

Aggression: the biology of war and peace



Professor Keith Kendrick

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Violent crime rose 37% in London last year

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In the USA nearly 1 in 4 women say they have been raped or sexually assaulted

Nearly half of all rapes and violent crimes are associated with alcohol consumption



Why are we so aggressive and can we do anything about it ?

What is aggression and why has it evolved ?

Is aggression an inevitable trait in all species ?

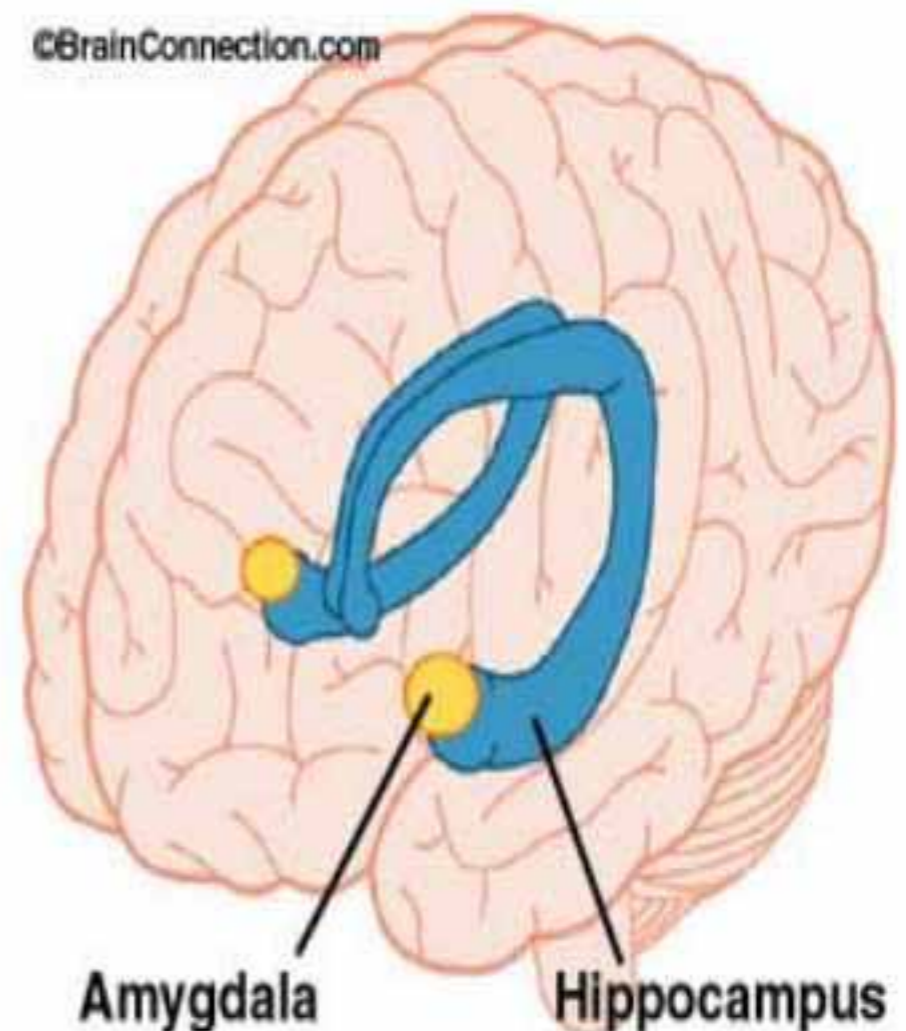


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How is aggression controlled by the brain ?



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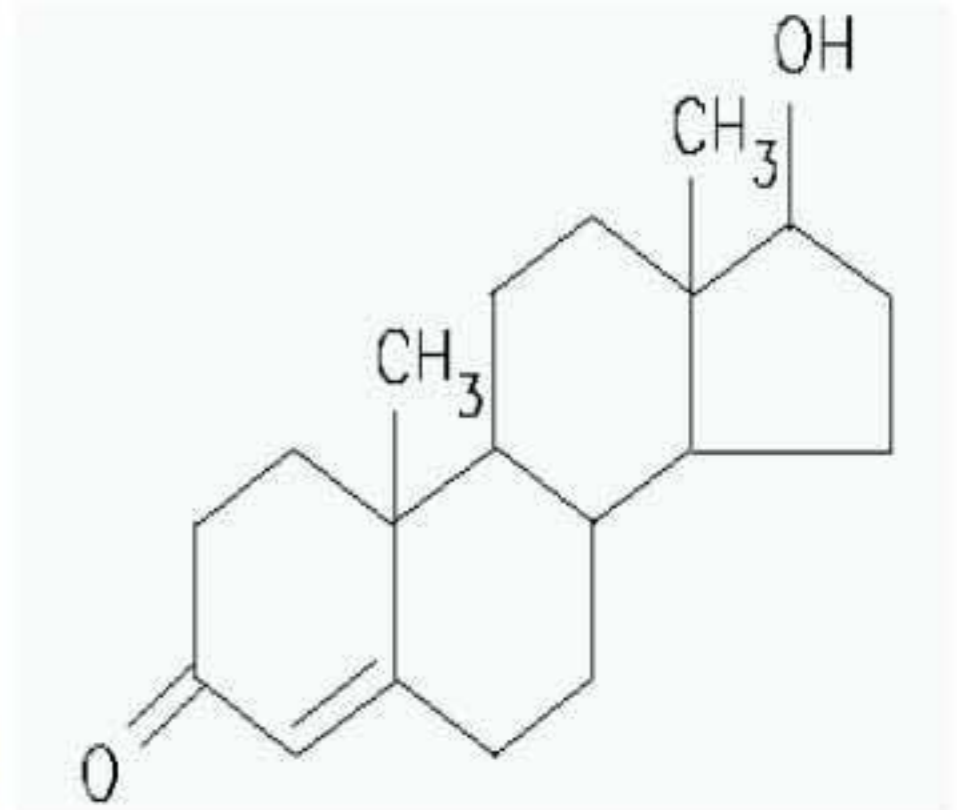
What is aggression and why has it evolved ?

Is aggression an inevitable trait in all species ?

How is aggression controlled by the brain ?

What hormonal, biochemical and genetic factors may contribute to excessive aggression ?

Testosterone



Why are we so aggressive and can we do anything about it ?

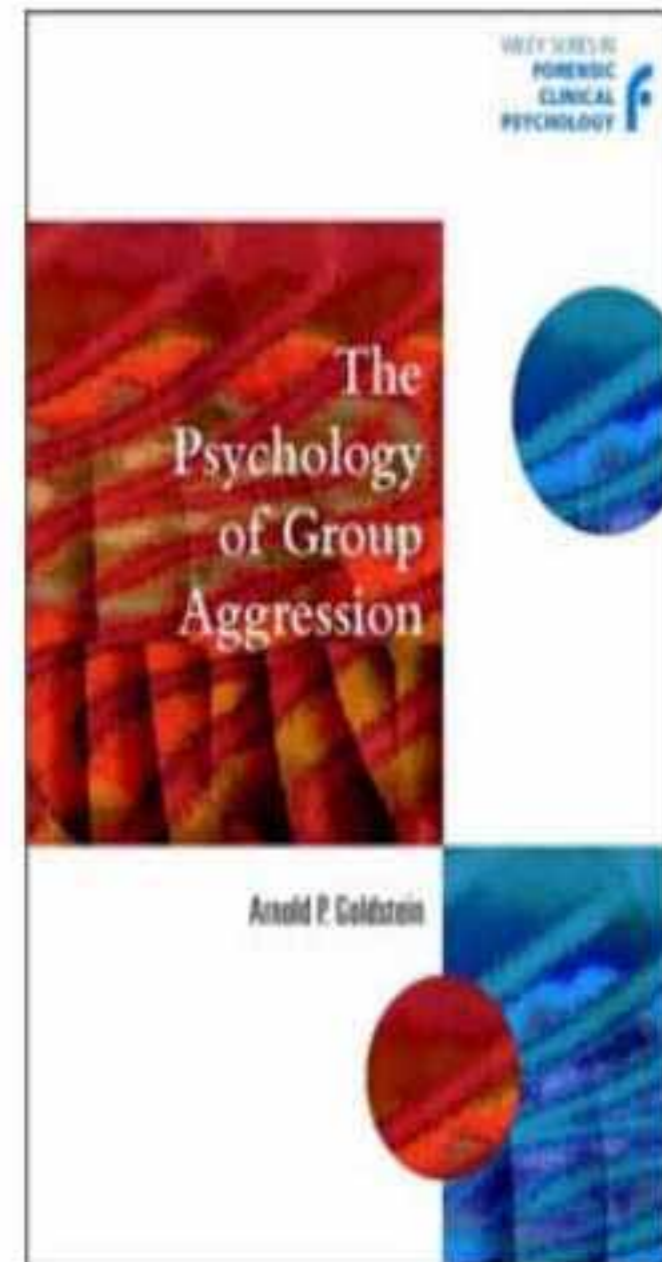
What effects does experience have on levels of aggression ?



Why are we so aggressive and can we do anything about it ?

What effects does experience have on levels of aggression ?

Why do some species engage in group-based aggression in order to kill neighbours ?

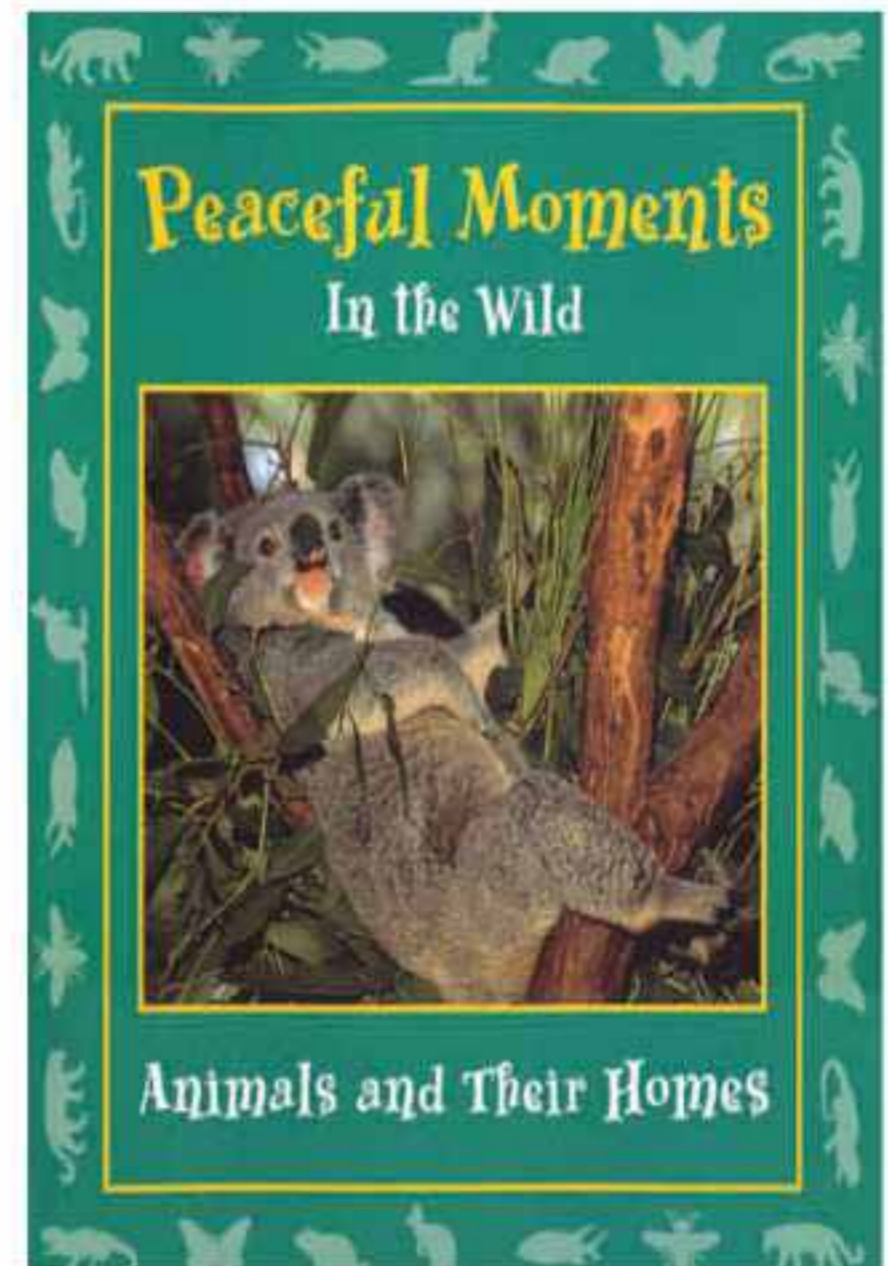


Why are we so aggressive and can we do anything about it ?

What effects does experience have on levels of aggression ?

Why do some species engage in group-based aggression in order to kill neighbours ?

Can we learn anything from other species about how to live more peacefully ?



What is aggression and why has it evolved?



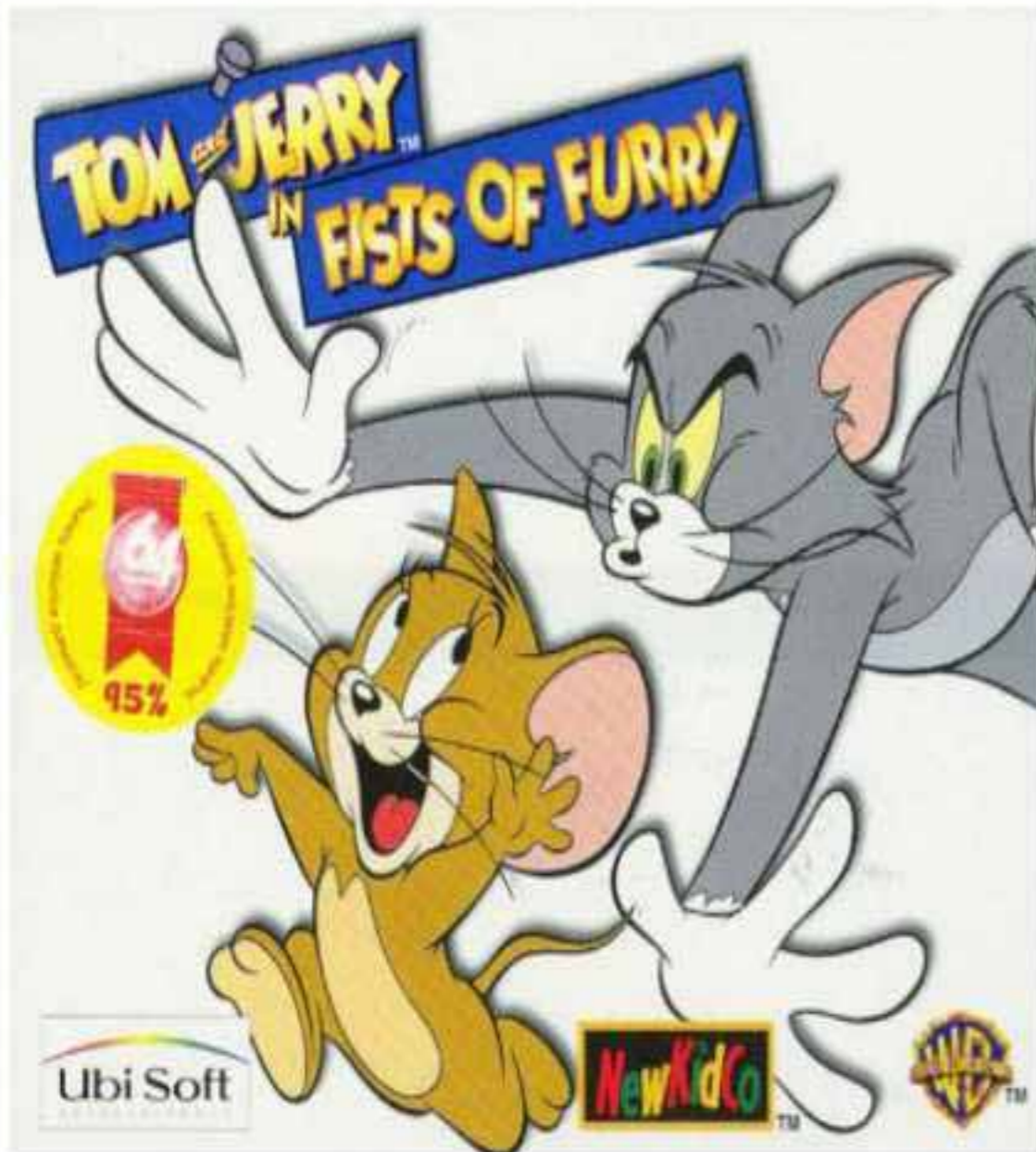
What is aggression and why has it evolved?

