Title: Aggression

Specification: Neural and hormonal mechanisms in aggression, including the roles of the limbic system, serotonin and testosterone. Genetic factors in aggression, including the MAOA gene.

### WHAT YOU NEED TO KNOW

1. Outline and evaluate neural and hormonal mechanisms in aggression, including:
   a. Role of the limbic system
   b. Role of the neurotransmitter serotonin
   c. Role of the hormone testosterone

2. Outline and evaluate genetic factors in aggression:
   a. Role of the MAOA gene

### 1a. Limbic System

The biological approach to explaining aggression has three core areas: the neural explanation, the hormonal explanation and the genetic explanation. The main neural explanation is the Papez-Maclean limbic theory involving structures such as the amygdala, hypothalamus, and hippocampus which are implicated in reactive aggression. Reactive aggression is a response to a perceived threat, rather than proactive aggression which is a response in anticipation of a reward. The limbic system also connects to the cingulate gyrus which is responsible for focusing attention on emotionally significant events. Also, the limbic system has connections to the prefrontal cortex which is involved in forward planning and anticipation of rewards. The limbic system plays a key role in how an organism responds to environmental threats and challenges and thus is believed to be the key factor in whether we respond aggressively or not to an external stimulus.

The hypothalamus is responsible for the regulation of the autonomic nervous system, which in turn regulates responses to emotional circumstances. Therefore, damage to this area can result in an inappropriate aggressive response to a perceived threat. The amygdala is responsible for attaching emotional significance to sensory information. The limbic system is believed to be hierarchical with signals being passed from the lower systems to the higher systems in the prefrontal cortex where feelings are monitored and interpreted, which then triggers a physical response. The prefrontal cortex is crucial for regulating social behaviour and aggressive responses. Damage to the prefrontal cortex would reduce the inhibition of the amygdala resulting in higher levels of aggression.

### 1b. Neurotransmitters

Under normal circumstances, the neurotransmitter serotonin works on the frontal areas of the brain to inhibit the firing of the amygdala, the part of the limbic system in the...
brain that controls fear, anger and other emotional responses. Consequently, serotonin has a calming influence and low levels of serotonin mean that people can’t control their impulsive and aggressive behaviour. Serotonin also regulates the pre-frontal cortex; therefore, lower levels of serotonin affect our response to external stimuli, meaning the person becomes aggressive easily and can’t control their responses in a ‘normal’ way. They can’t anticipate risk and therefore impulsively engage in aggressive behaviour.

1c. Hormones
Observations of non-human and human species have demonstrated that aggression is more evident in males than in females. Animal studies have led to the explanation that male hormones are implicated in aggression. The main hormone which decides whether an embryo develops into a male or female is testosterone. Testosterone peaks in young adolescent males before gradually declining with age. It also promotes muscle strength and is responsible for the sex drive. However, testosterone is also implicated in aggression.

Exam Hint: In an exam answer on neural and hormonal mechanisms there needs to be some elaboration for reasonable AO1 marks; for example, the origins and the general role of testosterone, or an outline of the structures that make up the limbic system and their involvement in behaviour. A simple description of hormones and neurotransmitters involved in aggression without application to how they affect behaviour will only achieve rudimentary AO1 marks.

Evaluation
- Kluver and Bucy (1939) were early researchers who, using Rhesus monkeys, removed the main areas of the limbic system including the amygdala, hippocampus and surrounding cortical areas. They found that the monkeys displayed an absence of emotional, motor and vocal reactions normally associated with stimuli or situations eliciting fear and anger. Lesioned monkeys also lost the social understanding of group hierarchies and would try to fight the more dominant and larger members of the group. This research demonstrates the importance of the limbic system in regulating aggressive responses. One of the main criticisms of research using animals to provide evidence for aggression in humans is the differences between animal and human physiology and the question of whether we can extrapolate research findings from animals to human aggressive behaviour. Despite humans and monkeys both possessing similar neural structures, we cannot be sure that the processes involved in mediating aggression in humans are the same as those shown in animals such as the Rhesus monkey.

