Neural mechanisms in aggression and aggressive behaviour

Agressive behaviour is that kind of behaviour when a person is very angry and has the intention to destroy, hurt something or someone. Sometimes the person’s intention would actually come into practice and so they would do it. There are studies which tell that behaviour is somewhat related to biochemical activities while others have insisted that environmental and social factors are the main source of this behaviour. Here I am focusing on biochemical theories, which includes hormonal, genetic and chemical activities which were studied and have been coorelated with aggressive behaviour.

The role of neural mechanisms on aggression

Serotonin as a Neurotransmitters

According to several studies on serotonin which is a neurotransmitter influences the aggressive and violent behaviour in humans. Serotonin has been thought to have inhibitory control over impulsive aggression. Davidson experimented on criminals and detucted a low level of serotonin. This was further reinforced by a study involving Vervet monkeys. The reduction of serotonin on monkeys resulted in an increase in aggressive behaviour, whereas an increase in serotonin levels resulted in a decrease in aggressiveness. Virkkunen studies also concluded that Offenders with either antisocial personality disorder or intermittent explosive disorder had low serotonin concentrations. Matti Virkkunen(1995)http://www. ncbi. nlm. nih. gov/pmc/articles/PMC1188701/pdf/jpn00062-0021. pdf

Low serotonin may be responsible for an increase in depression and drug use among teens and children.

Seroiotinon is an important chemical secreted by the body which control the sleep cycle, emotional stability, and apetite control among other important things. Serotinon are Proteins are digested by the stomach acid, Zinc and B6 vitamins have to present to assist in creating the L-Tryotphan. By the help of the enzyme Tryptophan Hydrolase and the presence of cofactors Folate, Iron, Calcium and B3 vitamin, 5-hydroxytryptophan is created which is indeed converted to serotonin with the help of Dopa decarboxylase

http://www. understand-andcure-anxietyattacks-panicattacks-depression. com/5-htp. html.

According to Young and Leyton, 2003, an increase in trypthophan ingestion can help to increase the amount of serotinin in the body. In some clinical trials, tryptophan and Desyrel 5HTP (a serotonergic drug) has been given to juvenile delinquents to reduce their aggressive tendencies (Morand et al, 1983).

Relationship with Adrenalin and aggressiveness

Lt. Col. Dave Grossman and Bruce Siddlehave conducted landmark studies in the area of how aggression induces adrenaline’s (or Epinephrine) influence http://www. aggressionmanagement. com/P DF_Files/Measuring_Aggression_Expanded_(2). pdf

According to Olwens (1987) adrenalin does not have an affect on aggressive behaviour, Adrenalin levels are linked with the cortical arousal which stimulates signs of fear or excitement. Mednick et al. 1982) studies showed that certain criminals in a stressed state, take longer time to reduce the adrenalin in the body. Eysenck (1959) claims that a person . with low cortical

arousal is easily bored and craves exciting experiences to stimulate him. A person with low cortical arousal according to Eysenck(1959) is usually easily bored. Criminal activity in young people depends on arousal levels perhaps led by adrenalin as well as on strong socialisation for certain types of behaviour. This could mean activities associated with crime and delinquency. Baldwin also notes that crimes decline with age, quickly during the 20s. This may be partly because the level of stimulus received from certain types of behaviour declines with maturity. http://socialscience. stow. ac. uk/criminology/criminology_notes/biochemical_influences. htm

When a person is in a critical situation, cortisol is one of the hormones that is produced since it is the stress-fighting hormone. Tennes and Kreye (1985) and Tennes, Kreye, Avitable and Wells(1986) conducted an experiment on urine and have found low levels of corisol in aggressive persons. In normal healthy adolescents a postive relationship was found.