Aggression:

'Overt behaviour intended to inflict damage on another individual'

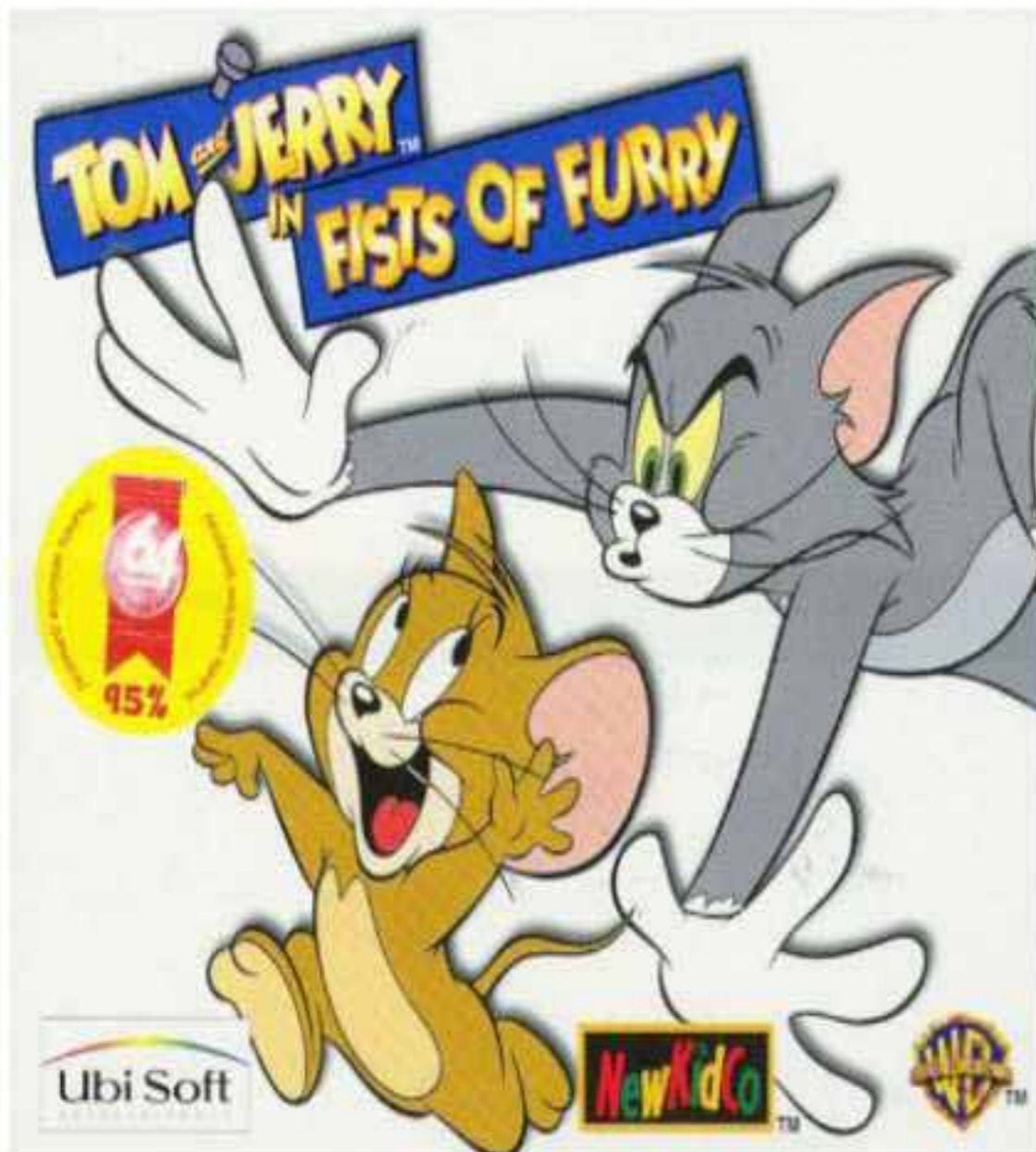


Predatory and affective aggression



Predatory and affective aggression

For humans affective aggression tends to be reactive and predatory aggression tends to be proactive



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Predatory aggression is no longer about putting food on the table



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Premeditated acts of aggression towards people or property are reinforced by learning



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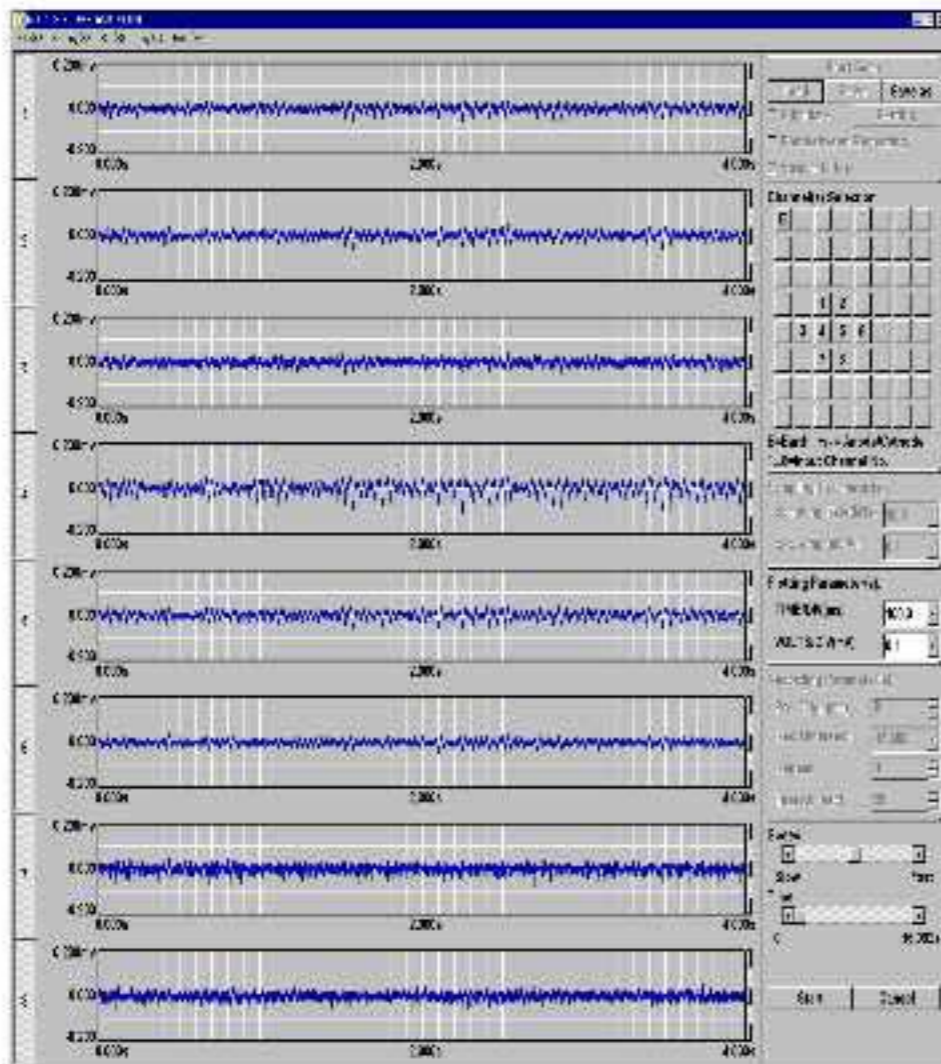
Pathological killers often seem to operate in predatory mode



Some physiological characteristics of violent criminals

Criminals, murderers and psychopaths are often hypoaroused

They may have lower heart rates, skin conductance and slower frequency brain waves (EEG)



Some physiological characteristics of violent criminals

Criminals, murderers and psychopaths are often hypoaroused

They may have lower heart rates, skin conductance and slower frequency brain waves (EEG)

A chronic state of underarousal may be aversive, and crime could provide a buzz !

A's Top Yankees — Rain Helps Giants Beat Mets

SPORTS FINAL
★★★★★

San Francisco Chronicle

THE LARGEST DAILY CIRCULATION IN NORTHWEST CALIFORNIA

SATURDAY, JULY 8, 1995

415-777-1111 SF CENTS



The Gunman's Grudge

Killer's Letter Shows Depth of His Anger



Message found on body spelled out botched deals

By Kim Winters, Susan Fawcett and Michael Taylor
Chronicle Staff Writers

Stanford, Calif. (AP) — A gunman who killed eight people and wounded 10 Thursday afternoon in his rampage through the San Francisco Bay Area had a history of deals with the police that darkened his path to the fatal business center, according to an early letter he wrote weeks before the attack.

A handwritten letter, dated last week, was found on the gunman's person by the San Francisco police. It was a copy of a letter that had been typed by the gunman in 1993, according to police.

Typed in capital letters and outlined with computer and printer's marks, the document outlined a series of deals between the gunman and police for the handling of his criminal record. The letter, dated 1993, was found on the gunman's person.

Although the letter was dated 1993, it was found on the gunman's person last week. The letter was found on the gunman's person last week. The letter was found on the gunman's person last week.

OTHER STORIES ON THE SHOOTINGS

- ◆ Caught from the news: San Francisco Police... PAGE A12
- ◆ How do police help victims?... PAGE A12
- ◆ The killer's shooting... PAGE A12
- ◆ Who was the killer?... PAGE A12

Some physiological characteristics of others

Extreme sports activities may be a better option !



Some physiological characteristics of others

Individuals in some professions seem to benefit from underarousal.....



So why develop an affective aggression response?

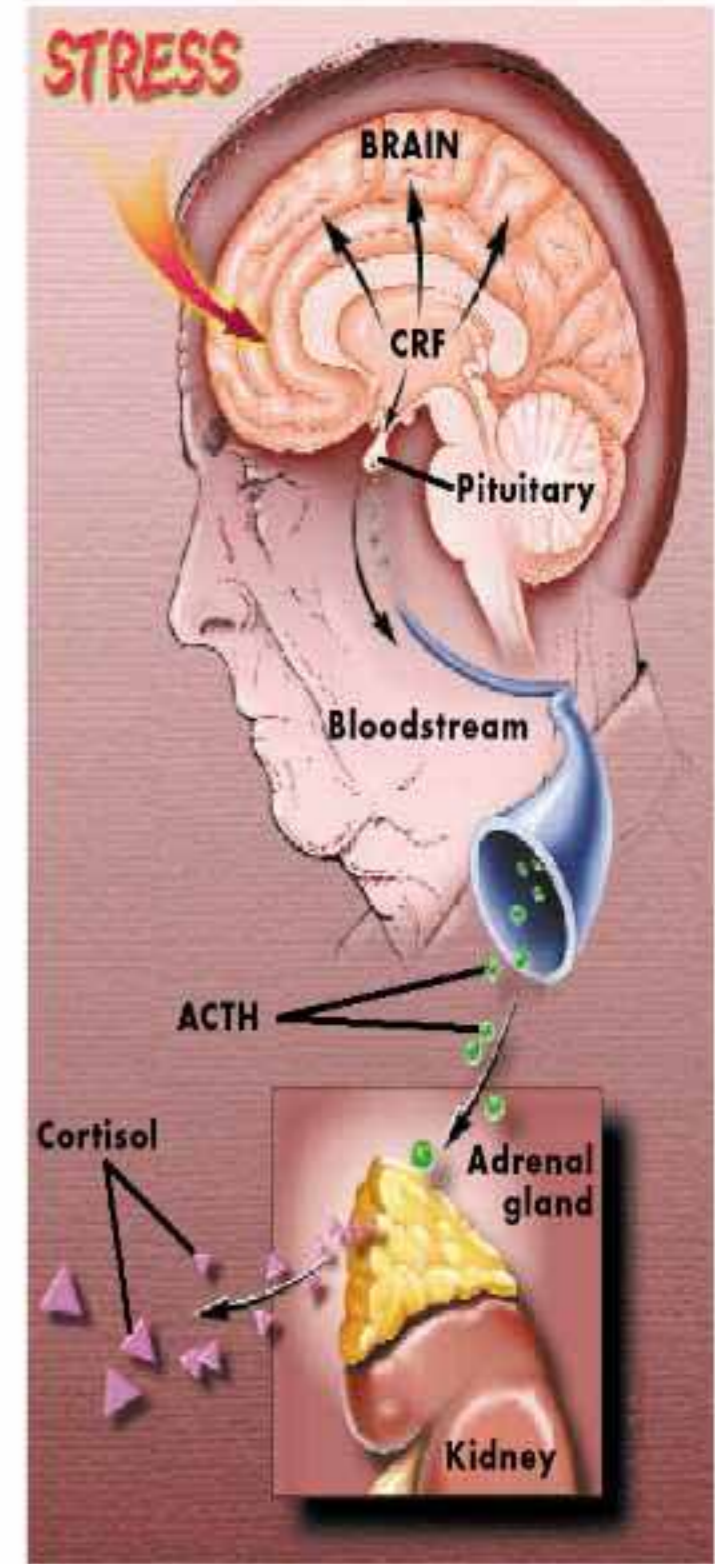
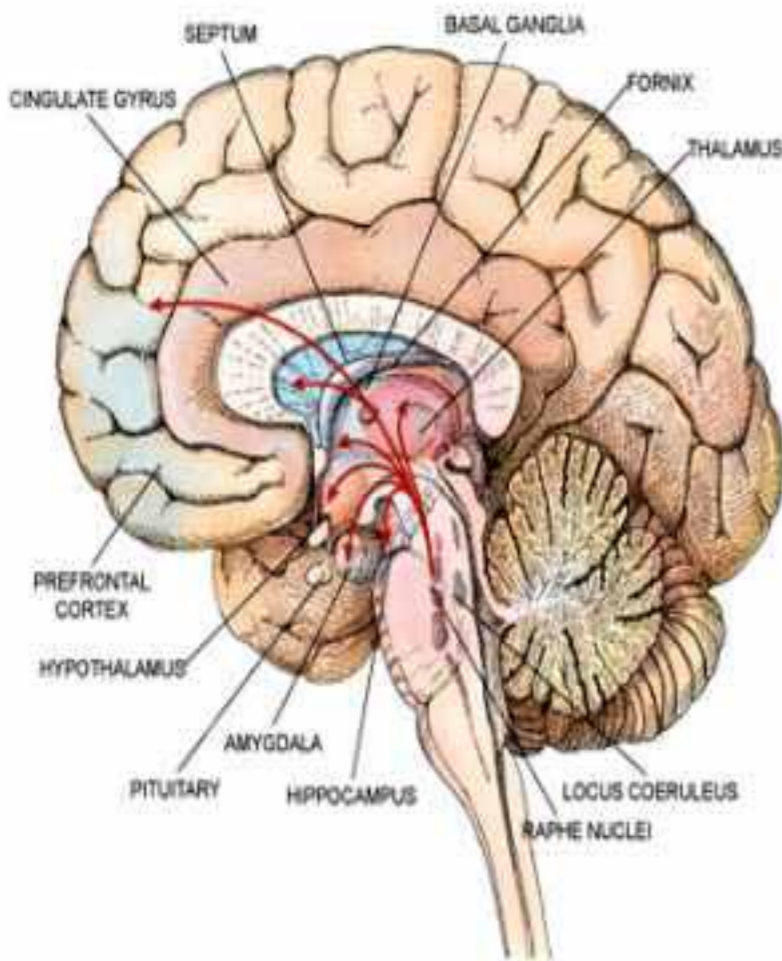
Why have most species developed an affective aggression response ?



So why develop an affective aggression response?

Why have most species developed an affective aggression response ?

An affective response will mobilise stress hormones and improve defense

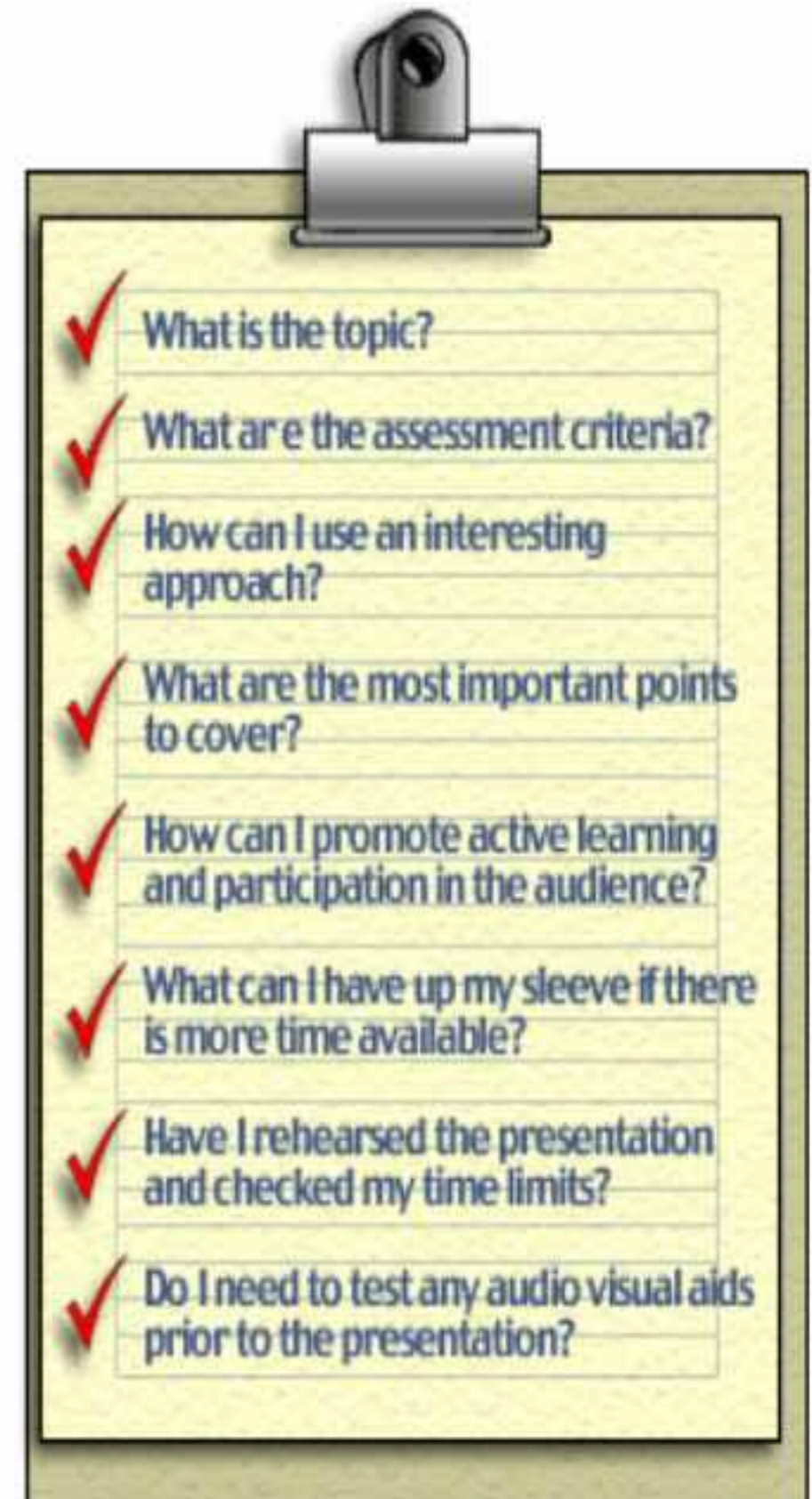


So why develop an affective aggression response?

Why have most species developed an affective aggression response ?

An affective response will mobilise stress hormones and improve defense

Better risk assessment for offensive action



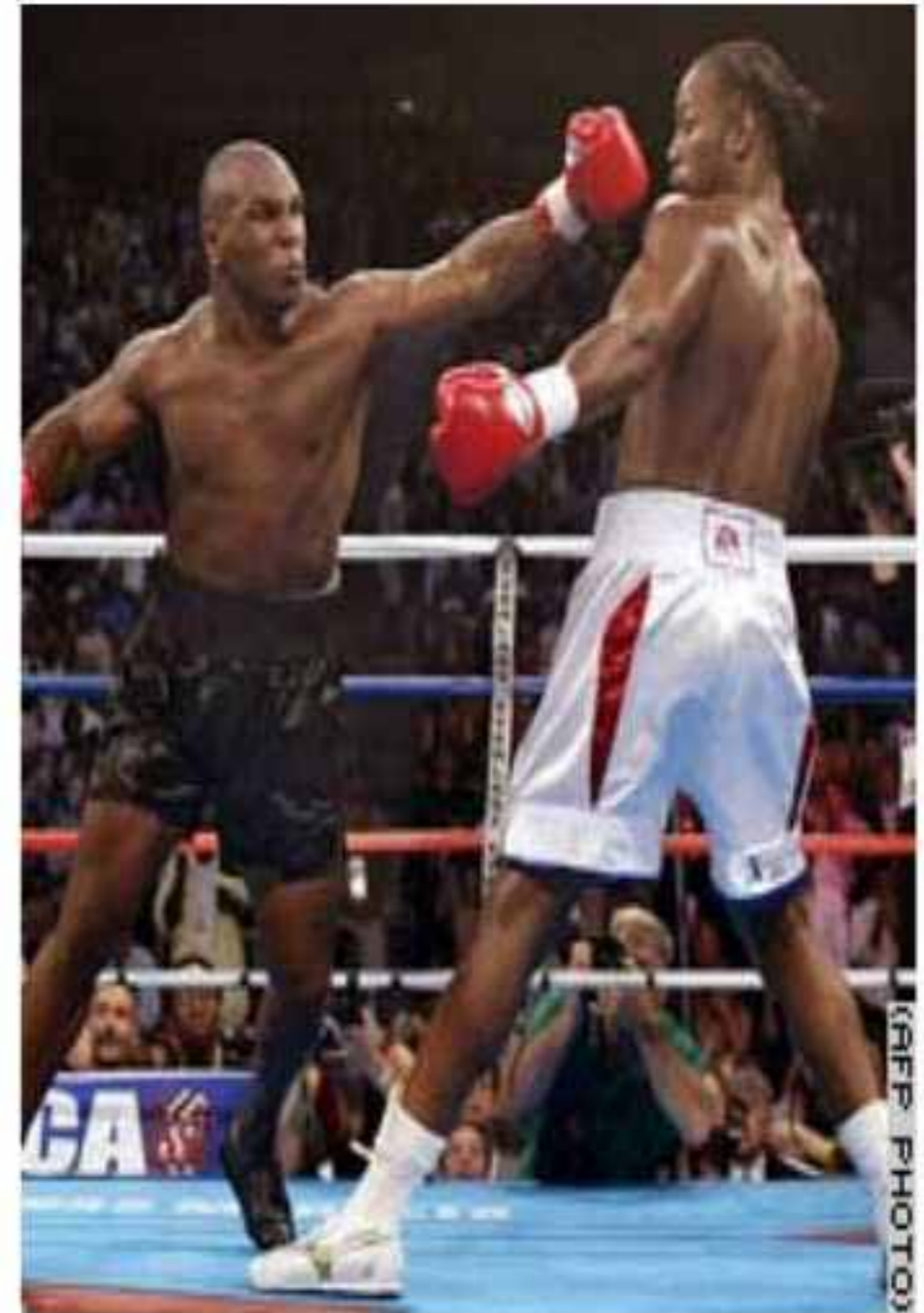
So why develop an affective aggression response?