- More recent technological advances have allowed neuroimaging techniques such as MRI scans to investigate the relationship between neural structures such as the amygdala and aggressive behaviour. Wong et al. (1997) undertook MRI scans of 19 violent male criminals in Broadmoor hospital and compared the size of the amygdala with 20 ‘normal’ control subjects. He found that the volume of the amygdala was
significantly smaller in the 19 violent criminals, thus supporting the role of the amygdala and limbic system in aggression. One of the problems with this research is a lack of population validity: the sample was relatively small, and thus the issue of whether these findings can be generalised to the wider population can be raised. The research can be accused of gender bias, as their research was confined to males; therefore, caution must be taken in using this research to explain aggression in females. When research is used to explain behaviour is both males and females yet only undertaken on males, this is called beta bias.

- **Ferrari et al. (2003)** provide support for the role of serotonin in aggressive behaviour. They allowed adult male rats to fight with another rat at a specific time for ten days. On the eleventh day, the rat wasn’t allowed to fight. However, researchers found that the rat’s dopamine levels had raised by 65%, and his serotonin levels were reduced by 35%. Despite the fact that the rat was not fighting, the experience had changed the rat’s brain chemistry. Ferrari et al. (2003) research raises the question of whether lower levels of serotonin cause aggression or whether they are a response to aggression being carried out. The issue of cause and effect is a key factor in the explanation of aggressive behaviour. The aim of any science is to establish the cause by measuring the effect, whereas the reverse, i.e. lower levels of aggression, are the effect, this substantially lowers the validity of the explanation as to the causes of aggression. Nevertheless, this research does demonstrate the complexity of the role of serotonin in aggressive behaviour.

- **Mann et al. (1990)** administered the drug dexfenfluramine (which depletes serotonin in the brain) to 35 healthy adults. The researchers then used a questionnaire to assess hostility and aggression levels, which rose following administration of dexfenfluramine amongst males, but interestingly not amongst females. The research by Mann et al. (1990) demonstrates the issue of beta bias that is inherent in neural explanations of aggression and shows that males and females may not be subject to the same physiological factors when explaining aggression.

- Psychologists interested in finding out if testosterone was implicated in aggression decided to test out this theory by castrating animals, thereby removing their testes. Wagner (1979) castrated mice and aggression levels went down, thus providing support to the theory that testosterone is implicated in aggression. Wagner’s (1979) research however only provides correlational support for the cause of aggression, as the research only demonstrates a relationship between lowered testosterone and lowered aggression. However, Wagner’s (1979) research does demonstrate that testosterone plays a crucial role in aggressive responses.

*Exam Hint: It is important to ensure you focus on answering the question. If you are asked to consider the role of neural and hormonal explanations in aggression, make sure you specifically refer to the role.*
2. Genetics

The basic difference between men and women lies in their genotype. Most people have 23 pairs of chromosomes and on these chromosomes are our genes. One pair of chromosomes decides whether we are male (XY) or female (XX). Early psychologists investigating aggression believed the genetic cause of aggression could lie in the Y chromosome. They were particularly interested in examining individuals with a genotype of XYY. These individuals were often referred to as ‘super males’ as they possessed two male Y chromosomes.

Court-Brown (1965) discovered 314 patients that had the XYY chromosome presentation and he put forward the view that these patients should remain hospitalised given their increased likelihood of aggressive behaviour.

More recently psychological research has focused on examining individuals with the normal XY genotype. Psychologists have used selective breeding in animals and have found that aggression is a trait that can be transmitted from parent to offspring, thus supporting the genetic explanation.

Research with human subjects has focused on twin studies that have looked at the incidence of aggression displayed by monozygotic (MZ or identical) and by dizygotic (DZ or non-identical) twins. Differences in the rate of concordance of aggression between these sets of twins have indicated that aggression has a genetic element.

With the advances in genetic testing in the last fifty years, specific genes have been identified which have been shown to carry the aggression trait down to individuals. One such gene is the MAOA gene, and one variant has been named the ‘warrior gene’. The MAOA gene is responsible for the production of the protein monoamine oxidase. This protein allows the metabolising of noradrenaline, serotonin and dopamine. A dysfunction in this gene can result in these neurotransmitters not being broken down in the body. If adrenaline isn’t metabolised, then we end up with too much adrenaline. This can cause hypersensitivity in the fight or flight response and individuals may overreact to an external stimulus and perceive a threat where one does not exist.

