). They compared cortisol levels of the boys who had aggressive forms
cortisol levels of boys who did not (1). They found that cortisol levels were higher i
and highest in those with aggressive forms of the disorder (1).

3 marks for three points that describe a related study that could include: aims, meth

5. ***Discuss the use of animals in aggression research. (6 marks)***
One advantage of using animals in research is that there is a much greater degree o
an animal can be born and live in the laboratory for the duration of their lives mean
detailed knowledge and good control over their lives (1). A higher degree of contro
more certain about attributing causation because the number of confounding varia
a disadvantage is that while animals share our basic physiology, we are not the sam
applicable to humans (1). For example, humans may weigh up the pros and cons of
accordingly; in contrast, animals are likely to act purely on impulse and without the
their action (1). This suggests that there may be crucial differences in the motivatio
aggress and accordingly assumptions should not be imposed on either (1).

*3 marks (× 2) for discussion of an advantage or disadvantage that includes: identific
explanation. Does not need to be so split up; can be a more fluid discussion.*

Exam-style questions:

Question number	Answer
Q1.	**AO1 (2 marks), AO3 (2 marks)** 1 mark for each strength/weakness identified (2 AO1) 1 mark for justification of each strength/weakness (2 AO3) Maximum of 2 marks if only one strength or weakness is identified and For example: **Strength** • Research into violent criminals has important real-life applications understanding crime (1). By learning which factors increase crime we try to reduce the incidence of violent crime (1). **Weakness** • Studies of violent criminals can tell us little about normal everyda limits the usefulness of this research to understanding extreme fo Credit other appropriate points

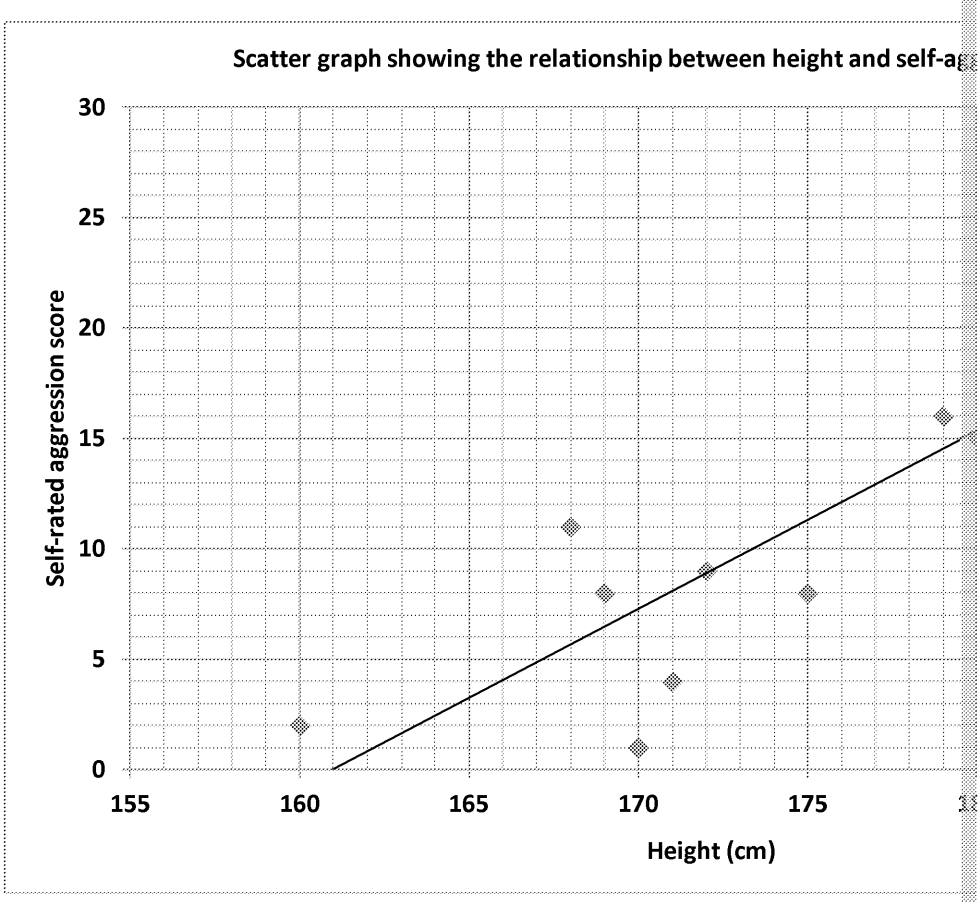
Question number	Answer
Q2.	**AO1 (2 marks), AO3 (2 marks)** 1 mark for each strength identified (2 AO1) 1 mark for justification of each strength (2 AO3) Maximum of 2 marks if only one strength is identified and justified For example: • Animal research uses high levels of control due to the fact that the from birth in the laboratory environment (1). This is advantageou knows the animal's exact history and how this might influence the • Researchers can use techniques such as castration or lesioning wh to do in humans (1). This allows researchers to learn more about is difficult to study in humans due to the interconnectivity of the s Credit other appropriate points