Why have most species developed an affective aggression response ?

An affective response will mobilise stress hormones and improve defense

Better risk assessment for offensive action

Increased chance of avoiding a fight



Aggression and dominance

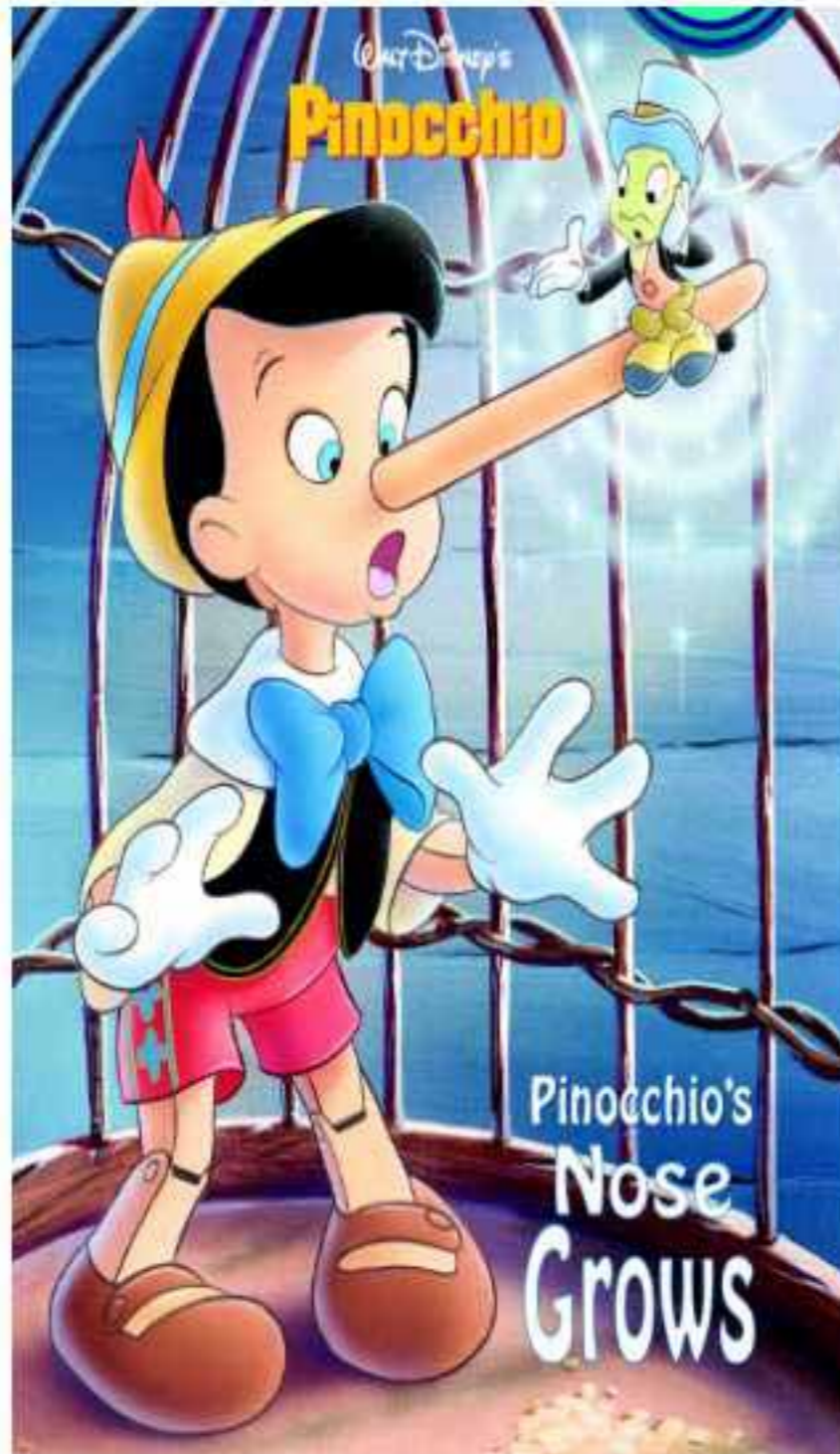
A key aim of aggression is to dominate over someone or something

It is used to obtain/control key resources of survival or reward value



Aggression and dominance

We also use negotiation, cheating and deceit



Aggression and dominance

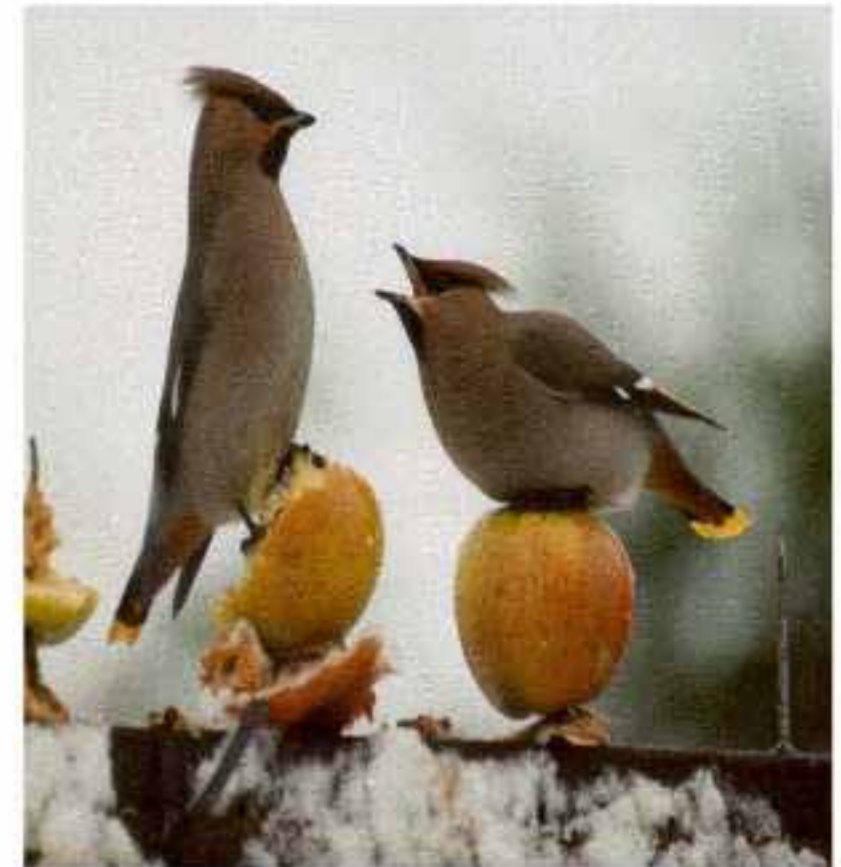
Physical aggression does not necessarily lead to social dominance



Aggression and dominance

Physical aggression does not necessarily lead to social dominance

For most species real physical aggression is relatively rare

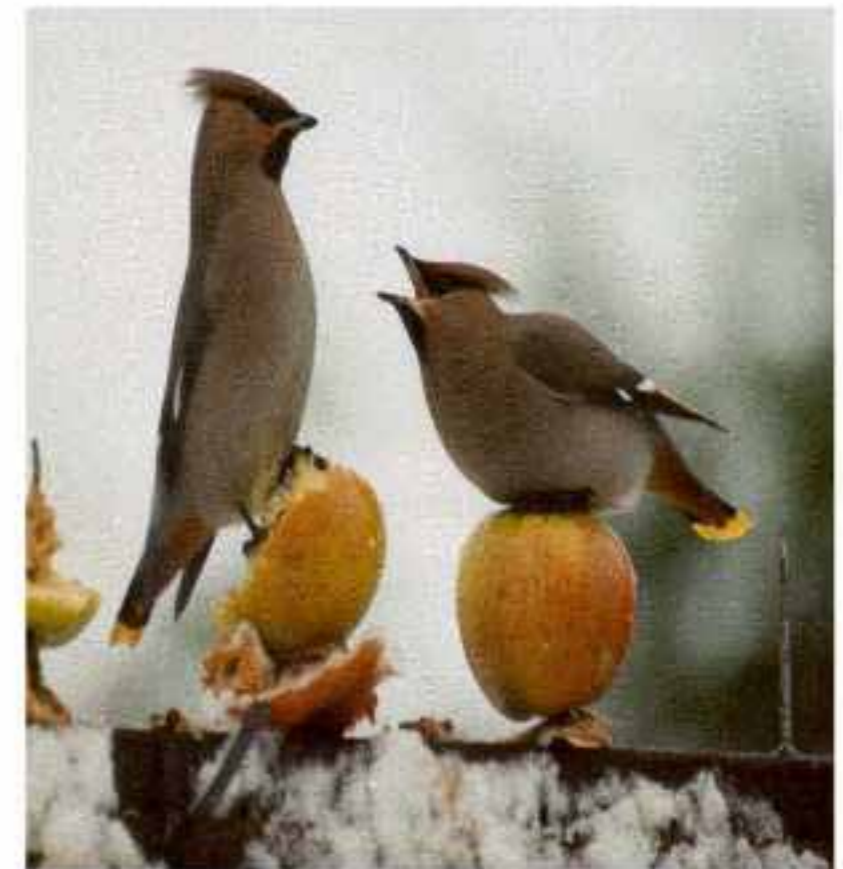


Aggression and dominance

Physical aggression does not necessarily lead to social dominance

For most species real physical aggression is relatively rare

Threat displays and submissive gestures are used extensively

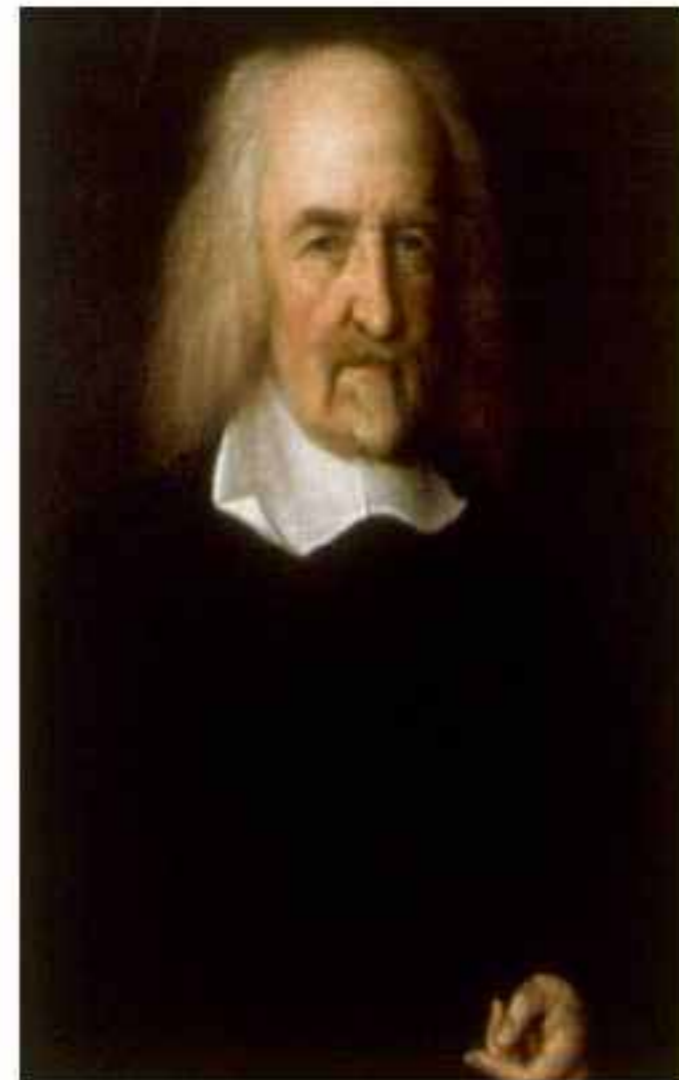


Aggression and literature

'So that in the nature of man, we find three principal causes of quarrel. First, competition; secondly, diffidence; thirdly, glory

'The first maketh men invade for gain; the second, for safety; and the third, for reputation'

Thomas Hobbes 'Leviathan' (1651)



Is aggression an inevitable trait in all species ?

There are two opposing views of aggression:

Like other motivated behaviours it is an inherited spontaneous tendency – i.e. it is in our 'nature'



Freud



Konrad Lorenz



Churchill



Pinker

Is aggression an inevitable trait in all species ?

There are two opposing views of aggression

Violence is learned behaviour and therefore avoidable



Bandura



Watson

The Seville statement



The Seville statement

It is scientifically incorrect to say:

We have inherited a tendency to make war from our animal ancestors

War or any other violent behaviour is genetically programmed

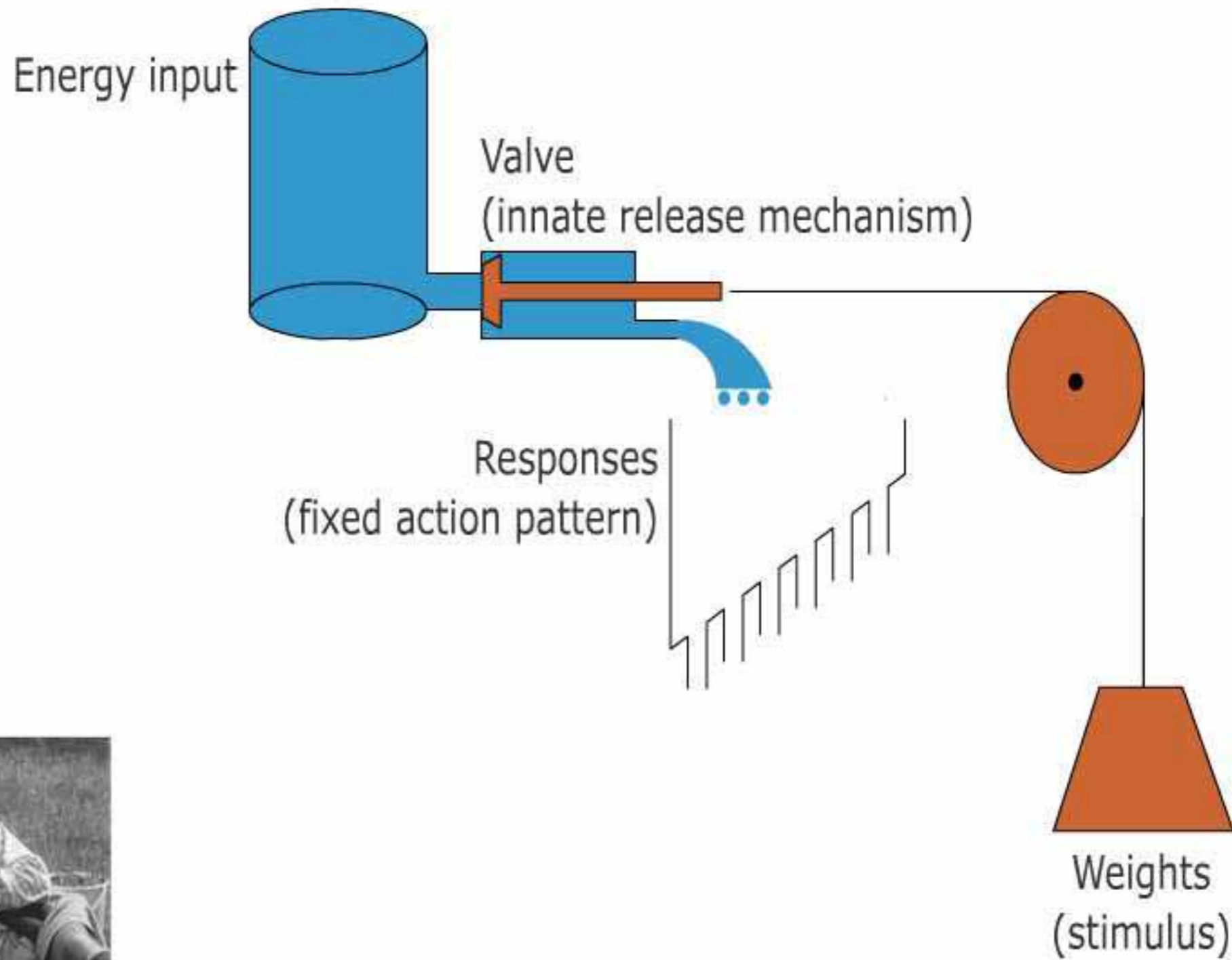
In the course of human evolution there has been a selection for aggressive behaviour more than other kinds of behaviour

Humans have a 'violent brain'

War is caused by 'instinct' or any single motivation



Konrad Lorenz – Hydraulic model



Konrad Lorenz – Hydraulic model

If Lorenz is right, then this makes for some disturbing conclusions:



Konrad Lorenz – Hydraulic model

If Lorenz is right, then this makes for some disturbing conclusions:

Aggression is inevitable – accumulating energy must find an outlet

Humans and other animals will actively look for fights

After a fight has occurred individuals will become less aggressive

Even animals reared in isolation will show aggressive behaviour



'Supporting literature'

'Thus it is manifest that during the time men live without a common power to keep them all in awe, they are in that condition which is called war; and such a war as is of every man against every man'

The result of this being:

'.... continual fear, and danger of violent death; and the life of man, solitary, poor, nasty, brutish, and short'

(Thomas Hobbes)

'The story of the human race is war. Except for brief and precarious interludes there has never been peace in the world; and long before history began murderous strife was universal and unending'

(Winston Churchill)

