- It has a role in regulating social behaviour via its influence on certain areas of the brain, which are implicated in aggression.
- High levels of testosterone reduce the activity in the orbitofrontal cortex, meaning that there might be less self control
- Testosterone also influences the activity of serotonin in the brain and can therefore reduce its activity, which leads to more aggression.

2. Cortisol
- This is a key hormone in the body's response to stress
- The dual-hormone hypothesis states that high levels of testosterone lead to aggressive behaviour only when levels of cortisol are low.
- High levels of cortisol block the influence of testosterone hence reducing aggressive behaviour, but when levels of this hormone are low it no longer has this inhibitory effect on testosterone and aggression results.

Research Evidence for Hormonal Explanations:
1. Testosterone
- Mehta and Joseph measured changes in their male PP’s testosterone levels before and after a competitive game (they all lost).
- Once second sample was taken they were given a choice- challenge their winning opponent (aggressive) or do an unrelated task (non agg).
- Of the losers whose testosterone levels rose after their loss, 73% re-challenged.
- But of the losers whose levels dropped only 22% re-challenged. After a loss of status, PP’s behaved aggressively only after an increase in testosterone.
  - Research is correlational so it is important that it is recognised that testosterone levels may be a response to aggression instead of causal. Caution should be taken when describing testosterone's role in aggression.
  - Game playing → not objective and low mundane realism.
  - Lab → reliable and replicable as high control.
- (extra) Dabbs measured salivary testosterone in violent and non-violent criminals and found those with highest levels had history of violent crimes, those with lowest levels had only committed non-violent crimes.
  - Testosterone is measured using saliva samples which is a reliable measure- however hormonal fluctuations occur throughout the day so test-retest reliability may be low.
  - Findings are correlational so testosterone is associated w/ agg but doesn't necessarily cause it.
  - Only tested criminals so low pop validity and low generalizability.

Evaluation of the Biological Explanation (neural and hormonal)
1. Determinism and alternate approach
  - A weakness is that it emphasises the role of biological determinism- sees an individual as not having control over the function of their limbic system/serotonin/testosterone levels so they cannot control their aggressive behaviour. → this is not consistent with the way our legal system operates as offenders are held morally accountable for their...
actions so this explanation has implications for punishing violent offenders. 

- Another weakness is that it is not only our biological mechanisms that control aggression - environment. !Kung San are a peaceful tribe in Africa are a peaceful tribe where aggression is not tolerated so is not shown. Yanomano tribe in South America are rewarded for showing aggression in inter-tribal warfare. This cultural difference in aggression shows that for the biological explanation to be effective it needs to be able to explain aggression in all situations → it does not.
  - On the other hand, social learning theory can explain cultural differences as it states that agg is learnt from role models in our culture. So whilst biological mechanisms may explain the biological readiness for aggression it does not adequately explain the expression of aggressive behaviour → needs to consider both.

- A strength of this explanation is that biological determinism means aggressive behaviour can be predicted/treated/prevented at a biological level. E.g. chemical castration to reduce testosterone to rehabilitate violent male sex offenders to eliminate chance of reoffending. This has implications for the economy as life imprisonment is more costly. Reducing levels of aggression in society places less strain on social/polic services and allows the rehabilitated offender to become a functioning member of society. The explanation thus provides the opportunity for treating the consequences of aggression at a biological level.

2. Research Methodology

- Most research into neural and hormonal influences on aggression are correlational because opportunities to experimentally manipulate brain structures and hormones are very limited. But when 2 variables are correlated it is impossible to establish which one is the cause or the other. Having a clear causal relationship is important to determine the validity of neural and hormonal mechanisms in explaining aggression.

3. Reductionism and a Simplistic Explanation

- Another problem is that it is reductionist- many other factors associated with the development of aggression. Higley suggests that testosterone levels are not the only factor in agg- they found that testosterone levels can affect how agg an individual feels but they will not necessarily act on that feeling. Therefore it could be argued that testosterone levels may underpin the emotional response to a situation but that often factors such as social learning will affect whether aggression influences the expression of the aggressive behaviour. So the biological explanation is only part of a wider explanation that considers the impact of social environment.

- It is also simplistic to assume that it is only testosterone or the limbic system that is responsible for aggression. Research shows if activity in the orbitofrontal cortex is reduced- disrupting impulsive control function aggression results. Agg is therefore a highly complex behaviour and involves at least 3 neural structures. It is important to include all mechanisms involved in aggression in order for the explanation to be valid.
ritualistic. Aggression is therefore determined by instinctive drives that are triggered and aimed at securing the survival of the species.

