**Biological Approach: Sample SAQ Answers from DP InThink Website**

**SAQ sample: Neuroplasticity**

* SAQ sample: Neuroplasticity

The following sample is for the question: *Explain neuroplasticity with reference to****one****study.*

The sample below is an exemplary response.

An annotated copy of the sample response can be found at the bottom of the page.

**What is this question asking?**

* The focus of the question is on the explanation of neuroplasticity. There should be a clear understanding of neuroplasticity demonstrated.
* A relevant study should be described in terms of the aim, procedure and findings.
* There should be an explicit explanation of what the study teaches us about the role of neuroplasticity in understanding the brain and behaviour.

**Sample response**

Neuroplasticity is the brain's ability to reorganize itself by forming new neural connections. Neuroplasticity allows neurons in the brain to compensate for injury or to respond to changes in the environment. When neurons fire continually as a result of stimulation in the environment, the neurons sprout new dendrites – known as dendritic branching.  This increases the number of synapses available for the behaviour. Dendritic branching as a result of stimulation in the environment is seen in a study by Maguire.

Maguire carried out a study to see if neuroplasticity would be seen in the brain of London taxi drivers due to the amount of time that they had been driving the streets of London. The hypothesis was that since they were required to pass a test called “the knowledge” which required them to memorize the location of key places and routes in the city and they spent a lot of time driving around the streets of London, repeated use of the brain for spatial memory would result in neuroplasticity and a denser hippocampus.

Maguire used 16 healthy right-handed males who were licensed taxi drivers. She compared the taxi drivers to 50 healthy right-handed males who were not taxi drivers. An MRI was used to detect changes in the structure of the brain as a result of their experience. The results showed that the taxi drivers had larger posterior hippocampi compared to the controls and that the controls had larger anterior hippocampi compared to the taxi drivers. Also, there was a positive correlation between the number of years the participants had been taxi drivers and the size of the posterior hippocampus, but a negative correlation with the size of the anterior hippocampus.

Maguire argued that this demonstrates the plasticity of the hippocampus in response to environmental demands. She argued that the posterior hippocampus stores a spatial representation of the environment and that in the London taxi drivers the volume of the posterior hippocampus expanded because of their high reliance on navigation skills and spatial memories.

**333 words**

**What are common problems with this response?**

* There is only a limited explanation of neuroplasticity.
* The study is not focused on neuroplasticity, but on the localization of function.
* The study is not clearly described in terms of the aim, procedure and findings.
* There is no clear explanation of what the study teaches us about the role of neuroplasticity in psychological understanding of the brain and behaviour.

**SAQ sample: Agonists**

The following sample is for the question: *Explain the role of one agonist with reference to****one****study.*

There are two ways to answer this question.  Neurotransmitters are **endogenous agonists** - that is, they bind with receptor sites on the post-synaptic neuron and cause an action potential. Drugs are **exogenous agonists**.  They act in the same way, but they are not natural in our nervous system.

The sample below is an exemplary response using an exogenous agonist.

**What is this question asking?**

* The focus of the question is on the explanation of how agonists work.
* A relevant study should be described in terms of the aim, procedure, and findings.
* There should be an explicit explanation of what the study teaches us about the role of the agonist in human behaviour.

**Sample response**

An agonist is any chemical that binds to a receptor site on a post-synaptic neuron, causing the neuron to fire. Neurotransmitters are endogenous agonists - the brain's natural chemicals that bind to receptor sites, leading to an action potential. Drugs can play the same role and are called exogenous agonists.  One example of an exogenous agonist is alcohol.  Alcohol binds with dopamine receptor sites, causing dopamine neurons to fire. The firing of these neurons results in the activation of the brain's reward system - the nucleus accumbens.

The study of the role of alcohol on the brain's reward system has led to theories about the origins of alcoholism. Leyton (2013) carried out a study with 26 healthy social drinkers. The researcher then categorized the drinkers based on their risk for alcoholism based on personality traits and having a lower intoxication response to alcohol - that is, they did not feel as drunk despite having drunk the same amount as other drinkers. Each participant underwent a PET scan after drinking either juice and then later, alcohol. In each condition, they were asked to drink three drinks in 15 minutes.