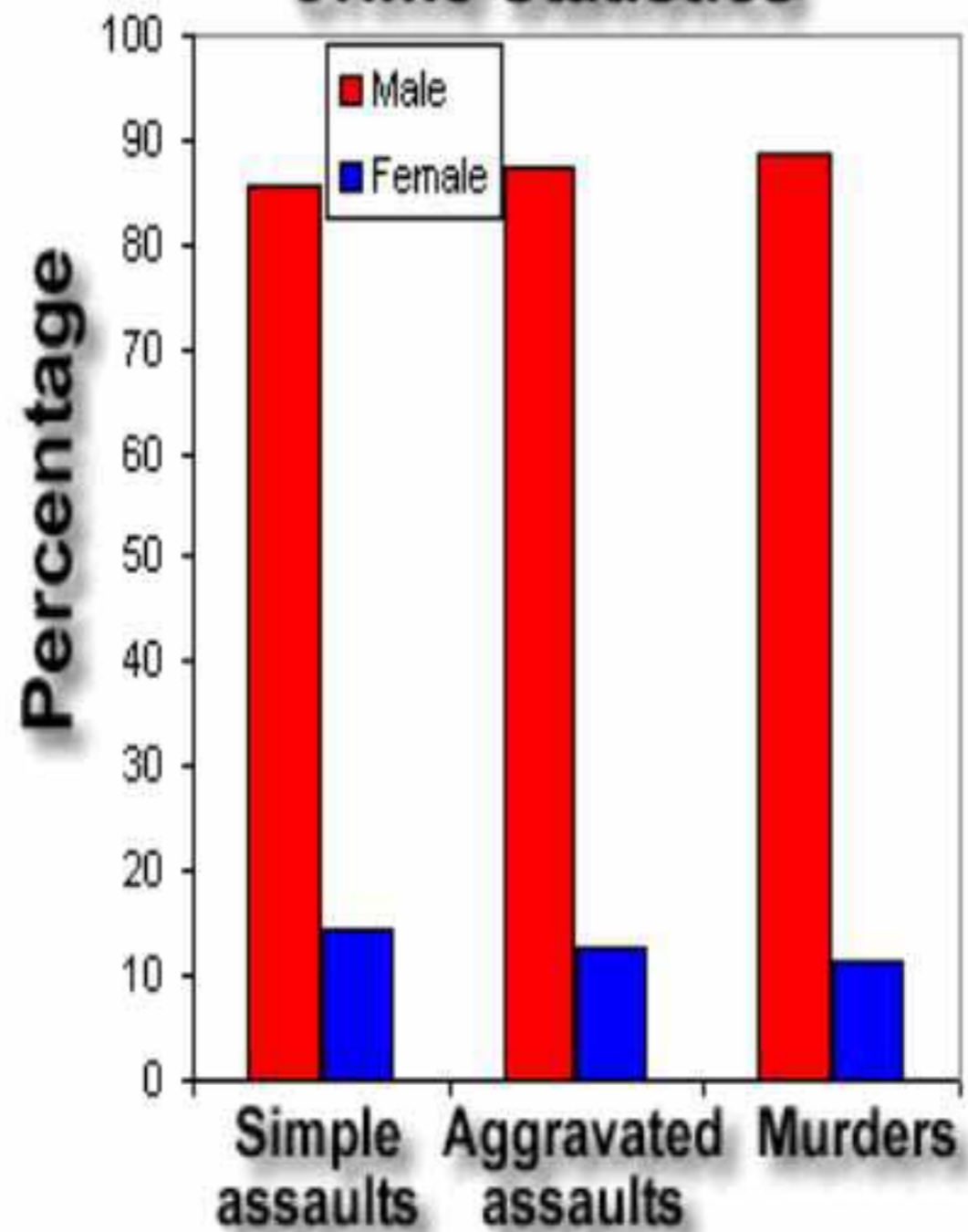
Sex differences in aggression:

Is it true that men are from Mars, and women are from Venus ?



Sex differences in aggression:

Sex Difference in US Crime Statistics



Sex differences in aggression:

Males:

Are both physically stronger and reproduce their genes best by mating with as many females as possible



Sex differences in aggression:

Females:

Cannot normally physically dominate males



Sex differences in aggression:

Females:

Cannot normally physically dominate males

Have only a limited potential for choosing a mate



Sex differences in aggression:

Females:

Cannot normally physically dominate males

Have only a limited potential for choosing a mate

The best reproductive strategy is to nurture and defend offspring...



Sex differences in aggression:

...and to reproduce with males who can best protect them



Sex differences in aggression:

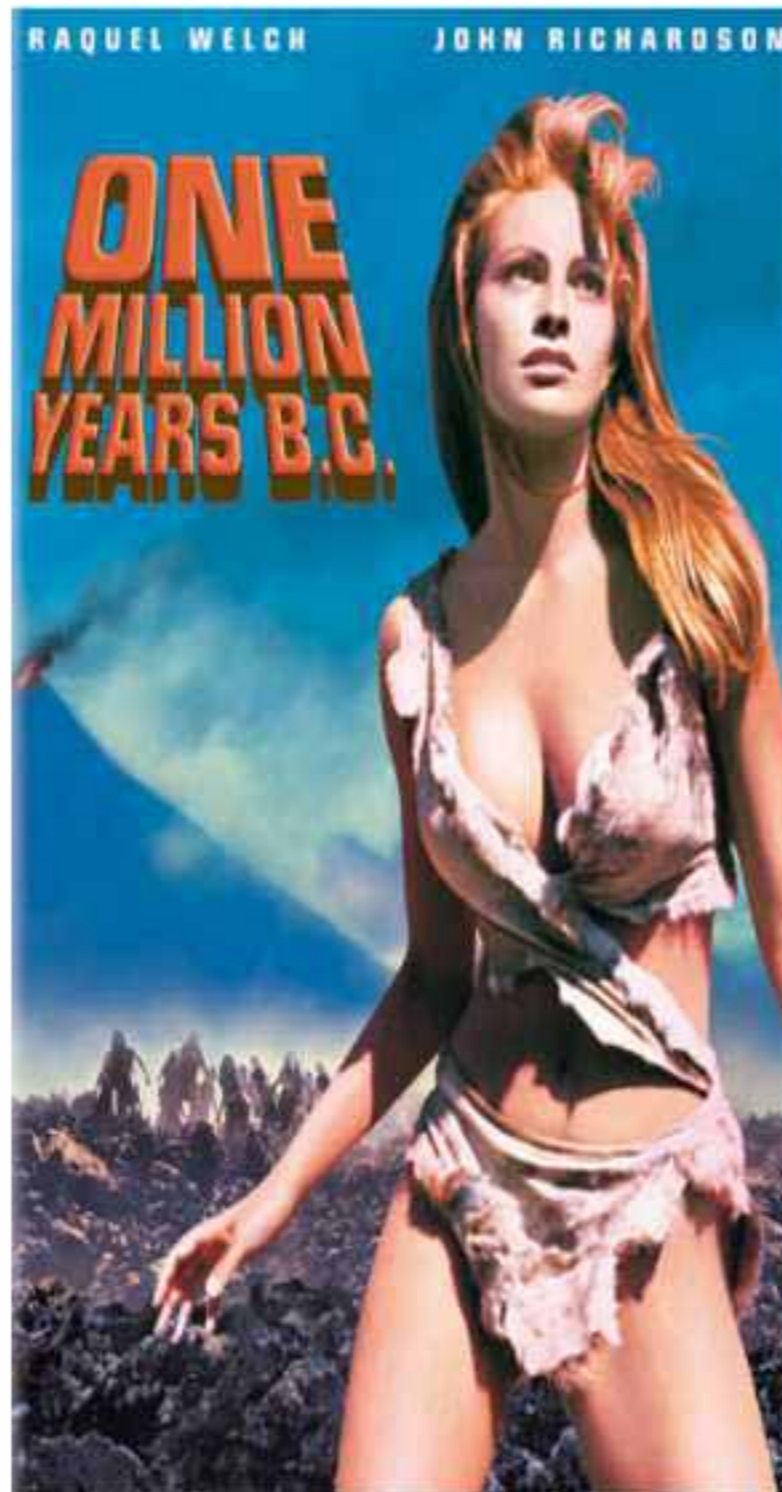
Female aggression is restricted to protecting young and obtaining resources

It is less to do with dominance which is far more important for males



Sex differences in aggression:

Females are more fearful of potential threats than males...



Sex differences in aggression:

Females are more fearful of potential threats than males...

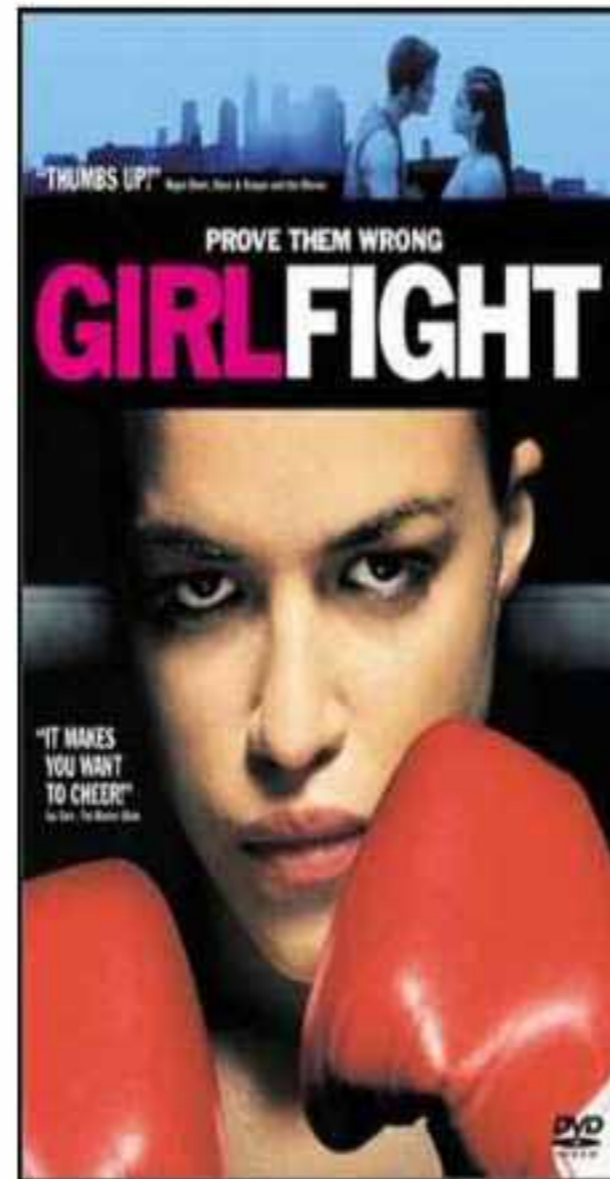
...and may use social psychology instead of physical aggression!



Sex differences in aggression:

Prediction:

The absence of aggressive males might increase physical aggression in females and concern for social dominance



Sex differences in aggression:

Prediction:

The absence of aggressive males might increase physical aggression in females and concern for social dominance

Levels of violent crime by females appear to be on the increase



Sex differences in aggression:

Prediction:

The absence of aggressive males might increase physical aggression in females and concern for social dominance

Levels of violent crime by females appear to be on the increase

In Bonobo apes females dominate males and are more concerned about social dominance



Sex differences in aggression:

Females may not be an inherently peaceful sex



Sex differences in aggression:

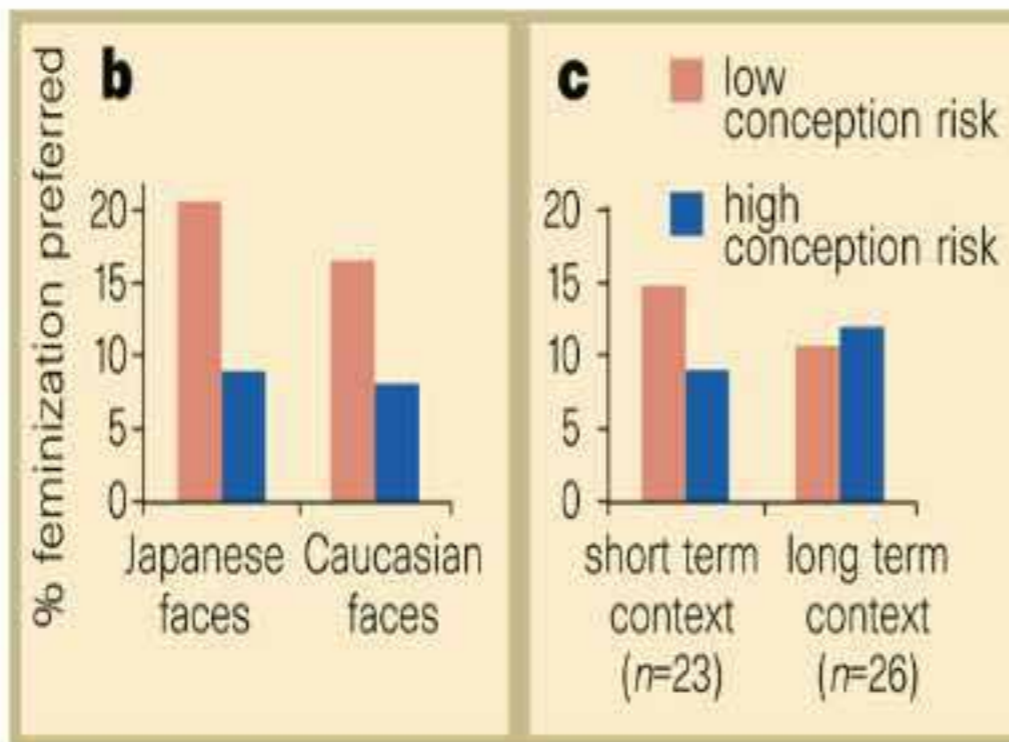
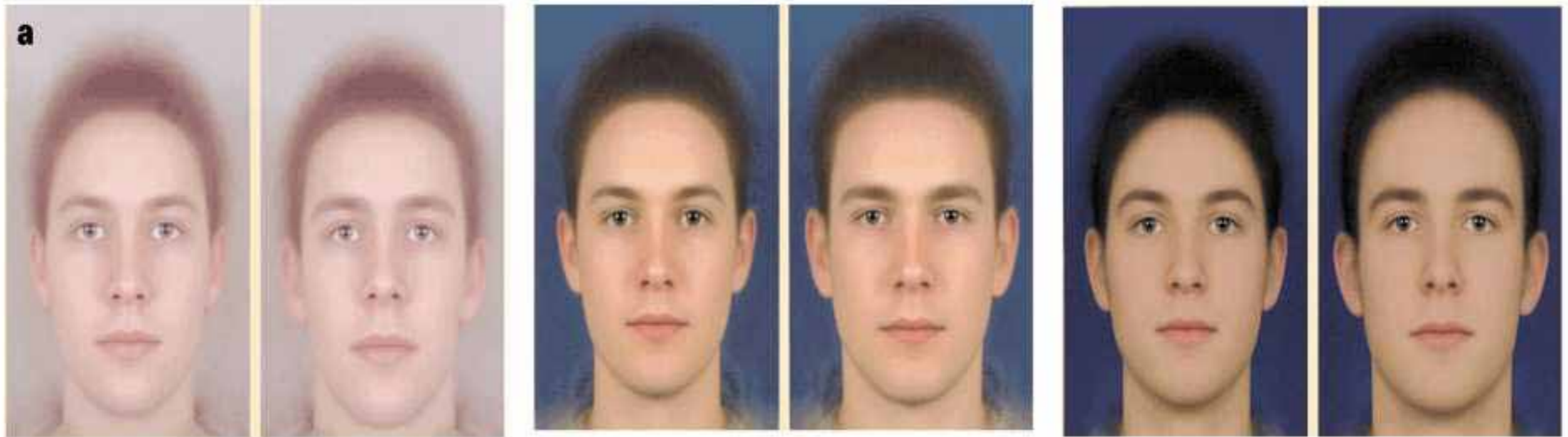
Females may not be an inherently peaceful sex

Lower aggression may owe more to social structure and political expediency than to biology



Sex differences in aggression:

Females may exert positive selection for aggressive males



David Perrett

Sex differences in aggression:

Females may exert positive selection for aggressive males

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ANIMAL BEHAVIOUR, 2005, ■■, ■■-■■
doi:10.1016/j.anbehav.2004.06.012

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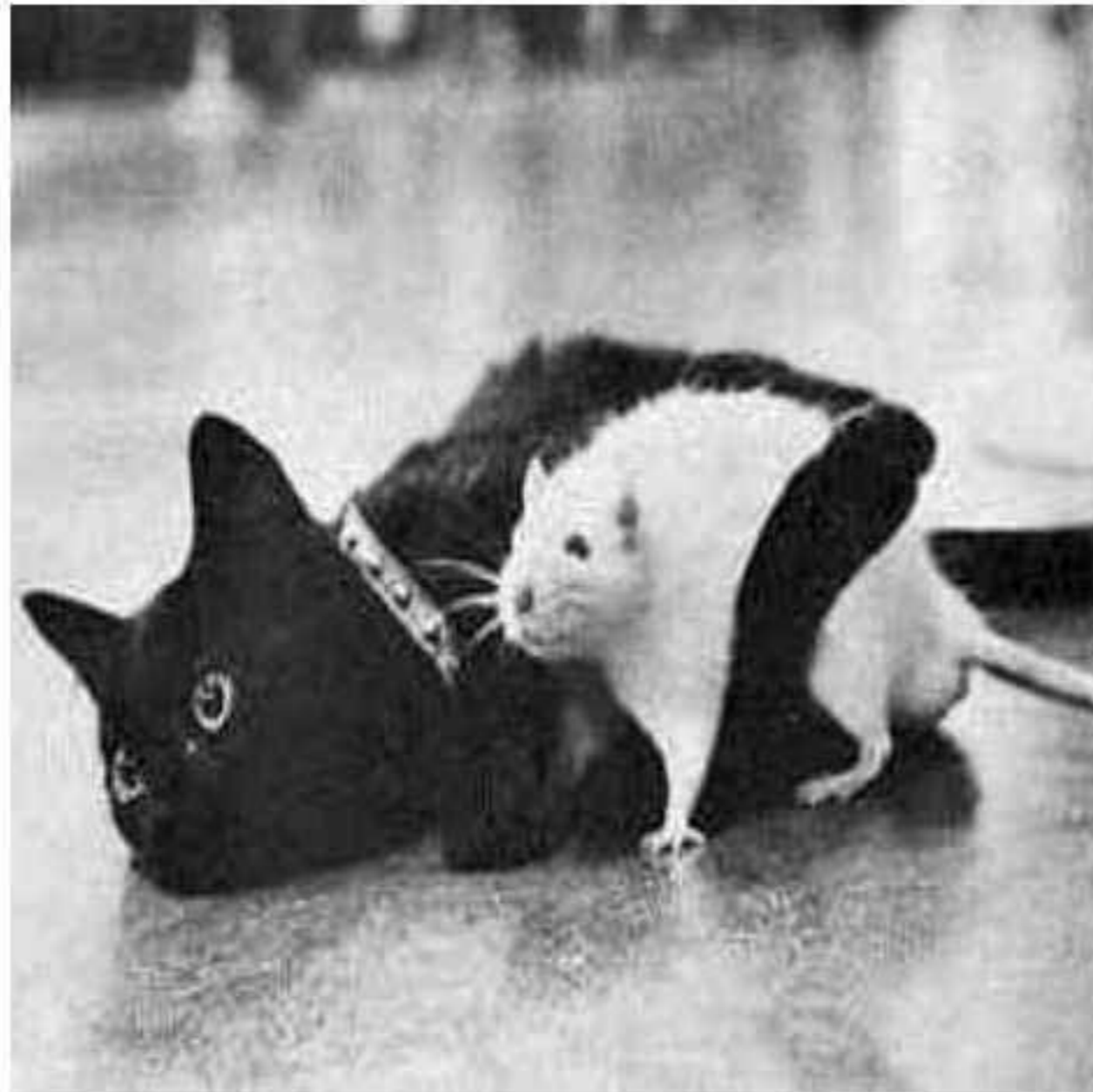
Manipulations of fundamental and formant frequencies influence the attractiveness of human male voices

D. R. FEINBERG, B. C. JONES, A. C. LITTLE, D. M. BURT & D. I. PERRETT
School of Psychology, University of St Andrews

*(Received 3 July 2003; initial acceptance 4 September 2003;
final acceptance 12 June 2004; published online ■ ■ ■; MS. number: 7778R)*

How is aggression controlled by the brain?