http://books. google. com. mt/books? id= XmSfJEl2v4sC&pg= PA294&lpg= PA294&dq= low+cortisol+secretion+and+aggressiveness&source= bl&ots= MrjUCs1Taa&sig= r5Bg5eIbBEEnpcCHCkbxPrpAjpU&hl= mt&ei= XG3aTI_bLpKR4AbSiYDUCA&sa= X&oi= book_result&ct= result&resnum= 2&ved= 0CBwQ6AEwAQ#v= onepage&q&f= false

Keith McBurnett assessed boys in a period of four years who usually gets into a fight, were cruel topeople and animals, steal and he find the same negative relationship, low cortisol cortisol implies more aggressivenes

Read more: Low Cortisol Levels & Aggression | eHow. com http://www. ehow. com/about_6103180_low-cortisol-levels-aggression. html#ixzz14nbvtGpl

The synthesis and secretion of cortisol are controlled by a cascade of neural and endocrine signals. Signals are initiated in the cerebral cortex . Acetycholine and serotinine stimulate the release of corticotropin-releasing hormone(CRH). This is discharged into the hypothalamico hypophyseal portal blood to specific receptors on cell membrane of the adrenocorticotropic hormone (ACTH)secreting cells of the anterior pituitary gland. This hormone receptor causes ACTH to be released into the general circulation, and eventually to nteract with specific receptors for ACTH on the plasma membranes of cells. The Cortisol is secreted from adrenal cortex in response to ACTH. High cortisol levels in the blood suppress CRH and ACTH secretion and low cortisol levels stimulate secretion.

http://books. google. com. mt/books? id= HHK7S7t47BEC&pg= PA815&lpg= PA815&dq= low+cortisol+release+biochemistry&source= bl&ots= e6ztMK–YP&sig= UZftiWMAF0NJZr586SA9bAnKM8I&hl= mt&ei= l2nZTIyoC9GC5AbQgtSnCQ&sa= X&oi= book_result&ct= result&resnum= 1&ved= 0CBUQ6AEwAA#v= onepage&q= low%20cortisol%20release %20biochemistry&f= fals

The role of testosterone (hormonal)

More than 95% of the testosterone is produced in the males, and little amounts in the outer layer of the adrenal gland. The hypothalamus release gonadotropin -releasing hormone to the pituitary gland. Pituary produce two other hormes the follicle stimulating hormone and the luteininzing hormone. The last hormone travels to the male testes in the bloodstream triggering the production of testosterone. FSH is involved in the increase and decrease

of sperm production. http://www. seekwellness. com/andropause/testosterone. htm#production

Figure 1. The chemical structures of testosterone and its derivatives are shown. Testosterone is converted into 5ï ¡-DHT by the enzyme 5ï ¡-reductase to then act on androgen receptors. Alternatively, aromatase can convert testosterone into estradiol which acts on estrogen receptors.

Testosterone acts as a prohormone which when converted into 5-alpha-dihydrotestosterone (5a-DHT) acts on androgen receptors or when converted into estradiol by the enzyme aromatase, acts on estrogen receptors . There is overwhelming evidence that most of the effects of testosterone in mediating aggression occur after aromatization. Testosterone induced aggression is related with an elevated level estrogen receptor activity in the hypothalamic area. Treatment with an aromatase inhibitor blocked this aggression and lowered nuclear activated estrogen receptorsFurthermore the intensity of aggressive behaviour was directly correlated with thearomatase activity

There is evidence that aggression increases with increased levels of this hormone in puberty. Tthe relationship between hormones and aggression in humans was conducted by Nelson in 1995. It have appeared that there is a positive correlation between violence in male and female prisoners and circulating levels of this hormone. Mazur (1985) proposed that rising or

elevatedlevels of T facilitate attempts to achieve or maintain high status, and falling or depressed levels of T inhibit such attempts". " Harisson et al (2000) noted that after giving testosterone to 56 men (aged 20-50) during a computer game which will involve frustration, aggressive behaviour was dominant . Huston et al (2007) showed that men with high levels of testosterone often perform well in competitive tasks but poorly on cooperative tasks. Kreuz and Rose (1972) found significantly higher testosterone levels with criminals who had a history of violent behavior compared to those with non-violent histories. A replication of the study found an even more significant testosterone – aggression effect (Ehrenkranz, Bliss, & Sheard, 1974). Rada, Laws, and Kellner (1976) investigated the relationship between testosterone and sex crimes. Studies in rats, mice, monkeys and humans show that competitive orintermale aggression increases at puberty, whereas it isreduced by castration and increased by testosterone injection