It was found that when drinking alcohol, those who were considered "high risk" for alcoholism showed significantly greater activity in the nucleus accumbens.  The researchers argued that alcohol is an agonist for dopamine, connecting to dopamine receptor sites and causing the neurons to fire. It is hypothesized that people with a potential for alcoholism have a greater response to the agonist than those at low-risk.  Research shows that those with a low level of dopamine neuron activity as a result of alcohol consumption often get tired after drinking a small amount of alcohol.  This is because the higher level of dopamine activity counteracts the sedative effects of alcohol.  By studying the way in which alcohol acts as an agonist on dopamine neurons, it is also possible that researchers could find ways to treat the disorder.

**323 words**

**What are common problems when answering this question?**

* There is no clear definition of agonists - or a clearly identified example.
* The study is not clearly described in terms of the aim, procedure and findings.
* There is no clear explanation of what the study teaches us about the role of the agonist in understanding the brain and behaviour.

**A note about Leyton et al (2013)**

Just a reminder that students are not penalized for having the wrong name of a study - or the wrong year.  And thank god!

When looking for this study, it is sometimes cited as Leyton (2013), including in a biopsychology textbook that I use.  However, the publisher's citation is as follows:

Elaine Setiawan, Robert O. Pihl, Alain Dagher, Hera Schlagintweit, Kevin F. Casey, Chawki Benkelfat, Marco Leyton. **Differential Striatal Dopamine Responses Following Oral Alcohol in Individuals at Varying Risk for Dependence**. *Alcoholism: Clinical and Experimental Research*, 2013; DOI: [**10.1111/acer.12218**](http://dx.doi.org/10.1111/acer.12218)

**SAQ sample: Antagonists**

* SAQ sample: Antagonists

The following sample is for the question: *Explain the role of one antagonist with reference to****one****study.*

The sample below is an exemplary response.

**What is this question asking?**

* The focus of the question is on what an antagonist is and how they work.
* A relevant study should be described in terms of the aim, procedure and findings.
* There should be an explicit explanation of how the study illustrates the function of an antagonist.

**Sample response**

An antagonist is any substance that fits into a receptor site on the post-synaptic neuron, inhibiting the neuron.  This means that the neuron will not fire and therefore a behaviour will not happen.  Acetylcholine is a neurotransmitter that plays a role in the formation of memories. It is not possible for researchers to directly observe the role of neurotransmitters, so one of the ways that they attempt to understand the role of different neurotransmitters is by giving animals or human participants an antagonist.  They want to see what happens when acetylcholine receptors are blocked and the neurons are "not allowed" to fire.

An example of an antagonist commonly used in memory research is scopolamine. Rasmusson and Dadar (1979) gave participants a scopolamine tablet and asked them to either learn a series of numbers or to solve a maze task. In a second condition, participants were given a placebo as a control.  In the number series condition, verbal declarative memory was being tested.  In the maze task, spatial memory was being tested. The researchers found that there was no significant difference between the placebo group and the AcH antagonist group in the number series condition.  It appears that AcH may not play a key role in the encoding of declarative memories. However, participants in the scopolamine group made more errors and took longer to solve the maze.  This study is supported also by animal research - such as the study by Rogers and Kesner - that found that scopolamine inhibits a rat's ability to remember a maze. It also makes sense as Maguire found that taxi drivers had more grey matter in their posterior hippocampus - an area of the brain high in AcH receptor sites.

By using an antagonist, blocking AcH receptor sites, researchers are better able to understand the role of the neurotransmitter in the formation of memory.

**309 words**

**What are common problems for answering this question?**

* There is no clear definition of antagonists or the response lacks a clearly identified example.
* The study is not clearly described in terms of the aim, procedure and findings.
* There is no clear explanation of what the study teaches us about the role of the antagonist in understanding the brain and behaviour.