Animal models, mainly cats and rats



How is aggression controlled by the brain?

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Affective aggression – pupillary dilation, increased heart rate and blood pressure, urination and piloerection



How is aggression controlled by the brain?

Animal models, mainly cats and rats

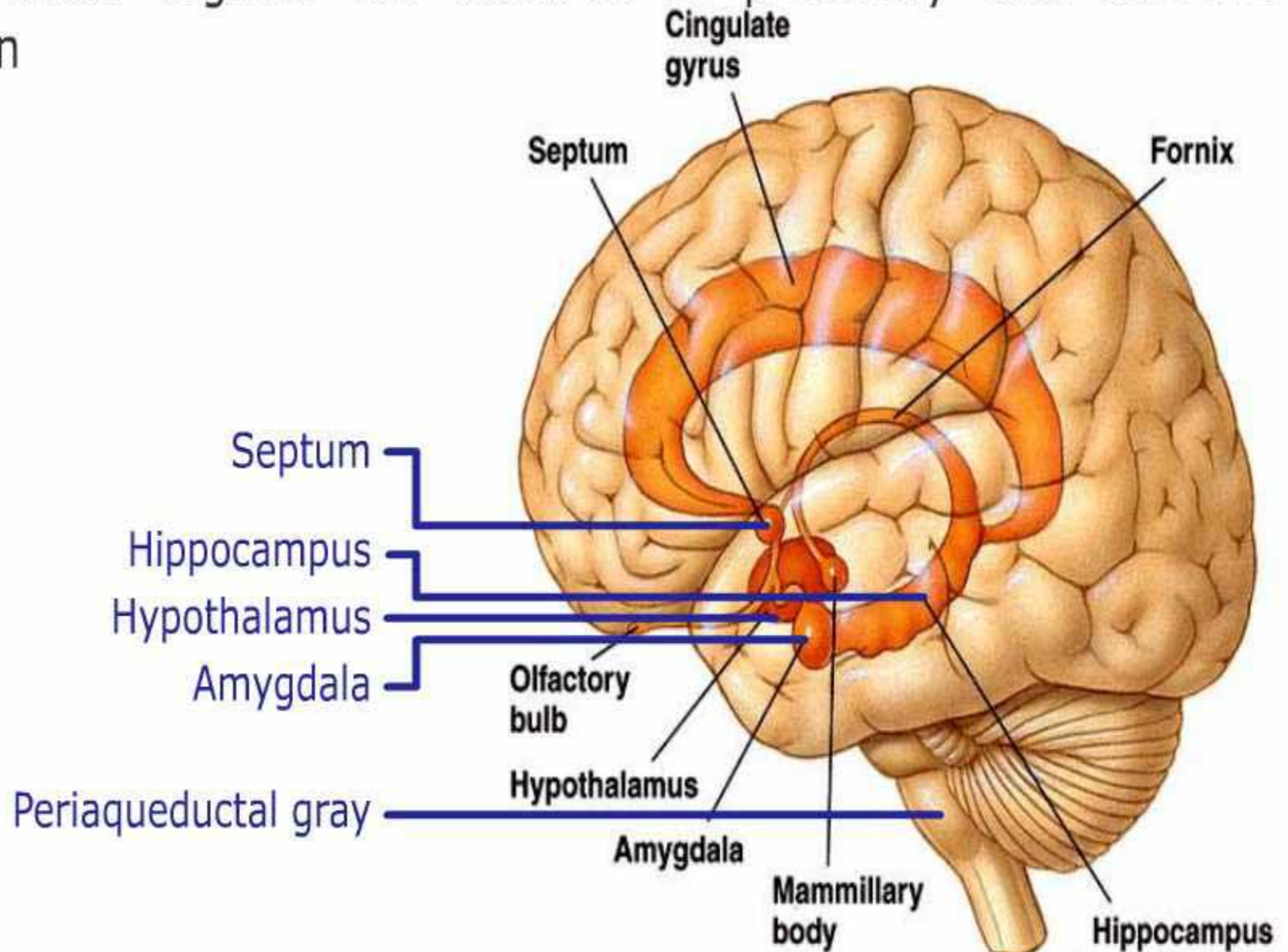
Affective aggression – pupillary dilation, increased heart rate and blood pressure, urination and piloerection

Predatory aggression – pupillary dilation only



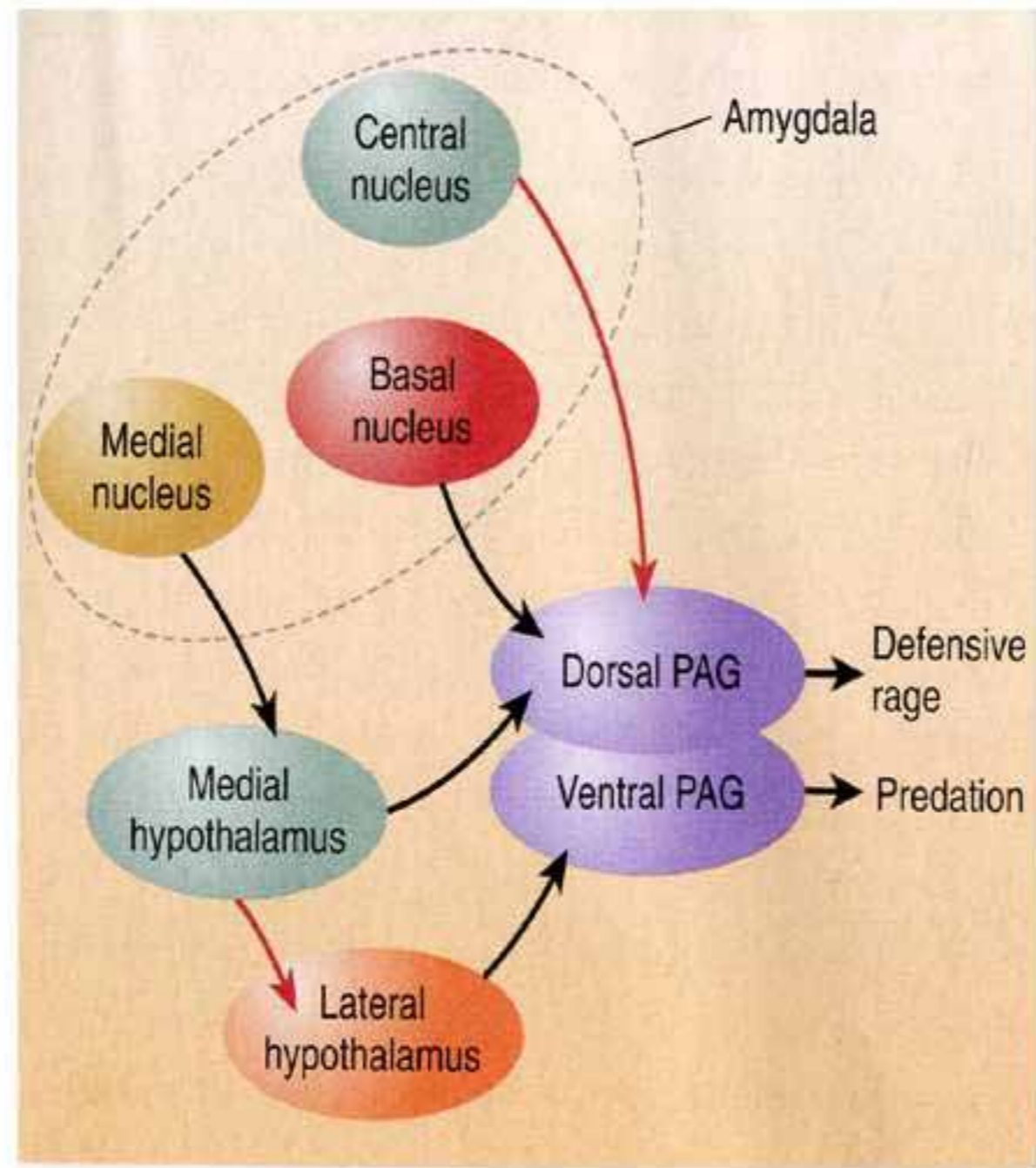
How is aggression controlled by the brain?

Different brain regions are involved in predatory and affective aggression



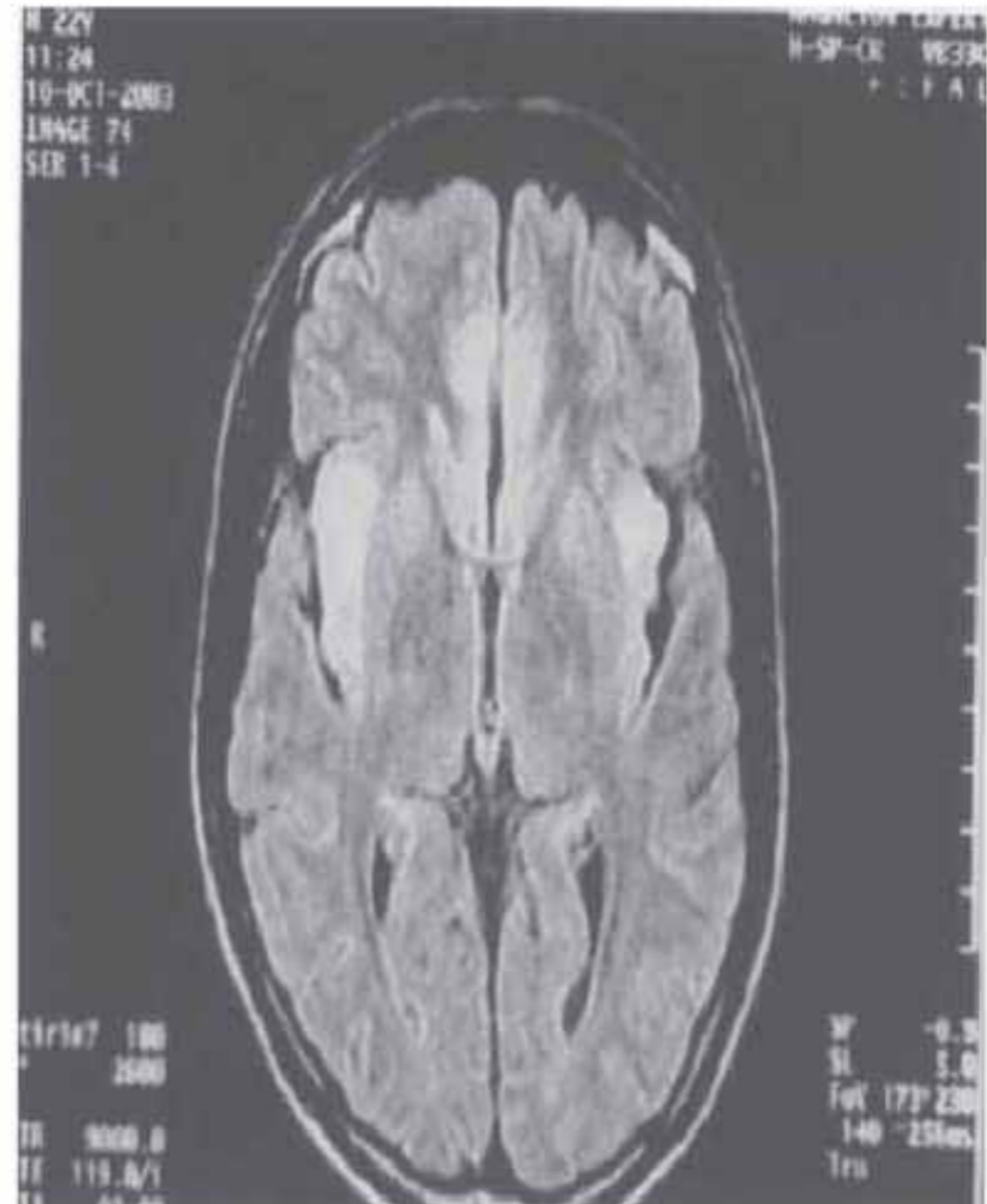
How is aggression controlled by the brain?

Different brain regions are involved in predatory and affective aggression



How is aggression controlled by the brain?

Kluver-Bucey Syndrome



How is aggression controlled by the brain?

Kluver-Bucey Syndrome

Amygdala brain tumour in a mass murderer



Charles Whitman
The 'Texas Tower' sniper

How is aggression controlled by the brain?

Kluver-Bucey Syndrome

Amygdala brain tumour in a mass murderer

Rabies



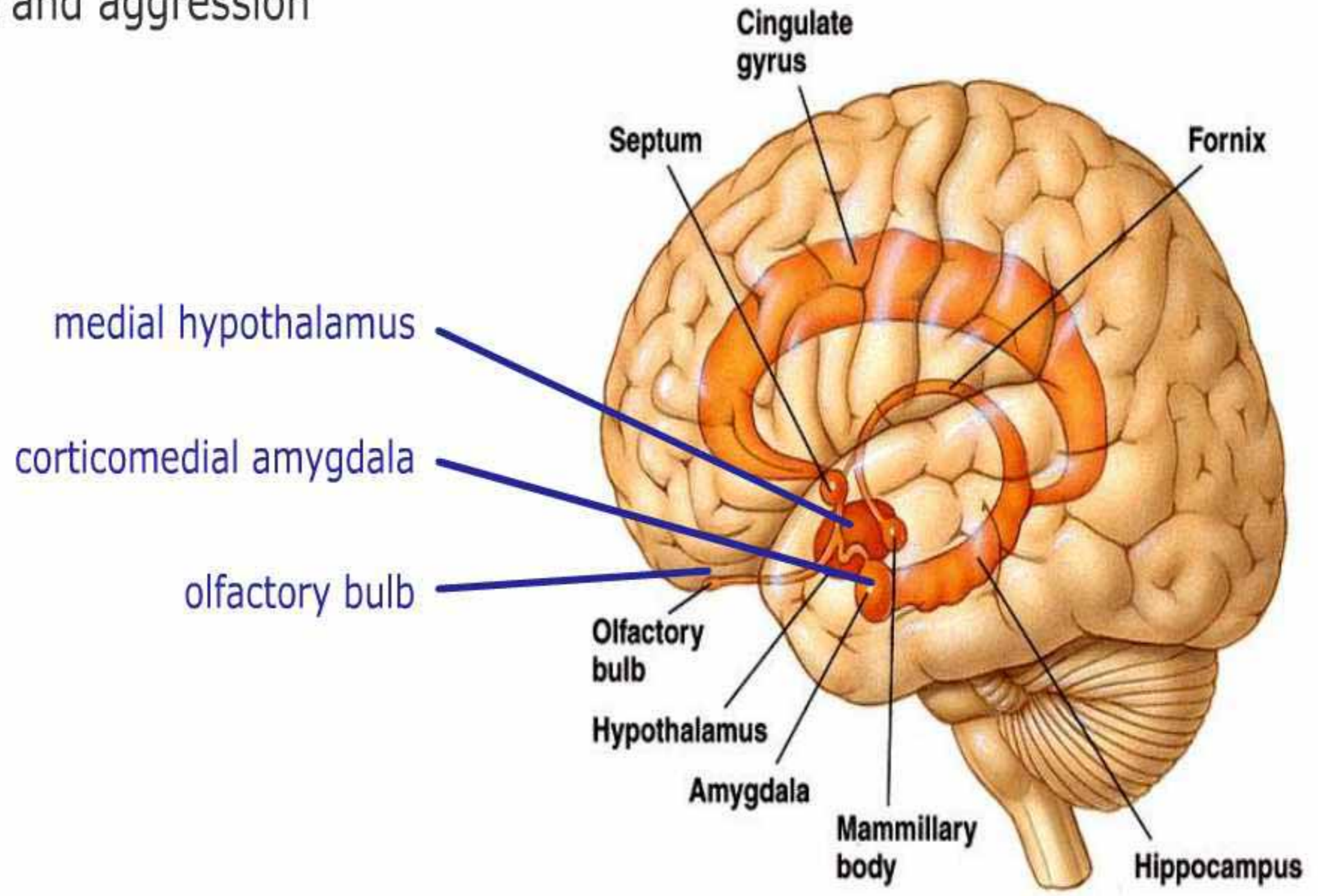
How is aggression controlled by the brain?

Smell and aggression



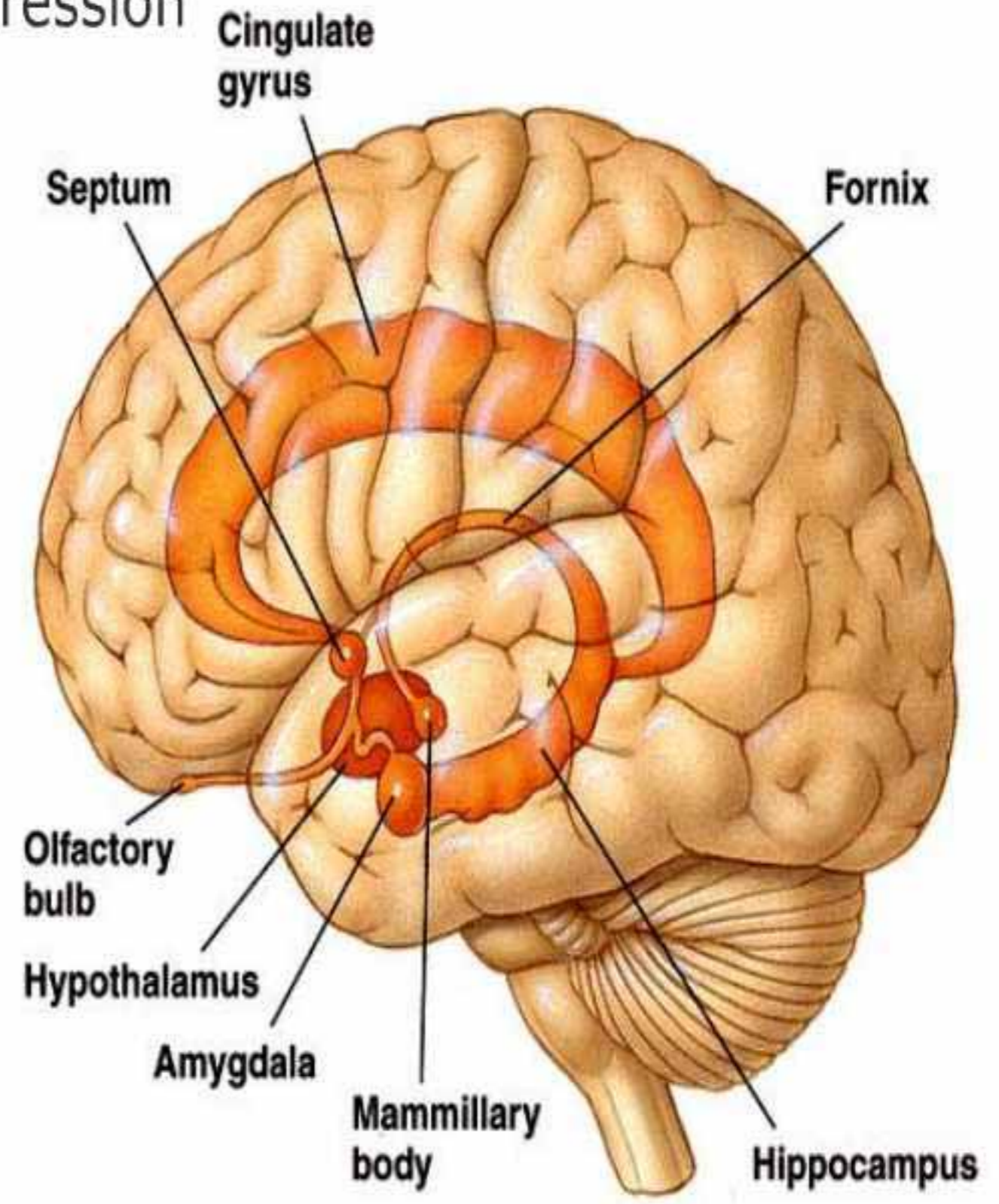
How is aggression controlled by the brain?