Furthermore, if dopamine is not broken down, increased or excessive levels of dopamine are also linked to aggressive behaviour. Serotonin has a calming influence, and low levels have been implicated in a reduction of control over impulsive behaviour.

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<tr>
<th>NEUROTRANSMITTER</th>
<th>LEVELS</th>
<th>CONSEQUENTIAL BEHAVIOUR</th>
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<tr>
<td>DOPAMINE</td>
<td>High</td>
<td>Increases likelihood of feelings of reward when aggression is carried out</td>
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<tr>
<td>SEROTONIN</td>
<td>Low</td>
<td>Lack of inhibition over impulsive behaviour</td>
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<tr>
<td>NORADRENALINE</td>
<td>High</td>
<td>Overreaction to perceived threats</td>
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Evaluation

- **Theilgaard (1984)** undertook research into men with the XYY genotype and found that XYY can cause an increase in height in individuals but not an increase in aggression.

- **Coccaro et al. (1997)** compared monozygotic versus dizygotic twin pairs. In this study, twin pairs were examined for the concordance of criminal behaviour for both twins. In cases of monozygotic or identical twin sets, the siblings are genetically identical (100% same genes) whereas in dizygotic or fraternal twin sets, the siblings are merely genetically similar (50% same genes). In MZ twin pairs were found to have a 50% concordance whereas DZ twins were only 19%. This research supports the role of genetics in aggression as the twins that were genetically identical, i.e. 100% of the same genes, were more likely to display criminal behaviour than the twins that only shared 50% of the same genes.

- Scientists such as **Godar et al. (2014)** have refined selective breeding by specifically removing (knock-out) certain genes in mice. This has been done with the MAOA gene. The MAOA knockout mice showed increased aggression and also higher levels of serotonin, demonstrating the relationship between genes and neurotransmitters. When the mice were given fluoxetine to raise their serotonin levels, their behaviour returned to normal.

- **Brunner (1993)** undertook a famous study on the males in a large family from the Netherlands, whose members were displaying high levels of aggression. Five of the males were found to have a non-functional version of the MAOA gene. The females in the family were not affected by the genetic dysfunction. The MAOA gene is carried on the X chromosome, and as females have two X chromosome even if they possess one dysfunctional MAOA gene, their corresponding X chromosome is likely to have a functional MAOA gene, which has been found to be dominant. The female genotype presentation has the effect of preventing the issue of the flawed monoamine metabolism.

- **Stuart et al. (2014)** studied 97 men who had been involved in severe domestic abuse to their partners. They found the most violent men had the faulty MAOA gene. These men engaged in the highest level of physical and psychological aggression and inflicted the worst injuries on their partners.

*Exam Hint: Achieving enough AO1 marks on a genetics question can be problematic. In this case, good AO1 marks can be achieved by explaining the link between the MAOA gene and monoamine/serotonin levels.*

*Exam Hint: AO1 marks can also be achieved by presenting research evidence as illustration and the mark scheme for genetics questions advises that genetic research can be accepted as AO1 or AO3. Depending on the AO1 marks available either presenting research evidence as an illustration (AO1) or evidence (AO3) is the key to achieving the maximum AO1 marks.*
Possible Exam Questions

1. Briefly outline and evaluate the findings of one research study into genetic factors in aggression. (4 marks)

2. Outline and evaluate the role of neural and/or hormonal mechanisms in aggression. (16 marks)

3. Outline and evaluate the role of genetic factors in aggression with reference to the MAOA gene. (16 marks)

4. Micah was experiencing outbursts of temper at home and school. His friends and family were concerned that he seemed to have no control over his temper. Micah has two older sisters, and they are both doing very well in school and are calm and easy going. Micah’s grandfather had spent some time in prison for arson and Micah’s father had died when Micah was younger in a fight. Using your knowledge of the genetic, neural and hormonal mechanisms in aggression explain why Micah may be having trouble controlling his temper. (12 marks)
Title: Aggression

Specification: Media influences on aggression, including the effects of computer games. The role of desensitisation, disinhibition and cognitive priming.