**SAQ sample: Studying the brain**

* SAQ sample: Studying the brain

The following sample is for the question: *Explain****one****technique for studying the role of the brain in behaviour*.

The sample below is an exemplary response.

An annotated copy of the sample response can be found at the bottom of the page.

**What is this question asking?**

* Identify and describe **one** technique used in brain research – this may include any brain imaging technique
* Describe one study that uses the technique you have chosen.
* Describe the aim, procedure, and results of the study.
* Explain why the technique was used in the study.

**Sample response**

One technique used to study the brain is the fMRI.  The fMRI is a brain scan that allows researchers to see the function of the brain in real-time. The scan uses a strong magnetic field that responds to changes in the level of oxygen in the blood and the flow of blood in the brain as a response to neural activity.  When neurons are active in the brain they use more oxygen and to provide more oxygen, blood flow increases to the active area. fMRIs allow participants to carry out very simple tasks while in the tunnel and then measure activity in parts of the brain that are activated as a result of the behaviour.

One study that used an fMRI to study emotional memories was done by Sharot. The study used a sample of 24 people who were in New York City on 9/11.  She had the participants lie in the fMRI while words were flashed on a screen in front of them.  The words were either paired with “summer” or “September.”  Sharot found that for the participants who were in New York City but not near the attack had equal activation of the amygdala for both sets of words.  However, for the group that was downtown on the day of the attack, they had much stronger activation of the amygdala.  It appears that the amygdala plays a role in emotional memories, but in flashbulb memories, it may play an even more important role. This makes sense since if they felt that their lives were in danger, their fight or flight response would have been activated and played a role in the creation of the flashbulb memory.

Although the fMRI is able to show the researchers activity in parts of the brain, it does not actually explain what is happening.  The fMRI allowed Sharot to localize activity in the amygdala and then make further hypotheses about how the flashbulb memories may be formed.

**322 words**

**What are common problems with this question?**

* The technique is identified but not explained in any detail.
* The study does not use the technique described.
* The focus is more on the study, rather than on the technique.
* The aim, procedure and/or results of the study are not clearly stated.
* It is not explained why the technique was used in the study.

# SAQ sample: Hormones

* SAQ sample: Hormones

The following example is for the prompt: Explain how ***one*** hormone may affect human behaviour with reference to ***one*** study.

The sample below is an exemplary response.

An annotated copy of the sample response can be found at the bottom of the page.

#### What is this SAQ asking for?

* A hormone must be correctly identified.
* The function of the hormone should be explained.
* One study should be given that clearly shows how the hormone may affect human behaviour.
* The focus must be on human behaviour.  Although in theory an animal study could be used and linked to a human behaviour, this is not the best strategy for an SAQ.  It is a strategy that would work better in an essay response where you can use both animal and human research.

#### Sample response

One hormone that affects human behaviour is adrenaline.  It is produced by the adrenal glands and plays an important role in what is called the “flight or fight response.”  When we are afraid, the brain signals the release of adrenaline, which then stimulates the sympathetic nervous system, resulting in increased blood flow to muscles, increased heart rate and increased breathing rate. This prepares an organism to either fight against a threat, or to run away from it.

Since we often create strong memories of things that have frightened us, McGaugh & Cahill wanted to study the effect of adrenaline on the creation of emotional memories.  They had participants watch a series of slides while listening to a story.  In one group, the story was uninteresting.   The second group heard a story that was very traumatic about a young boy who was in an accident and his feet were severed.  After two weeks, the participants came back and were asked to answer a series of questions about the slides.  Those that were in the more emotionally arousing condition remembered more than in the boring condition.

To test the role of adrenaline, they repeated this procedure but gave the participants beta-blockers that interfere with the release of adrenaline. It was hypothesized that if adrenaline is blocked, then the amygdala would not be able to produce emotional memories.  It appears that this was the case. The group that took beta-blockers remembered no more detail about the slides than the group that heard the boring story.

It appears that by interacting with the amygdala, adrenaline plays a key role in the creation of emotional memories.