Sex and aggression



How is aggression controlled by the brain?

Levels of higher control over aggression

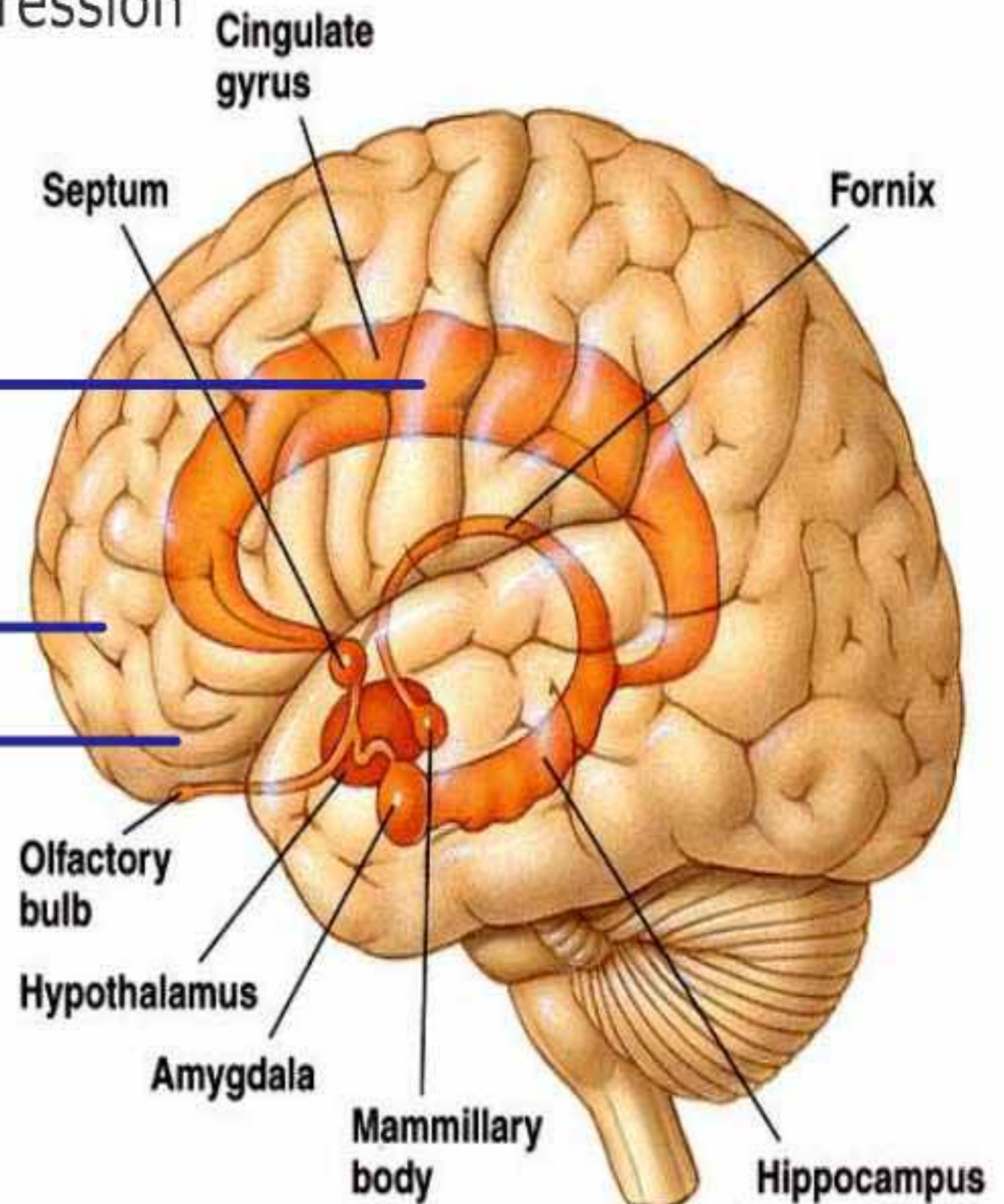


How is aggression controlled by the brain?

Levels of higher control over aggression

Orbitofrontal, prefrontal and cingulate cortices

cingulate cortex
prefrontal cortex
orbitofrontal cortex

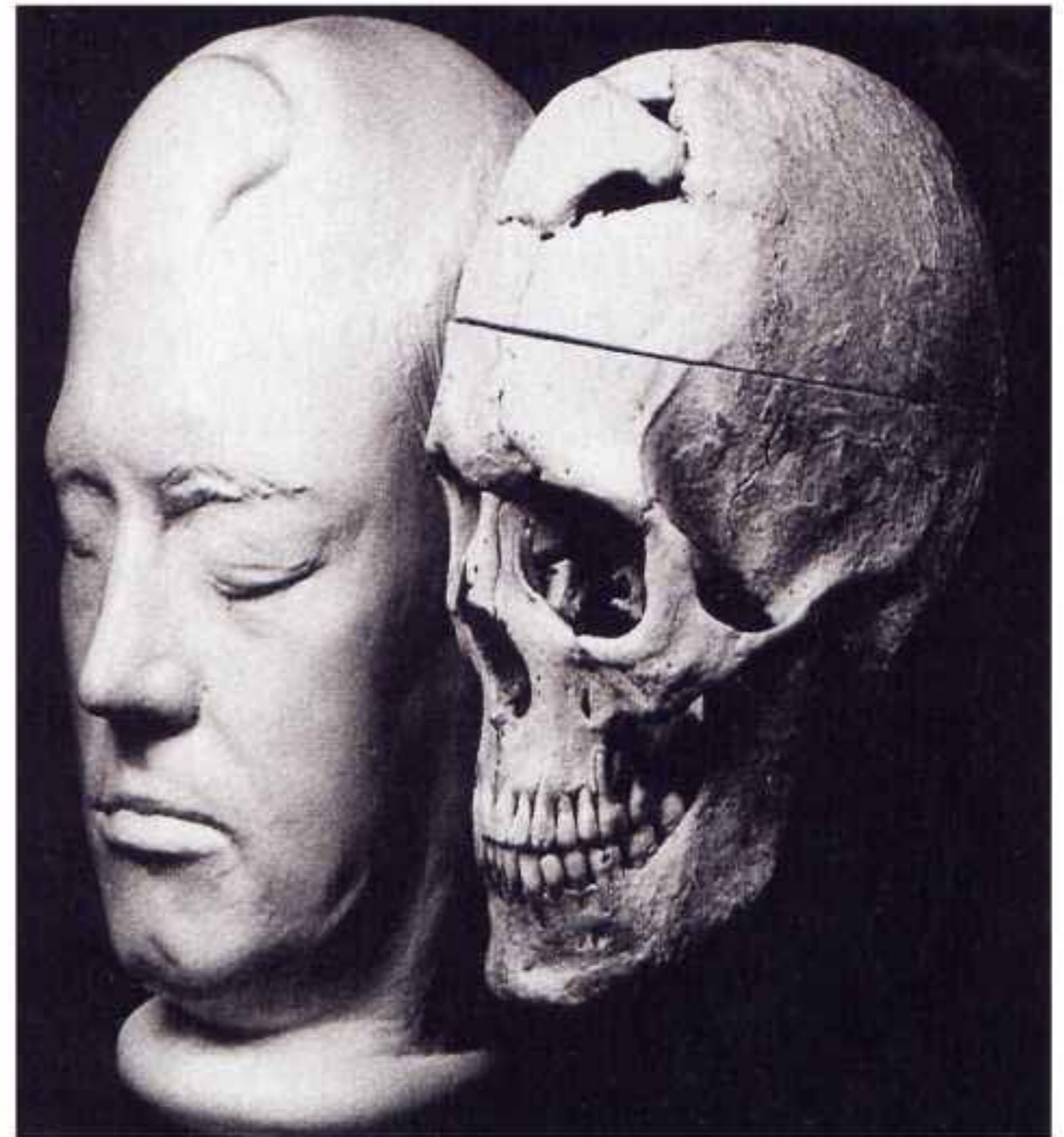


How is aggression controlled by the brain?

Levels of higher control over aggression

Orbitofrontal, prefrontal
and cingulate cortices

The orbitofrontal cortex



Phineas Gage

How is aggression controlled by the brain?

Levels of higher control over aggression

Orbitofrontal, prefrontal
and cingulate cortices

The orbitofrontal cortex

The frontal and cingulate cortices
are less strongly activated by
emotive stimuli in murderers
(Reiss *et al* 1998)



STANLEY KUBRICKS
SHINING

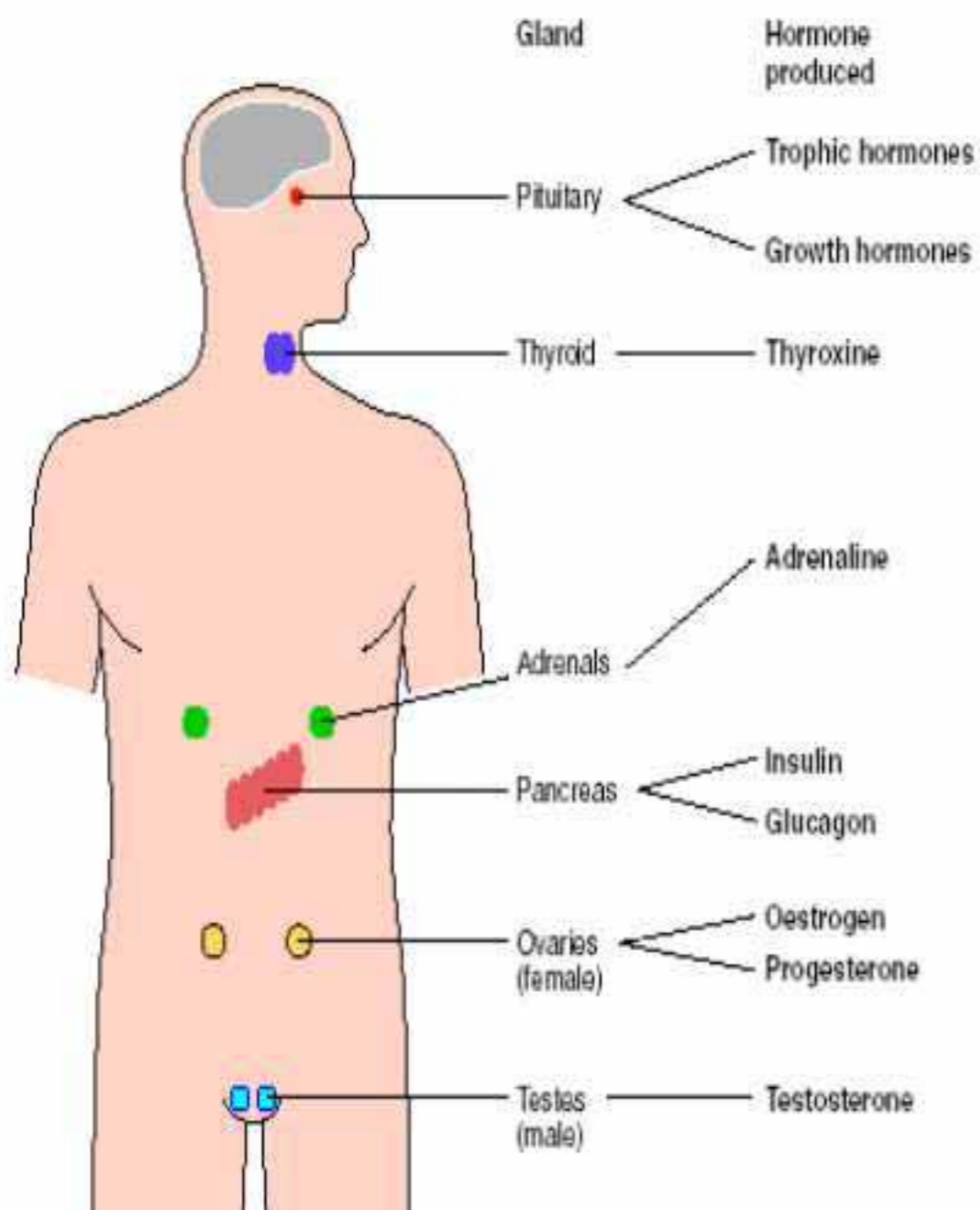
How is aggression controlled by the brain?

Females have a larger orbitofrontal cortex in proportion with amygdala

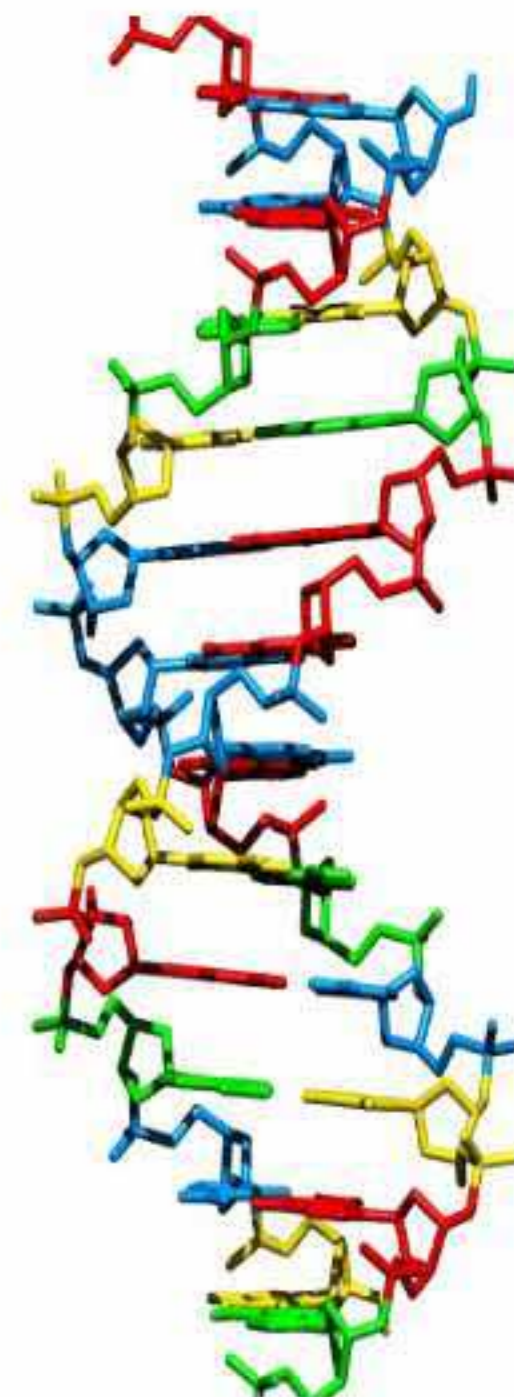
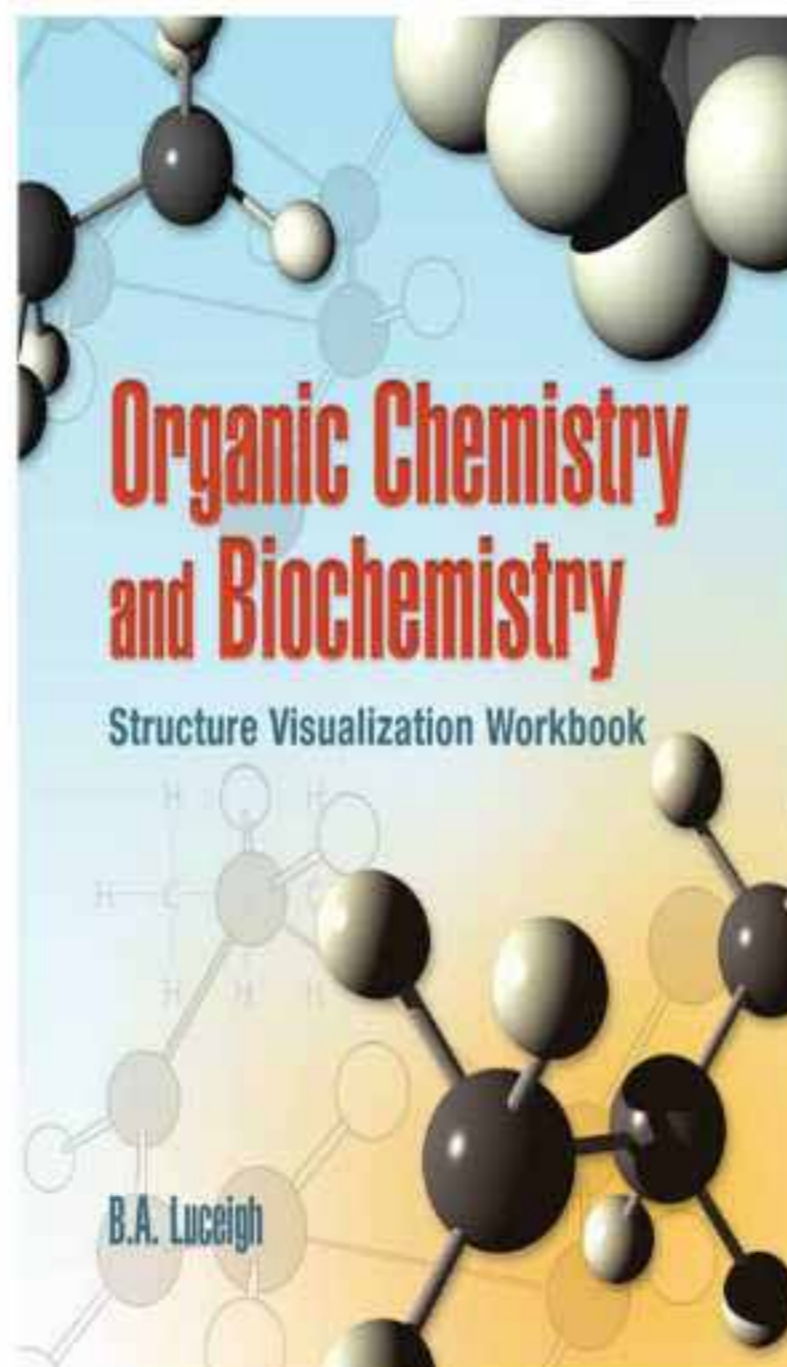


What factors may contribute to excessive aggression?