Chapter 7

Task 7.1: Ethical considerations

Ethical guideline	How will we uphold this ethical g
Protection from harm	*Aggression is a sensitive topic and it is possible that t memories of either being the victim of aggression or Participants are reminded that they can leave at any removed. If any participants experience distress, a fo that no long-term damage was caused.*
Informed consent	*Participants will be given general information about involves filling in a questionnaire about aggression. provided afterwards that will inform the participants*
Deception	*Extreme forms of deception will not be used. Partici information about the study and the fact that it invo aggression. More detailed information will be provid participants about the true nature of the study.*
Right to withdraw	*Participants will be told they have the right to withd and will be reminded at the end of the study that the the end.*
Confidentiality	*The questionnaire will not contain any identifying inf addresses of participants. The questions themselves the participants.*

Task 7.2: Presenting your results in a scatter graph



Delete words as appropriate

The scatter graph shows a **moderate** correlation. The correlation is **positive**. As the part reported aggression score **increases.**

Task 7.3: Writing an abstract

Subsection	Write one or two sentences on e
What background research is there to our topic? Or if there is none, why did we decide to investigate this topic?	*Previous research has found that certain physic height ratio, are associated with aggression.*
What topic did we investigate?	*This research examines whether another physic associated with aggression.*
What method did we use? What are our (co)variables? How did we measure them?	*A correlational design was used and our covaria self-rated aggression scores. Self-rated aggres a questionnaire consisting of 10 questions on a*
What was our main finding?	*A significant positive relationship was found be aggression scores. Taller participants tended to scores.*
What was our main conclusion?	*It was concluded that there was a relationship aggression.*

***A Level exam questions**

Question number	Answer
Q1.	**AO1 (4 marks)** 1 mark for each point (up to a maximum of 4 marks) related to the cent together produce a coherent description The central nervous system is responsible for processing information ar rest of the body via the peripheral nervous system (1). The central nerv brain, which is comprised of four lobes, each with different functions (1 spinal cord which receives information from the rest of the body and se The brain interprets the information received and relays instructions do rest of the body (1). Credit other appropriate points

Question number	Answer
Q2.	**AO1 (3 marks)** 1 mark for identifying how a drug affects the central nervous system, ar how it is affected Alcohol has the effect of depressing the central nervous system (1). Thi increasing the effect of the inhibitory neurotransmitter GABA (1). Whe receptors it makes the neuron more negative which results in an inhibit neurons (1). Credit other appropriate points

Question number	Answer
Q3.	**AO1 (4 marks)** 1 mark for each point (up to a maximum of 4 marks) which together pro description In functional brain scanning, a participant's brain is studied at baseline l while completing a task (1). The researchers connect the function to th is most active (1). In the fMRI technique the machine examines the incr the blood-oxygen level to work out where the most active areas of the require more oxygen are related to the task because the brain has to w Credit other appropriate points

Answer	Mark
AO1 (4 marks) 1 mark for each point (up to a maximum of 4 marks) related to the theory of natural selection which together produce a coherent description The theory of natural selection is an evolutionary theory that describes how a population changes and evolves over time (1). Natural selection argues that some traits naturally carry survival and reproductive advantages (1). Individuals who carry these advantageous traits are more likely to survive and pass on their genes to their offspring (1). Over many years, these traits become common in the population because possessing them increases the likelihood of reproducing (1). Credit other appropriate points	4

Answer	Mark
AO2 (4 marks) 1 mark for each point (up to a maximum of 4 marks) related to Freud's theory of personality which together produce a logical explanation The answer must use the scenario. For example: Joseph's behaviour could be explained in terms of his ego successfully managing the demands of his id and reality (1). Joseph's id would want to be aggressive and not focus on the consequences of behaving aggressively (immediate gratification) (1). The reality of the situation was that Joseph needed to revise and his current situation was making it difficult to achieve that (1). The ego decided that aggression was not the right solution and used problem-solving to choose the best possible option for Joseph (1). Credit other appropriate points	4

