

Biology SAQs + ERQs

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SAQs

I. GENERIC

- *Explain the use of one research method in one study of the brain and behaviour.*

Psychologists at the biological level of analysis have tried to find specific biological correlates of behaviour. Different methods are used to investigate how biological factors such as brain structures and hormone levels could influence behaviour. One example is laboratory experiments.

The goal is to determine if there is a cause and effect relationship between two or more variables. It is usually quantitative which means they generate numerical data that can be tested for statistical significance to establish a relationship between the two variables. The variable that the researcher manipulates to cause change in the other variable is called an independent variable. The variable that is measured after the manipulation of the independent variable is called the dependent variable.

With laboratory experiment, it is usually conducted in highly controlled conditions that limit the influence of extraneous variables. Usually, in biological research, the researchers often prescribed a group of participants with placebo, a substance with no effect, to reduce the participant's demand characteristics that may influence the dependent variable, that is the participants might have acted in ways that they speculated the researchers desired to see rather than the actual impact of the drug itself.

One of the studies that had used this research method is Antonova et al (2011) where she demonstrated how blocking ACh receptors affect our ability to create spatial memories to illustrate the role of acetylcholine - a neurotransmitter - in the formation of spatial memories. She carried out a double-blind experiment with twenty men. The participants were randomly allocated to one of two conditions. They were injected with either scopolamine (an ACh antagonist) or a placebo, the independent variable.

The participants were then put into an fMRI where they were scanned while playing a virtual reality game. The goal was for the participants to navigate around a field to find a pole. After they learned where the pole was located, the screen would go blank for 30 seconds - controlled variable. When the field reappeared, the participant was at a new starting point. The men would have to use their spatial memory to determine how to get to the pole. The participants' brain activity was measured for six trials.

The participants returned between 3 - 4 weeks later and redid the test - receiving the opposite treatment to the original study. In other words, the study was a repeated measures design.

The researchers found that when participants were injected with scopolamine, they demonstrated a significant reduction in the activation of the hippocampus compared to when they received a placebo, the dependent variable. This indicates that in the placebo condition, AcH was binding to excitatory synapses that led to the creation of spatial memories. Whereas in the Scopolamine condition, these receptor sites were blocked so AcH could not bind to the site and cause the action potential to fire.

The experiment enables us to find the cause and effect relationship between acetylcholine and the formation of spatial memory. The experiment was controlled as it was done in a lab and placebos as well as repeated measures were given to ensure that there are no other extraneous variables affecting the results

- ***Explain the use of one research method in one study of hormones or pheromones and behaviour.***

Psychologists in the biological approach often use experiments to establish cause-and-effect relationships. An experiment allows researchers to manipulate an independent variable and measure its effect on a dependent variable while keeping other variables constant. In addition, participants are randomly allocated to conditions. Finally, in biological research, a placebo is often given as a way of preventing demand characteristics. A placebo is when participants believe that they are getting a treatment, but they are not.

An example of this was a study by Newcomer who wanted to see the effect of stress on verbal declarative memory. When we are stressed we secrete a hormone called cortisol. Newcomer's hypothesis was that high levels of cortisol would prevent memory formation. To test the hypothesis, participants were randomly allocated to one of three conditions: a low dose of cortisol, a high dose of cortisol or a placebo – a pill that they thought was cortisol but was not. The experiment took place over 10 days with four different measures of the participants' ability to immediately recall a piece of prose that was read to them. The experiment was a double-blind study- the participants did not know which group they were in and the researcher also did not know which participants had been assigned to each group.

The results showed that the group that received the high dose of cortisol had the lowest recall of details from the prose passage. From the manipulation of the IV, the researchers may conclude that it was the level of cortisol that actually affected their ability to form verbal declarative memories.

- ***Explain the use of one research method in one study of genetics and behaviour.***

Behavioural genetics look into how behaviour is an interaction of genetic inheritance and environmental factors. Different methods are used to investigate how biological factors such as genes could influence behaviour. One example is correlational studies. This is when data is collected to show a relationship between 2 variables where it can be either positive or negative correlation. Positive correlation is when as one variable increases, another variable also increases whereas negative correlation refers to when as one variable increases, the other variable decreases. There are no independent variables being manipulated, therefore no cause and effect relationship can be determined. In which causes bidirectional ambiguity whereby it is unsure whether x causes y or vice versa, or if it is simply coincidental or caused by a third variable. However, it is useful for researchers to adopt correlational study in studying genetics as it cannot be manipulated.

One of the studies that employ correlational study in examining how specific genetic mutations may play a role in behaviour is Caspi et al (2003). The study 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 regulation and therefore plays a role in human depression. A low level of serotonin is generally associated with a higher level of anxiety and 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. 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. Through the correlation found, it appears that by inheriting the mutation of the 5-HTT serotonin transporter gene, one is more vulnerable to the disorder.