WHAT YOU NEED TO KNOW

1. Outline and evaluate media influences on aggression, including the effects of computer games, using the following three psychological explanations.
   a) Desensitisation
   b) Disinhibition
   c) Cognitive Priming

1. Media Influences

Most of us live in a media saturated world. Television, radio, newspapers, books, magazines, the internet, and social media fill the daily lives of most individuals.

Psychologists have been interested to investigate whether these media influences have an effect on our behaviour, particularly aggressive behaviour. Any form of communication can be defined as 'media; new media is apparent in the technological advances in gaming. Computer games can be defined as a game played on a screen, using a mouse, keyboard or handheld controller. Computer games such as those played on the Xbox and PlayStation have become a chief source of entertainment for many individuals, especially those in younger age groups. Psychologists investigating the influences on behaviour of these computer games have produced three main theories:

1a. Desensitisation

Desensitisation theory proposes that with continual exposure to a stimulus our responses to that stimulus are decreased. Therefore, if aggression is presented to us on a daily basis, there is reduction in our response to the aggression. Under normal circumstances the sympathetic nervous system switches on in response to witnessing violence or aggression. Heart rate increases, adrenaline is released and this physiological stress response causes a desire to remove ourselves from the object. Viewing aggression will cause an initiation of this evolved 'fight or flight' response. This response was adaptive for our ancestors and helped keep them alive.

However, it was also adaptive for our ancestors to become accustomed to environmental stimuli that were frequently encountered. For instance, some tribes have become tree dwellers for their own safety. On the face of it living high in the trees would seem a stressful and frightening experience, but these tree dwellers have become
desensitised to the fear element of living in the treetops. Psychologists have proposed that desensitisation can therefore also provide an adaptive response to the environment.

Today our environment consists of a media saturated world, and violence and aggression are often present in news reports. However, violence is also a feature of many computer games. Psychologists propose that **desensitisation** as a response to violence viewed in computer games can have a negative effect. Individuals may not respond to real aggression with any physiological arousal, such as that associated with fear. The result of this effect is that individuals may be more likely to accept violence and aggression and may be more likely to respond violently and aggressively when presented with the opportunity to do so.

### 1b. Disinhibition

A further theory to explain how the media can influence aggression is through a process of **disinhibition**. Disinhibition theory proposes that our normal restraints are loosened after exposure to media violence. Aggressive behaviour becomes normalised and the norms governing our behaviour become altered from non-acceptance to acceptance and therefore aggression is seen as a ‘normal’ response in certain circumstances. One aspect of aggression that is particularly believed to become normal and acceptable is an aggressive response as a result of a real or imagined wrongdoing. So if the viewed aggression is seen as a revenge response, this is deemed to be ‘normal’, and thus it is justified. This type of viewed aggression is believed to have a greater disinhibitory effect on consequential aggressive behaviour.

Most people agree aggressive behaviour is harmful and antisocial. This is learnt through social learning. **Bandura (1977)** proposed that we learn how to behave from observational learning of role models, such as parents and significant others in our lives. However, as a child grows, the media becomes an increasingly powerful role model. Superheroes can provide an aggressive role model, albeit in the name of justice. Adult films can present such role models as James Bond which children may look up to and imitate. However, when aggression levels are normalised in these role models, the child can grow up believing that aggression is socially acceptable as a response and therefore more likely. This process of **disinhibition** is more powerful if violence is rewarded. Many computer games reward the player for initiating violence and in this format any negative consequences from aggression are minimal.

### 1c. Cognitive Priming

Children as young as ten may have been exposed to 8,000 murders and up to 100,000 other acts of violence on television alone (**Huston et al, 1992**). **Cognitive priming** is an explanation that proposes that the influence of aggression in the media and in computer games provides individuals with 'scripts' for their responses and behaviour when they perceive an environmental stimulus as aggressive. Cognitive priming maintains that there is a priming effect of media images on previously learnt behaviours or cognitive schema. This priming effect can activate memories and make aggression more likely.
Violent computer games may increase the likelihood of aggression in players who have learned aggressive responses in the past and/or who hold aggressive schema. A child may play a computer game where aggression is rewarded; when they find themselves in a potentially aggressive situation, rather than trying to defuse the aggression the child will have an internal script (schema) that the way to 'win' is through an aggressive response. Therefore, the violence in computer games has the effect of 'priming' an individual to violence. Children from a very early age have a potential gamut of violent scripts to guide their behaviour. They select the script depending on the situation and then take part as an actor in the situation. This process can occur without conscious thought and become an automatic response to cues in the environment.