Answer	Mark
AO1 (4 marks), AO2 (4 marks) **AO1** • The prison system aims to protect the rest of the population by keeping violent offenders away from the public • Studies into biological psychology show that biological causes are related to aggression • Higher levels of testosterone are linked to more violent crimes • Neural explanations have found that neurotransmitters interact with testosterone and increase aggression • Damage to certain areas of the brain (e.g. prefrontal cortex) is linked to inability to regulate impulsive aggression • MAO-A gene is strongly related to aggressive crimes (Brunner et al., 1993) **AO2** • Biological explanations do not acknowledge the role of the environment • Animal studies of aggression (e.g. castration studies in mice) have found that in animals biology can cause aggression, but in humans the matter is more complex • Research in humans has not found that biological markers *cause* aggression • Gene-environment interaction studies suggest that aggression is produced by an interaction of genetic vulnerabilities and environmental stressors, e.g. Caspi et al. (2002) found a high proportion of those violent crime convictions with a MAO-A variant had experienced maltreatment. Twin and adoption studies suggest that physical aggression is approximately 50% biological and 50% environmental (Tuvblad and Baker, 2011) • Biology is likely to be a factor in aggressive crimes but not the cause Credit other appropriate points	8

Mark	Descriptor
AO1 (4 marks), AO2 (4 marks)	
hould focus equally on understanding/knowledge and their application to the scenario.	
0	No credit-worthy material
1 – 2 marks	Candidate shows limited knowledge and understanding. (AO1) Includes little or no relevant contextual evidence. (AO2)
3 – 4 marks	Candidate shows largely accurate knowledge and understanding. (AO1) The discussion is not fully developed and is imbalanced or includes superficial content. Arguments are sometimes supported by relevant contextual evidence. (AO2)
5 – 6 marks	Candidate shows accurate knowledge and understanding. (AO1) Discussion is mostly logical and developed. The student has a good understanding of the competing viewpoints but the overall discussion is not balanced or includes superficial content. Arguments are supported by application of relevant contextual evidence. (AO2)
7 – 8 marks	Candidate shows accurate and comprehensive knowledge and understanding. (AO1) Discussion is well-developed and logical. The student demonstrates full awareness of the competing viewpoints and applies relevant contextual evidence throughout to support arguments. (AO2)

Glossary

Abstract	A section of a research article or report in which the of their research
Action potential	A neuronal impulse that transmits information
Adaptation	The evolutionary process of becoming more suited t
Alternate/experimental hypothesis	A prediction on the outcome of the research
Androgens	A group of hormones (for example, testosterone) th the development of male characteristics; male sex h
Autonomic nervous system	Regulates involuntary actions, e.g. heartbeat
Axon	A long fibre which signals from the dendrites travel covered in myelin sheath
Catharsis	The process of releasing pent-up or unconscious em
Cause and effect	The idea that changing one variable causes a change prediction possible
Cell body (soma)	Part of a nerve cell that keeps the cell functioning
Central nervous system	The brain and spinal cord; responsible for all of cogn
Closed questions	A question with a fixed response, e.g. 'yes', 'no', 'alw person can respond to the question
CNS depressant	A drug that slows down the activity of the central ne effect on the user
CNS stimulant	A drug that increases the activity of the central nerv more alert and awake
Computer Axial Tomography (CAT scans)	A scanning technique that uses a rotating x-ray mach structure
Computerised Tomography (CT scans)	A more modern version of CAT scans, which uses a s a 3D image of the brain's structure
Confidentiality	Experimenters are not to disclose confidential inform such a way that the participant is not identifiable fro names are replaced by numbers
Confounding variables	A variable that has not been controlled for that may in the DV instead of being caused by the IV (a third h
Correlation	A relationship between two variables; does not indic
Correlation	A measure of the association between two variables
Correlation coefficient	A type of research which aims to uncover a relations manipulate either of these variables to produce an e
Cortisol	A type of glucocorticoid hormone which is linked to s
Covariables	The variables measured in correlational research
Critical value	The value we use to determine whether to accept o
Defence mechanisms	A protective unconscious process designed to reduc
Dendrites	Branches that receive signals from other neurons
Discussion	A section of a research article or report where the re to past research and evaluates their own research
Dopamine	A neurotransmitter involved in reward
Ego	A structure of personality that balances the demand

A theory of how our population has changed over a long period of time as the result of genetics