4. States that aggression is genetically based - meaning all members of a species will display the same aggression. As this explanation extrapolates to humans, it means aggression should be the same across all cultures. Nisbett found there was a north south divide in the USA for homicide rates. Killings are much more common amongst white males in southern states than in northern states. This was only true for reactive aggression triggered by arguments - the difference in homicide rates was caused by a 'culture of honour'. Furthermore, the Yanomamo tribe in south America Is very aggressive while the !Kung San in Africa is not aggressive - shows aggressive behaviour is learnt and not down to genes. These cultural differences challenge the explanation as it shows aggression cannot just be determined by IRMs but a result of both nature and nurture.

Evolutionary Explanations of Human Aggression:

1. Aggression and Sexual Jealousy:
Men can never be 100% certain that they are the fathers of their own children as fertilisation of the female egg is hidden - they face the threat of cuckoldry or having to raise offspring that is not his own.
Any investment into offspring that is not his own is a waste of his resources - contributes to the survival of a rival's genes and leaves the father with fewer resources to invest in his own future offspring.

Men in the evolutionary past who could avoid cuckoldry were more reproductively successful as it increased the level of paternal certainty in males.

This negative emotional state of jealousy triggers aggression in the form of domestic violence, which would discourage a woman from cheating. SEXUAL JEALOUSY IS THEREFORE ADAPTIVE FOR MEN AS IT PREVENTS CUCKOLDRY LEADING TO REPRODUCTIVE SUCCESS.

Evolved behaviours in men that prevent women's infidelity = mate-retention behaviours.

- Direct Guarding of the female: male vigilance over partners behaviour to restrict their sexual autonomy to deter rivals from gaining access to their mates - e.g. tracking, checking phone
- Negative Inducements: in the form of violence and threats to prevent her from straying - e.g. threats to kill.

These behaviours ensure it is his genes that are passed on → paternal certainty.

Sometimes the aggressive behaviour can go too far and result in uxoricide (wife killing) - unintentional consequence of using violence to keep a partner faithful. Shackleford analysed 13,670 cases of uxoricide and found younger women had a greater chance of being killed by their husbands as they have more chance at successful reproduction when younger.
Dispositional factors (AO1):
- Prisoners are violent and aggressive people who bring the aggression into prison with them.

The Importation Model suggests that IA is not caused by any characteristics of the institution, but by the people in it. Prisoners bring their pre-existing aggressive normative states or dispositions into the prison with them.
- These dispositional factors include values, attitudes, beliefs, norms, gender etc.
- Inmate aggression in prisons is influenced by these characteristics being imported into the prison: they used agg outside prison to achieve goals so bring agg into prison to establish status.

Irwin and Cressey classified prisoners into sub-cultures:
- **Criminal/Convict subculture**: repeat offenders who have a criminal ‘code of honour’ who use aggression to establish power and dominance
- **Conventional subculture**: new to prison and likely to be one-time offenders - not generally aggressive but may use aggression to find a place in the prison hierarchy.

Situational Factors (AO1):
- Characteristics of the prison itself that is responsible for IA.
- An individual who is not normally aggressive can be made to behave aggressively due to stressful factors within the institution.

These factors are: All result in stress, leading to aggression.
- **Organisational**: leadership, policies, procedures. E.g. regular lock ups create frustration.
- **Physical**: security level, level of available resources.
- **Environmental characteristics**: overcrowding, temperature and noise
- **Staff characteristics**: gender, experience, interactions with prisoners.
- **Perceived and real deprivation.**

Underlying process = deprivation → frustration → aggression.

Sykes: The Deprivation Model
- Aggression in inmates originates in the deprivations they experience.

Skyes outlined 5 **key deprivations:**
- **Liberty**: permission needed to eat, sleep, shower and interact.
- **Autonomy**: staff have complete control, inmates feel helpless
- **Goods and services**: access is restricted - increases competition amongst inmates to acquire them.
- **Heterosexual relationships**: no access to companionship
- **Security**: prison environment is threatening - fear leads to heightened awareness and defensiveness.

Evaluation of IA:
Eval of Dispositional factors / importation model:
**Strength:**
- There is a significant number of research studies that support dispositional factors contributing to aggression in prisons.