Hormonal, biochemical and genetic factors?



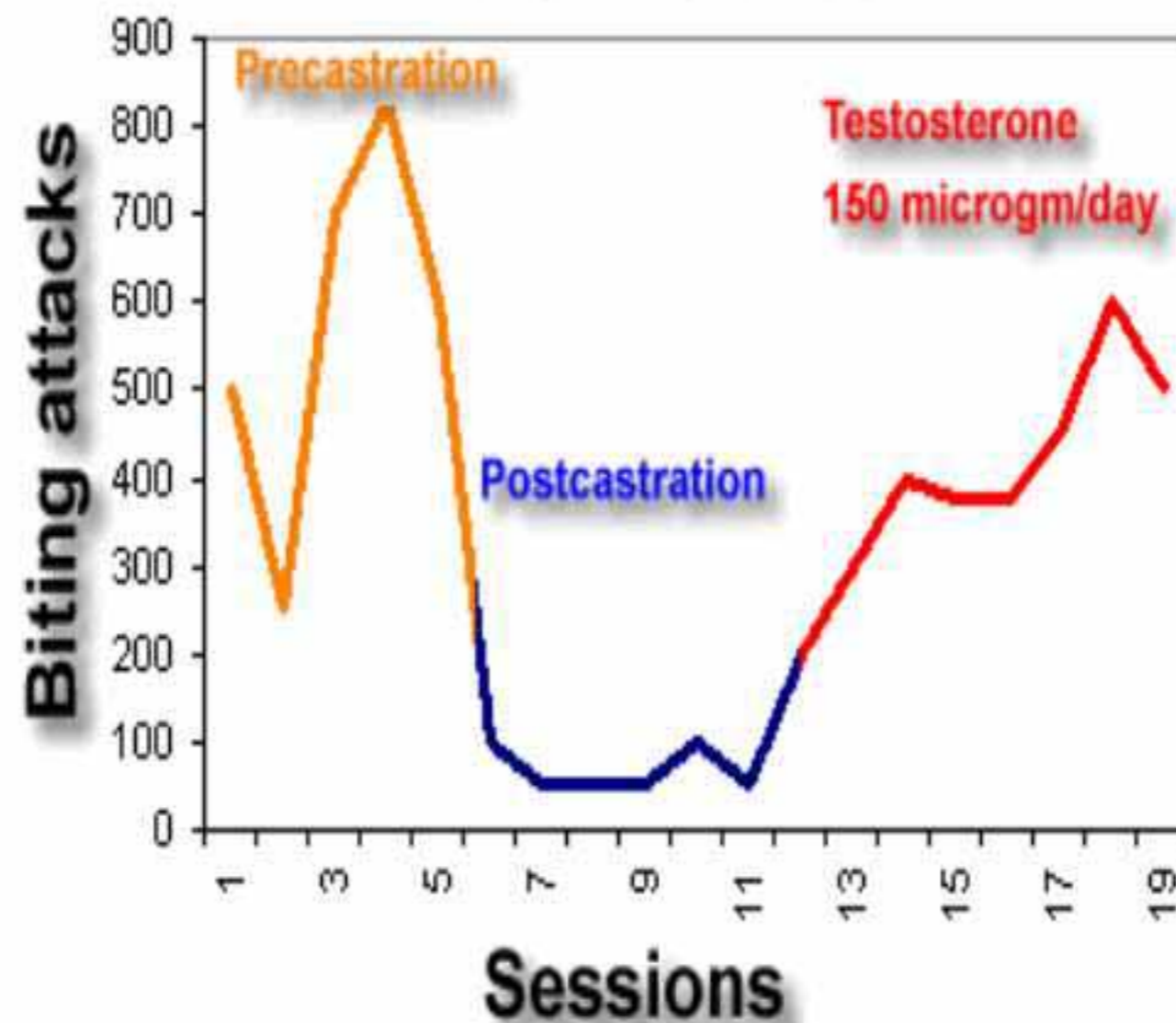
The positions of our glands, the hormones they release and the effects of these hormones



Testosterone

Is aggression just a testosterone-based thing?

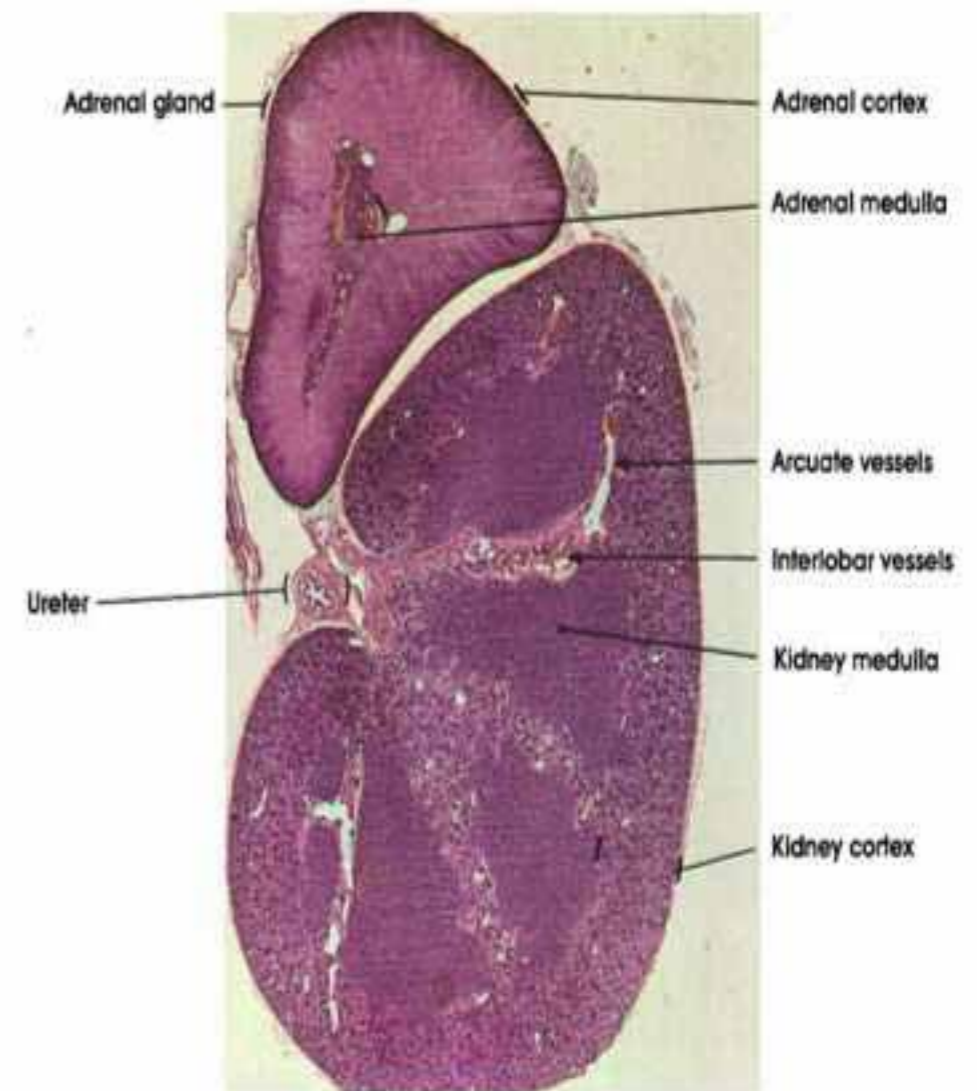
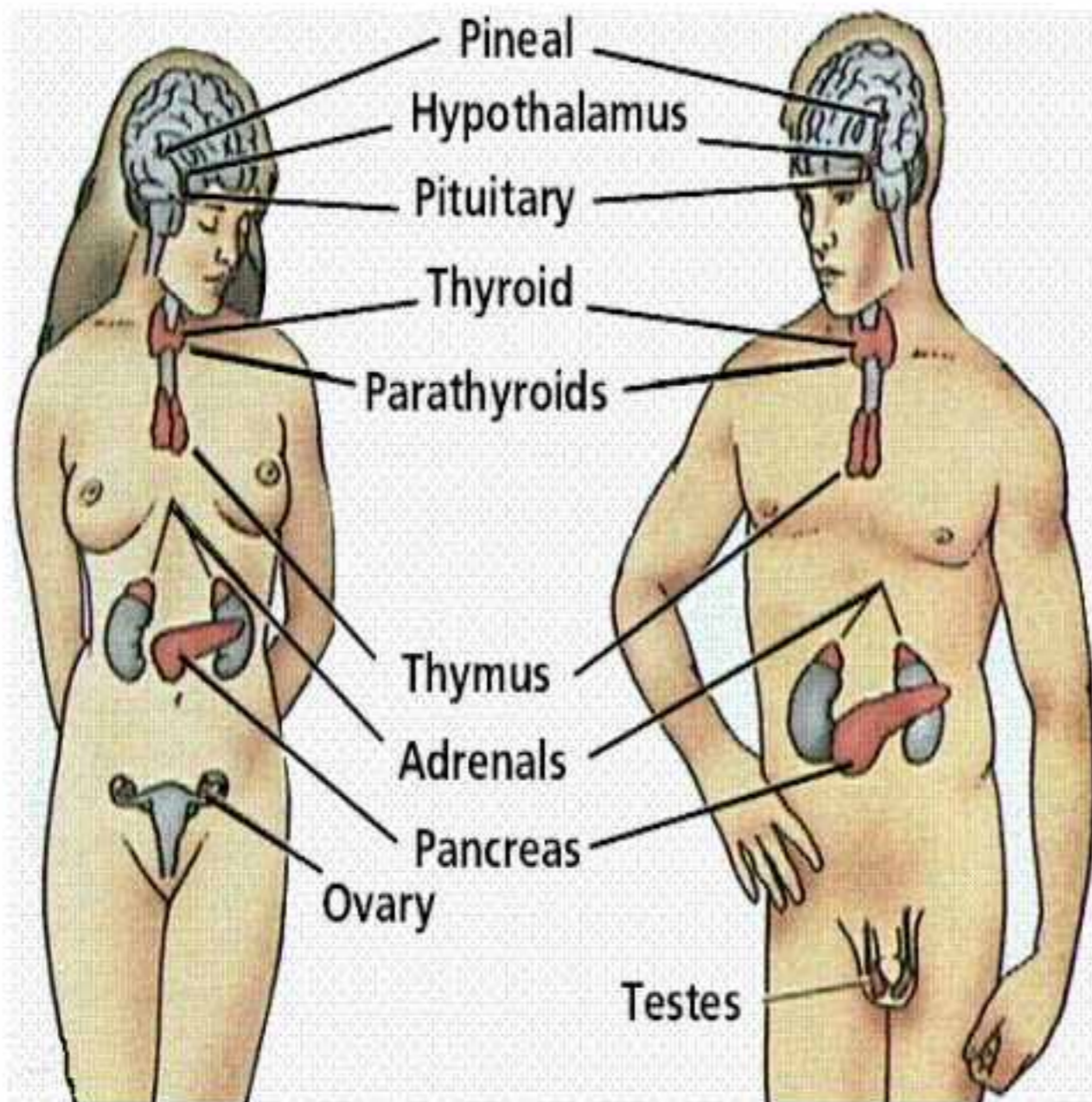
Testosterone Effects on Aggression in Male Mice



Testosterone

Is aggression just a testosterone-based thing?

Testosterone is produced by gonads and adrenals in both sexes



Testosterone

Is aggression just a testosterone-based thing?

Testosterone is produced by gonads and adrenals in both sexes

Adult males have 7 times higher testosterone levels than females



Testosterone

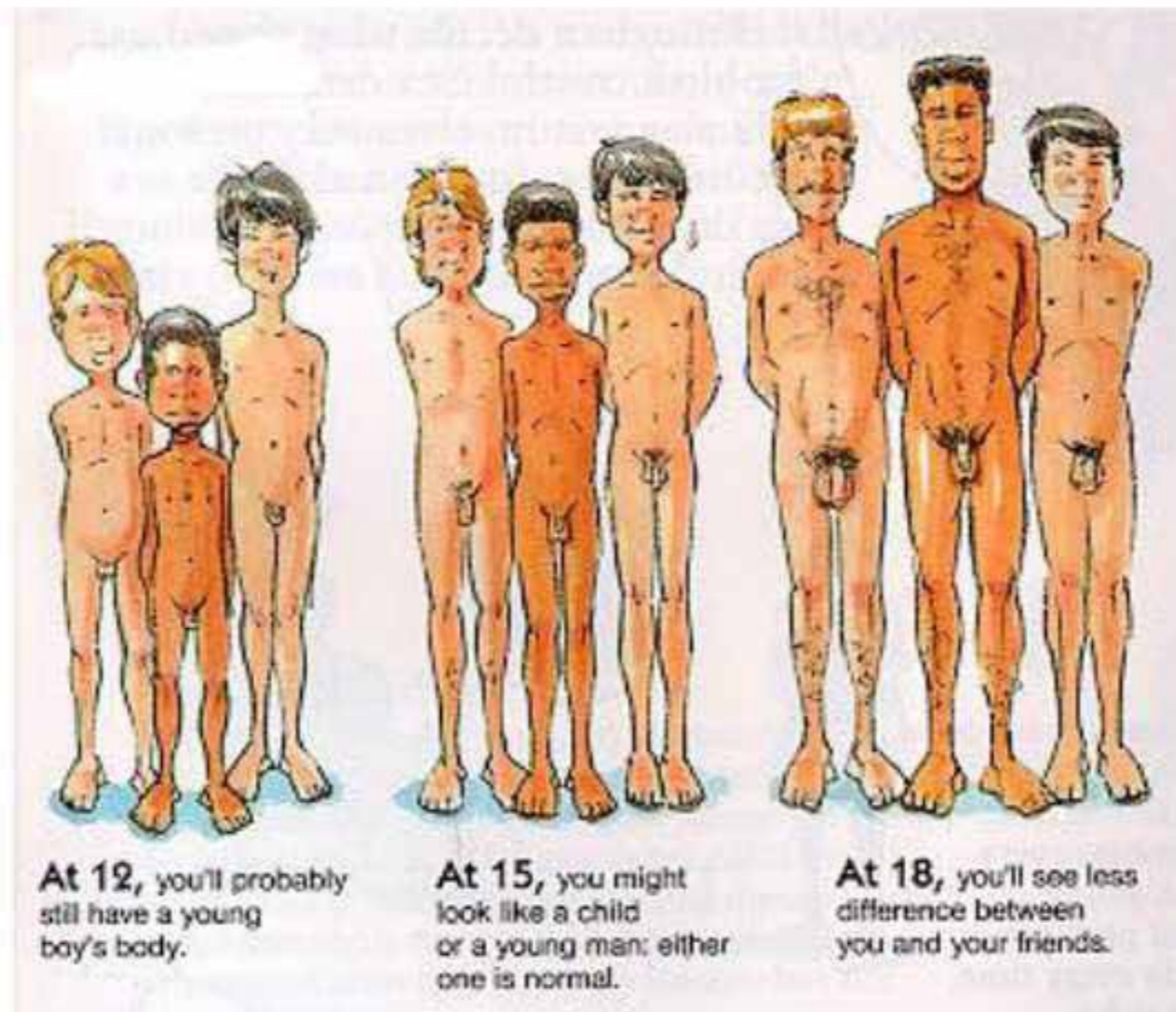
Testosterone maketh man and muscle:



Testosterone

Testosterone maketh man and muscle:

Testosterone changes in early development and at puberty make a male brain

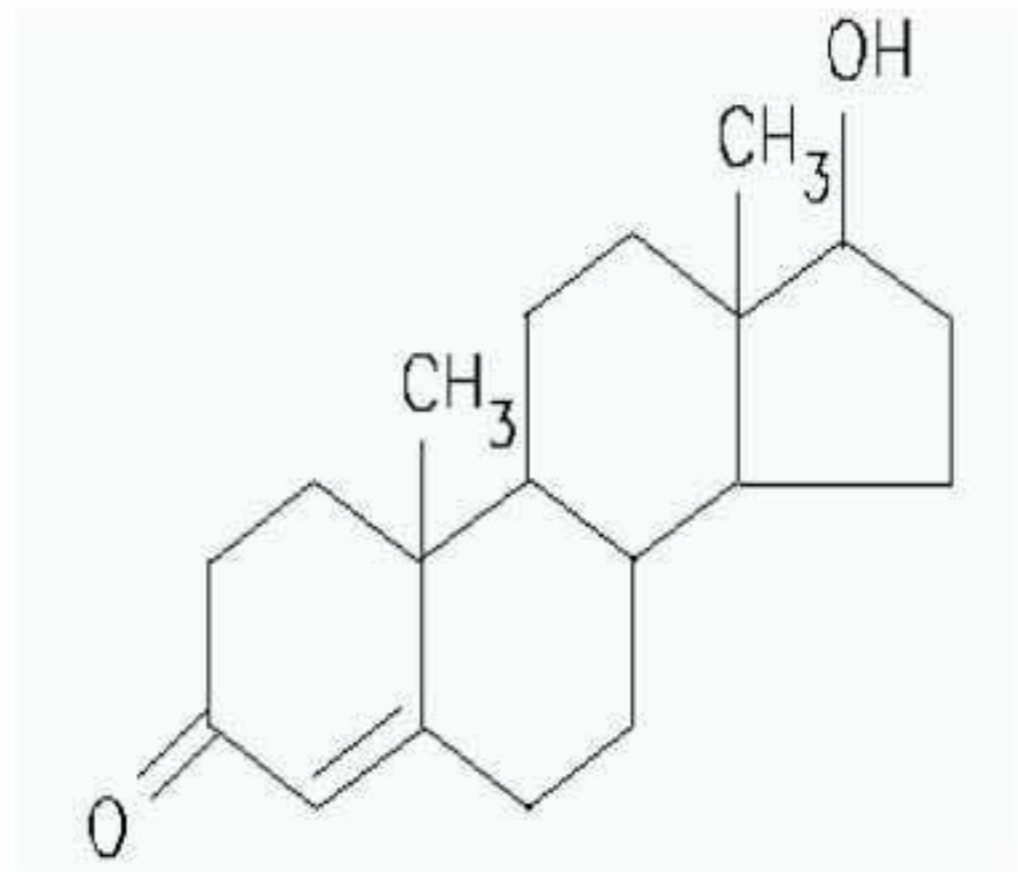
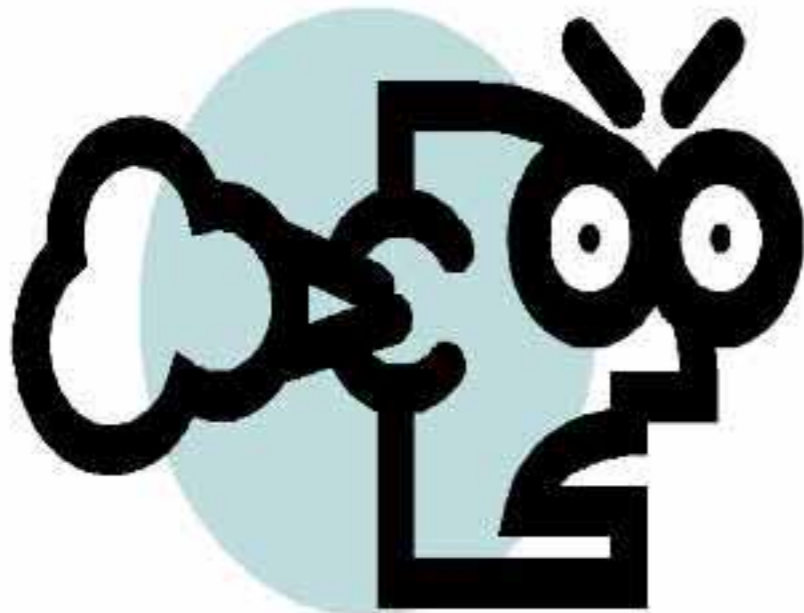


Testosterone

Testosterone maketh man and muscle:

Testosterone changes in early development and at puberty make a male brain

High testosterone levels do not necessarily make males more sexual or aggressive



Testosterone

Testosterone maketh man and muscle:

Testosterone changes in early development and at puberty make a male brain

High testosterone levels do not necessarily make males more sexual or aggressive

They will however boost muscle development!