Encourages an action potential

A biological response we make in extreme situations where we may be required to fight or flee to survive; adapted over the process of evolution

A scanning technique that uses strong magnetic fields and records the changes in blood oxygen level in different areas of the brain to measure activity

Gamma-aminobutyric acid (GABA) is the primary inhibitory neurotransmitter in the brain

Part of the endocrine system that produces and regulates hormones

A group of steroid hormones which are involved in the immune system

The primary excitatory neurotransmitter

The primary inhibitory neurotransmitter in the brain stem and spinal chord

A slower-acting chemical messenger that regulates functions of the body and is usually transported by the blood (endocrine hormones)

Chemicals that regulate the body

A structure of personality that is concerned with meeting basic needs, such as survival, and seeks immediate gratification

A variable which is manipulated to produce a presumed change on the dependent variable

Cheating; can be emotional (e.g. love) or sexual

The participant knows exactly what is going to happen in the study and agrees to take part. Differs from just consent when the person does not have knowledge of the exact experiment but agrees to take part.

Discourages an action potential

Equally spaced data

Competition between the same sex (e.g. males and males)

A way of classifying types of data based on their attributes

A type of closed question where a person responds with a fixed answer on a continuum scale

A collection of structures within the brain that are thought to be related to emotion and memory

A relationship between covariables that forms a straight-line when plotted on a scatter graph; the ratio of change is constant

The act of deliberately stealing another's mate

An enzyme that breaks down serotonin, dopamine, norepinephrine, and epinephrine (adrenaline)

Used to transmit information to muscles and glands

A fatty substance often covering axons, which insulates and protects axons and enhances their transmission of impulses

An evolutionary theory formed by Charles Darwin that describes how traits that have survival and reproductive benefits become more common in the population

As one variable increases, the other variable decreases

A nerve cell, responsible for communication between different parts of the body and between areas of the brain

A chemical that transmits information between neurons

Categorical type data

The researcher predicts that there will be an effect but does not state whether which direction the effects will be

A relationship between covariables where the ratio of change is not constant

States there will be no effect

The value we obtain from carrying out an inferential test

A test that only looks in the direction of interest

A question that allows the person to respond with their own answer; generates qualitative data

Ordered or ranked data that may not have an equal distance between the sequences

Is involved in normal resting state; inhibitory

An evolutionary theory that argues that men and women behave differently because they invest different amounts in their offspring

Nerves that exist beyond the central nervous system and function to connect tissues and organs to the central nervous system

As one variable increases, the other variable also increases

A scanning technique that uses a radioactive isotope to measure activity in different areas of the brain

The receiving neuron

The sending neuron

Participants should be protected from psychological and physical harm and should be made aware of anything that may present a risk to them

An area on the receiving neuron that neurotransmitters bind to

An area on the receiving neuron that neurotransmitters bind to

A drug taken for pleasure rather than for medical purposes

Reducing a complex problem down into simple terms, which often offers a simpler but less complete understanding of a problem

A type of automatic response which does not involve the brain

Used to transmit information between neurons

A defence mechanism in which unacceptable thoughts are pushed out of consciousness

The process of reabsorbing the neurotransmitter back into the sending neuron

A group of structures and neural pathways in the brain that are involved in pleasure, cravings and in reinforcing behaviours

It should be made clear to participants that they have the right to leave the study at any point and that any data from the study can be destroyed if requested

The method of selecting participants from the required population to participate in your study

A graph that shows correlational data where each point represents two values

Used to transmit sensory information from receptors

A particular neurotransmitter; low levels of serotonin are associated with depression

Regulating human behaviour, usually to improve society

Transmits and receives sensory and motor information to and from the central nervous system

An inferential test used to measure the relationship between two variables at ordinal or interval level

A result that researchers have interpreted to be true rather than caused by chance

A structure of personality concerned with societal ideals and norms; it is not bound by reality

A term from Herbert Spencer which describes how those best suited to the environment are more likely to survive and reproduce

Is involved in the fight or flight response; excitatory

A junction between neurons where the neurotransmitter crosses

A gap between one neuron and the next over which neurotransmitters cross to transmit information

The communication process between neurons

These store neurotransmitters in the axon

The nerve endings where an action potential may be released

A male sex hormone produced in the testes that is important in normal biological development in males

A test that looks at both directions because the research has not predicted the direction of the result

When we reject the null hypothesis when we should have accepted it

When we accept the null hypothesis when we should have rejected it

What is unknown to us and difficult to access