Archer (2006) also concluded thatcompetitively challenged women can show increases in T similarto men. This may be correlated withpersonality characteristics such as aggressiveness and dominance behavior. http://homepage. psy. utexas. edu/homepage/faculty/josephs/pdf_documents/EdwardsComment_MehtaJosephs. pdf

Hormones are certainly linked to behaviour since the presence or absence of hormones has been shown to have numerous effects on an organism. Testosterone has been shown to be correlated with outward displays of human and non-human animal aggression. For example, when testosterone

levels peak around puberty, there appears to be a corresponding peak in aggression levels among young boys.

Nelson (1995) reviewed research into how hormones influence aggressive behaviour. Generally there does seem to be a positive correlation between the level of androgens (male sex hormone e. g. testosterone) circulating in the body and aggressive behaviour in male and female prisoners. However, it is unclear whether the androgen level caused the aggression as it was not measured at the precise point when the aggressive act was being performed.

Activity: Why has much of the research on hormonal influences on aggressive behaviour been done on animals?

During puberty aggression increases when androgen levels are higher (especially in males). Animal research further supports these conclusions. Wagner et al (1979) show that if a male mouse is castrated, overall levels of aggression tend to reduce. If the castrated mouse receives testosterone aggression levels increase.

Activity: Give 2 problems with this research:

1.

2.

Simpson (2001) argues that ‘ testosterone is only one of a myriad of factors that influence aggression and the effects of environmental stimuli have at times been found to correlate more strongly’.

This ignores the potential for individual difference. Harisson et al (2000) noted that after giving testosterone to 56 men (aged 20-50), when given a frustration-inducing computer game, aggressive responses were significantly increased. But this effect was not the same for the entire sample.

Testosterone does have a role to play in this complex formula of human aggression. Huston et al (2007) showed how men with high levels of testosterone often perform well in competitive tasks but poorly on cooperative tasks. The Basal Model of Testosterone is a model which suggests that an individual's level of testosterone influences their level of dominance. The more testosterone that a person has, the more competitive and dominant they become. It follows that a man with a high level of testosterone will take part in antisocial behaviour (e. g. fighting), and on the whole will be more dominating. Mazur and Booth (1998) who, after reviewing a number of studies in this field, concluded that men with higher levels of testosterone ' are more likely to divorce, or remain single, be arrested for offences other than traffic violations; to buy or sell stolen property; to incur debts; and to use weapons in fights'. The Reciprocal Model of Testosterone, suggests that testosterone levels vary with the person's dominance. The level of testosterone is the effect of, and not the cause of, the dominance.

Q// how might testosterone exert its hormonal and behavioural effects?

A// Testosterone interacts with androgen or oestrogen receptors. During the critical time period, soon after birth (up to 10 days), testosterone acts to sensitise particular neural circuits in the brain. This sensitisation allows for the effects of testosterone that manifest into adulthood. A hormone such as

testosterone can affect neural transmission and the amount of neurotransmitter that is released during synaptic transmission. Testosterone lowers the amount of serotonin available for synaptic transmission. This is important given that it is fairly well established that the presence of serotonin serves to inhibit aggression, as shown convincingly in studies done on male rhesus monkeys. Serotonin reuptake inhibitors such as Fluoxentine and several other antidepressants lead to a significant decrease in aggression in both monkeys and humans (Simpson, 2001).

There are three possible explanations for the testosterone-aggression relationship:

- Testosterone causes aggression.
- Aggression increases testosterone secretion.
- Neither has an effect on the other.