- ***Explain one ethical consideration relevant to one study using a biological approach to understanding human behaviour. / Explain one ethical consideration relevant to one study of the brain and behaviour.***

One ethical consideration in the biological approach is informed consent. Informed consent means that before someone agrees to participate in a study, the researcher must explain the purpose and procedure of the study. In addition, the researcher must explain the person's rights – including the right to withdraw and that all data will be kept anonymous. Any potential negative effects of participation must be explained.

The biological approach has some special problems with regard to informed consent. First, the biological approach uses animals which cannot actually give consent. In addition, biological researchers often do studies of people who have mental illness or brain damage. It could be argued that these participants may not be able to understand what they are agreeing to. Finally, often biological research is rather complex and may not be understood by the average person, making "informed consent" difficult.

One study that raises questions about informed consent is the study of HM by Milner. HM had severe amnesia as a result of an operation which was done to stop epileptic seizures. HM had both retrograde amnesia (he couldn't remember what happened before the operation) and he had anterograde amnesia (he couldn't create new memories). Milner carried out a case study and found that the hippocampus plays a key role in the transfer of episodic and semantic memories from short-term to long-term memory.

As HM could not remember giving consent, this study is ethically problematic. HM was asked to give consent throughout the experiment, but it is not clear that he really understood what was happening or who Milner actually was. Originally consent was given by HM's mother and then later by his caretakers. However, there is a concern that HM may not have been able to take advantage of his right to withdraw either because he did not understand or he forgot.

Informed consent is important so that researchers do not take advantage of participants. Many of the types of participants used in biological research make obtaining informed consent difficult.

- ***Explain one ethical consideration relevant to one study of hormones or pheromones and behaviour.***

This answer is concerned with the ethical consideration of deception and refers to Cutler et al (1988), a study of pheromones and socio-sexual behaviour in heterosexual men. Deception means that participants are either misled about the study's purpose or some of the details are withheld. Although this may be necessary to preserve the validity of the study, (i.e. people are more likely to behave naturally if they are unaware of the hypothesis) it also makes it impossible to gain fully informed consent, thus putting participants at increased risk of psychological harm/distress, due to their inability to make informed decisions about their participation. The BPS say that when studies involve deception of any kind, they must be designed in order to preserve the dignity and autonomy of the participants as far as possible.

In a study by Cutler et al. (1988), 38 heterosexual male participants aged 26-42 were asked to hand over their usual aftershave and told that it would be returned either containing a synthetic version of a male pheromone thought to increase sexual attractiveness to the opposite sex or a placebo. They were told that the pheromone was "designed to improve the romance in their lives." Over the next six weeks they had to keep a record of six socio-sexual behaviours including petting/kissing, masturbation and sexual intercourse. The data was compared to two weeks of baseline data collected prior to the start of the experiment. Cutler et al. (1998) found that significantly more pheromone than placebo users increased above baseline in terms of the sociosexual behaviour including sexual intercourse and petting but not masturbation or formal dates.

The nature of the deception in this study was that the participants did not know whether their aftershave contained the pheromone or not. This was important because if they knew they were using the pheromone spray it would be impossible to know whether increased sexual success was due to the chemical or the participants' expectations of increased sexual success, which may have improved their confidence.

This type of minor deception is seen to be acceptable under the BPS guidelines as it serves to preserve the internal validity of the study and the participants are at minimal risk of psychological harm, due to the fact that they were told that they may or may not receive the pheromone. The BPS suggests that if participants are likely to react with anger or discomfort when the deception is revealed in the debrief then their study should not be conducted.

Cutler ensured that all the men were debriefed which group they were in at the end of the study and those men who were in the control group were given their own bottle of the pheromone. This seems to obviate any negative feelings in the intro group particularly, however, there are still some ethical concerns regarding Cutler's use of deception given that the benefits to society of the study are questionable and her financial interest given her involvement with the Athena Institute who sell pheromone aftershaves to the public.

- ***Explain one ethical consideration relevant to one study of genetics and behaviour.***

Research into human genetics aims to determine the influence of genes on behaviour and identify genes involved in hereditary diseases and disorders. This kind of research may pose risks to participants because there are consequences for any individual, and their family, who finds out that they have a genetic predisposition to a disorder or behaviour that is harmful. In psychology, ethics must be considered to ensure participants (humans and animals) are not harmed and that research conducted is ethically valid.

One ethical consideration relevant with a study of genetics and behaviours is the potential to cause undue emotional stress for the participants in learning about their genetic predisposition. This can be considered in the case of Caspi et al (2003) where it examined the role of the 5-HTT gene in depression, a gene known as a "serotonin transporter" gene that regulates the level of serotonin in the synapse. Psychologists believe that serotonin plays a role in mood and therefore plays a role in