273 words

#### What are common problems for this question?

* A neurotransmitter (serotonin, dopamine, acetylcholine) is explained rather than a hormone.
* The function of the hormone is not clearly explained.
* There is no study that clearly demonstrates the effect of the hormone on behaviour.

**SAQ sample: Pheromones**

* SAQ sample: Pheromones

The following sample is for the question: *Explain****one****study of the potential role of pheromones in human behaviour*.

The sample below is an exemplary response.

An annotated copy of the sample response can be found at the bottom of the page.

**What is this question asking?**

* The term “pheromone” should be defined. This will require more than a simple sentence.
* An appropriate study should be described in terms of the aim, procedure and results.
* There should be an explicit explanation of what the study teaches us about the potential role of pheromones in human behaviour.

**Sample response**

A pheromone is a chemical substance produced and released into the environment by an animal affecting the behaviour of others of its own species. Most commonly, pheromones affect sexual and mating behaviours. Although psychologists have not found actual pheromones in humans, there is research showing that some chemicals under controlled conditions may lead humans to show behaviours similar to what we see in animals.

One potential human pheromone is androstadienone – found in male semen and sweat. Zhou et al (2014) wanted to see if androstadienone influenced human sexual behaviour.  To do this he carried out an experiment with a sample of heterosexual men and women and gays and lesbians.

Participants watched stick figures walking on a screen and then were asked to guess the gender of the stick figure. While watching the screen, the participants were exposed to the smell of cloves. In the experimental condition, the cloves were mixed with androstadienone and in the control condition, only cloves were used. The findings showed that when heterosexual females and gay men were exposed to androstadienone, they had a higher rate of identifying the stick figures as “masculine” than the control group.  In addition, Androstadienone had no significant effect on men or lesbian women. The researchers concluded that Androstadienone could be a pheromone which influences mating behaviour in humans.

**218 words**

**What are common problems for this question?**

* Pheromones are not defined or explained.
* The study is not directly linked to pheromones.
* The study is focused on animal research, rather than on pheromones in humans.

# SAQ sample: Genetics

* SAQ sample: Genetics

This sample SAQ addresses the question: With reference to ***one*** research study, explain the role of genetics in ***one*** behaviour. An annotated copy of the sample response is attached below.

#### What is this question asking?

* One research study should be outlined which addresses the question of genetic inheritance.
* One behaviour should be clearly identified.
* The role of genetic inheritance in the behaviour should be clearly described.

#### Sample response

As a result of the Human Genome Project, psychologists have moved beyond simple twin studies and now can look at the role of a specific gene in a behaviour.  Often look at how different genetic mutations may play a role in a behaviour.  Caspi et al (2003) examined the role of the 5-HTT gene in depression, a gene known as a "serotonin transporter" gene, it regulates the level of serotonin in the synapse. Psychologists believe that serotonin plays a role in mood and therefore plays a role in human depression. The long allele is the "normal" allele; the short allele is the mutation. Caspi wanted to test if people who inherit two short versions of the 5-HTT gene are more likely to develop major depression after a stressful life event than people with two long alleles.

Caspi used a sample of over 800 New Zealand 26-year-olds. The study was a correlational study. Participants were divided into three groups: Group 1 had two short alleles; Group 2 had one short and one long allele; Group 3 had two long alleles. The participants were asked to fill in a "Stressful life events" questionnaire.  They were also assessed for depression.

People who had the two short versions of the allele and had three or more stressful life events were the most likely to have depression. Simply inheriting the gene was not enough to lead to depression, but the genes' interaction with stressful life events increased one's likelihood of developing depression. It appears that by inheriting the mutation of the 5 HTT serotonin transporter gene, one is more vulnerable to the disorder.

**269 words**

#### What are the common problems with this question?

* A long description of how we inherit genetic material is outlined, but it is not made relevant to psychology.
* The study is poorly described or is not linked to genetic inheritance. For example, a study on facial symmetry and physical attraction.
* A study is used which focuses on evolution, rather than directly on genetic inheritance.
* A study is outlined but there is not a clear statement of findings that explain the role of genetics.