**Evaluation**

- **Weisz and Earls (1995)** showed 86 males and 106 female university students one of four films depicting various types of aggression: a) sexual aggression against a male (Deliverance); (b) sexual aggression against a female (Straw Dogs); (c) physical aggression (Die Hard 2); or (d) a neutral film containing no explicit scenes of physical or sexual aggression (Days of Thunder). After viewing the film, subjects were asked to complete a 252-item questionnaire measuring the acceptance of interpersonal violence, acceptance of rape myths, attraction to aggression and levels of empathy. Participants then viewed a re-enactment of a rape trial and completed a 23-item rape trial questionnaire. Results showed males were more accepting of interpersonal violence and rape myths, more attracted to sexual aggression, less sympathetic toward the rape trial victim, and less likely to judge the defendant as guilty of rape. This supports the desensitisation as an explanation for how the media can increase acceptance of aggressive behaviours.

- However, an issue with research carried out into the effects of the media on aggression (for example, Weisz and Earls, 1995) is that of ecological validity. Most research has been carried out in laboratory settings and has measured aggression levels on a questionnaire or with subsequent behaviour towards confederates. This raises the issue as to whether the measured violence would occur in a 'real world' setting. Norms governing behaviour and particularly aggressive behaviour in public may be far more likely to inhibit an aggressive response where the repercussions could be fines or a prison sentence.

- **Berkowitz and Alioto (1973)** carried out a laboratory experiment where participants who saw a film depicting aggression as vengeance (revenge) gave more (fake) electric shocks of longer duration to a confederate. Berkowitz and Alioto (1973) propose that aggression is more likely to occur if the viewed aggression is seen as an acceptable response and disinhibition is more likely to occur.

- A practical application of our understanding of the processes of disinhibition has led to the American Army using games as a recruiting tool. From the perspective of the armed forces, recruiting individuals with an interest in violence and aggression and a disinhibited response to aggression is beneficial for future soldiers. Soldiers in a
war situation are likely to have to behave in an aggressive and violent way, so it is more beneficial for them to respond aggressively as the norm. If they didn't automatically and quickly respond aggressively in a threat situation, this could have potential issues for their own survival and those of the people they are trying to protect.

- **Fischer and Greitemeyer (2006)** found that male participants who had been exposed to aggressive song lyrics about women were more likely to give higher levels of hot chilli sauce to female confederates rather than male confederates than those participants who had heard neutral lyrics. Fischer and Greitemeyer (200) also found that the misogynistic lyrics also resulted in the males recalling more negative attributes of women and reporting higher levels of aggression towards women. This procedure was replicated with female participants and ‘men hating’ song lyrics with similar results. This research demonstrates the cognitive priming that aggressive song lyrics can have on subsequent aggressive behaviour.

Exam hint: Desensitisation, disinhibition and cognitive priming may all operate together, and a discussion can include all three. However, make sure you show the examiner you know the difference between the theories with a clear explanation of each.

Possible Exam Questions

1. Briefly outline the possible role of cognitive priming in the effects of computer games on aggression. (2 marks)

2. Outline and evaluate the role of disinhibition in the effects of computer games on aggression. (8 marks)

3. Sumar is eight years old, he likes to play on his elder brother’s Xbox. He is particularly fond of the games Halo and Gears of War. Sumar’s mother is getting concerned that Sumar has responded aggressively when she has asked him to tidy his room. She is worried that playing his elder brother’s computer games is causing Sumar to become aggressive. Using your knowledge of disinhibition and cognitive priming explain why Sumar’s mother may or may not have reasons to be concerned. Use research to support this answer. (12 marks)

4. Outline and evaluate two explanations for the effect of the media on aggression. (12 marks)

5. Discuss psychological research that seeks to explain the influence of the media on aggression (16 marks)