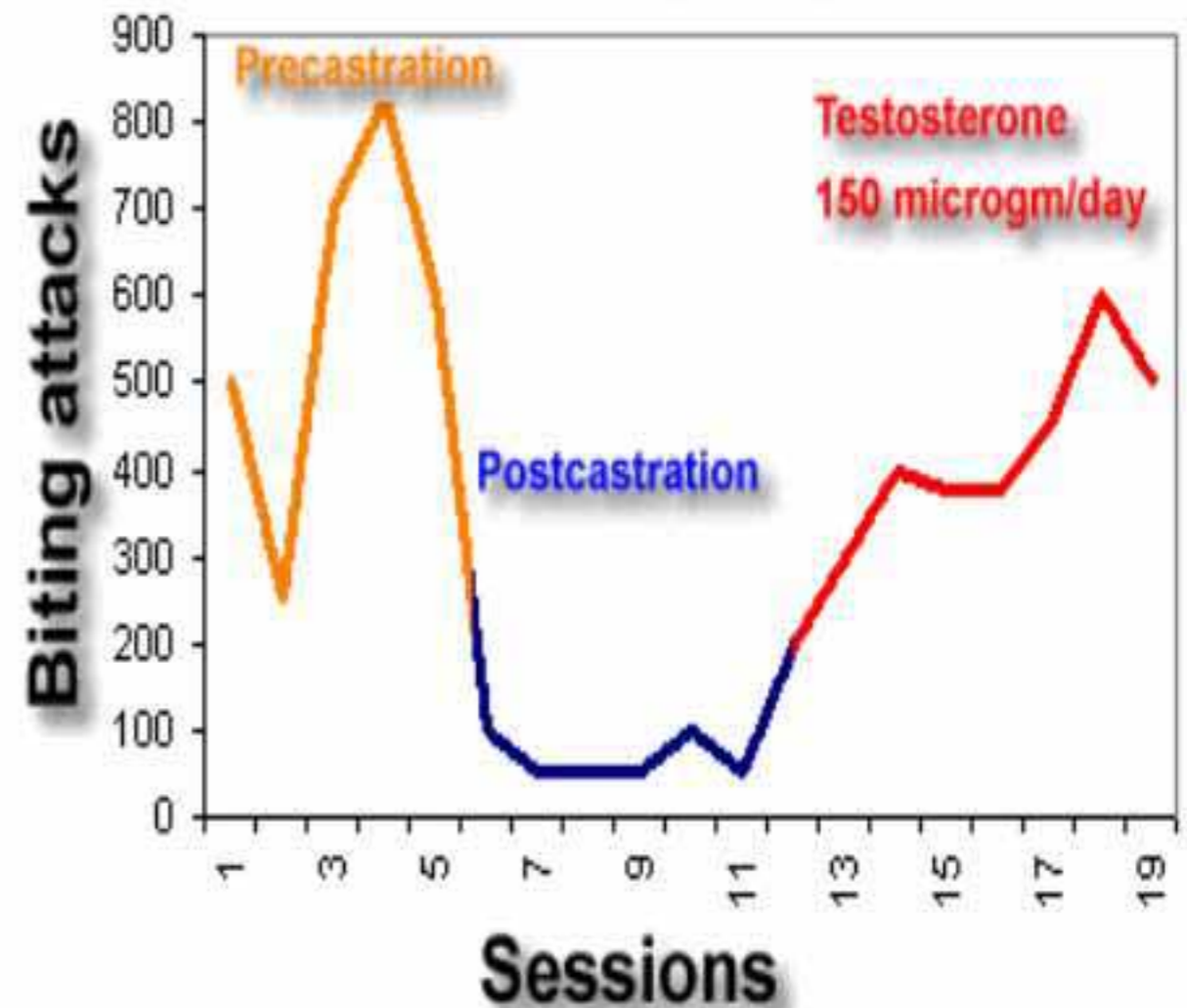
Testosterone

Castration will reduce male sex, aggression and muscle!



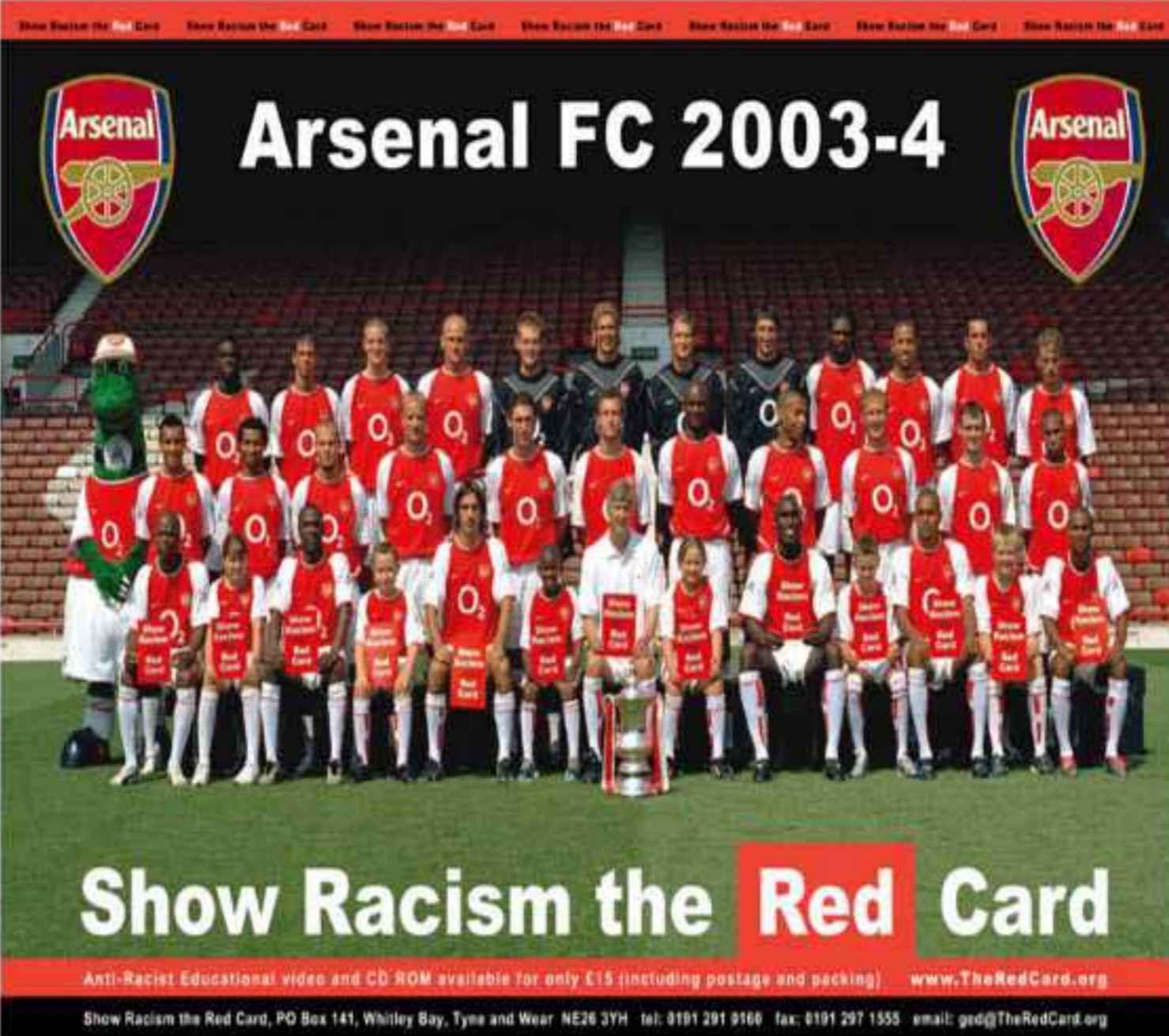
"The Gunch" 1963

Testosterone Effects on Aggression in Male Mice



Testosterone

High testosterone, fighting and football:



The image is a promotional poster for Arsenal FC's 2003-4 season. It features the team's group photo on a football pitch, with the Arsenal crest on either side. The text 'Arsenal FC 2003-4' is prominently displayed in the center. Below the photo, the slogan 'Show Racism the Red Card' is written in large, bold letters, with 'Red' highlighted in a red box. At the bottom, there is a red banner with white text providing contact information for an anti-racist educational video and CD-ROM. The bottom of the poster also features a row of logos for various partner organizations.

Arsenal Arsenal

Arsenal FC 2003-4

Show Racism the Red Card

Anti-Racist Educational video and CD-ROM available for only £15 (including postage and packing) www.TheRedCard.org

Show Racism the Red Card, PO Box 141, Whitley Bay, Tyne and Wear NE26 3YH tel: 0191 291 9160 fax: 0191 297 1555 email: ged@TheRedCard.org

Logos at the bottom include: London Underground, UNISON, Amnesty International, NASUWT, eis, Newcastle City Council, and UMB.

Testosterone

High testosterone, fighting and football:

Socially dominant animals have high testosterone levels



Testosterone

High testosterone, fighting and football:

Socially dominant animals have high testosterone levels

When males win a fight testosterone is increased

When they lose it is decreased



Testosterone

The same is true of football supporters!



Testosterone

High testosterone and crime:



Testosterone

High testosterone and crime:

Prisoners with a prior record of violent and aggressive crimes



Testosterone

High testosterone and crime:

Prisoners with a prior record of violent and aggressive crimes

Rapists who are most violent during the act

The Rape of Helene
Primaticcio 1539



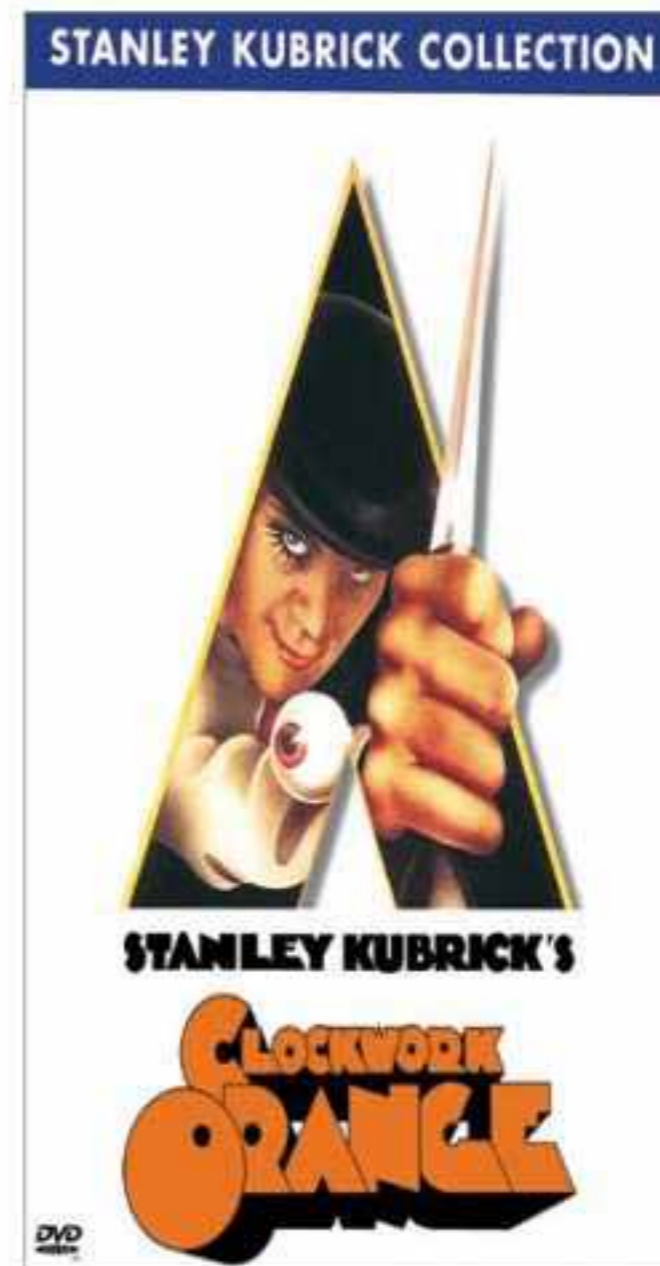
Testosterone

High testosterone and crime:

Prisoners with a prior record of violent and aggressive crimes

Rapists who are most violent during the act

Individuals exhibiting high levels of antisocial violence



Testosterone

High testosterone and marriage:

Men with high basal testosterone levels are less likely to marry

If they do marry they tend to have higher divorce rates due to extramarital sex and aggression



Testosterone

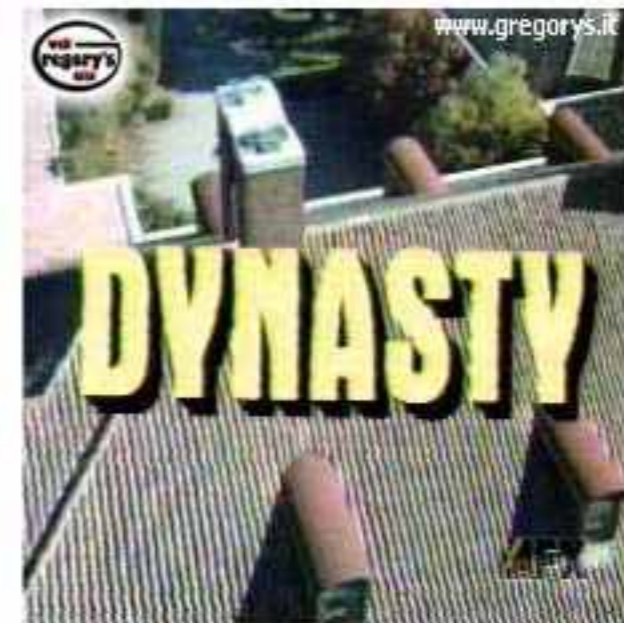
High testosterone in women:



Testosterone

High testosterone in women:

In females only dominance shows some correlation with testosterone



Testosterone

Testosterone: driver or facilitator ?



"The absolute amount of testosterone is highest in humans, followed by lower values in the bonobo, chimpanzee, gorillas, and orangutan."

Derived from Fig 4., Page 68 "Comparative urinary androstanes in the great apes," L.R. Hagey and N.M. Czekala, *General and Comparative Endocrinology* 2003; **130**: 64-69.

Testosterone

Testosterone: driver or facilitator ?

Giving testosterone does not cause aggression

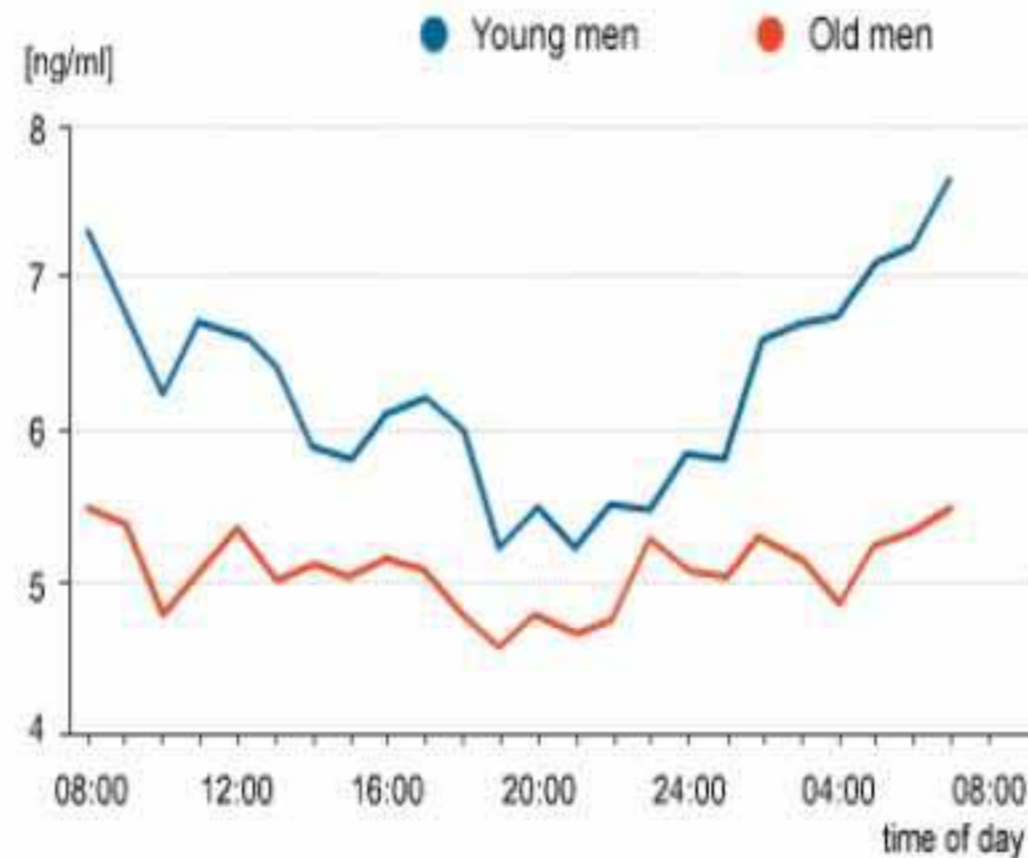


Testosterone

Testosterone: driver or facilitator ?

Giving testosterone does not cause aggression

Highest testosterone levels are when you are asleep!



Testosterone

Testosterone: driver or facilitator ?

Giving testosterone does not cause aggression

Highest testosterone levels are when you are asleep!

Female aggression is not preceded by a rise in testosterone



Testosterone

Testosterone: driver or facilitator ?

Giving testosterone does not cause aggression

Highest testosterone levels are when you are asleep!

Female aggression is not preceded by a rise in testosterone

Winning football supporters are not all bad!



Testosterone

Testosterone: driver or facilitator ?

Giving testosterone does not cause aggression

Highest testosterone levels are when you are asleep!

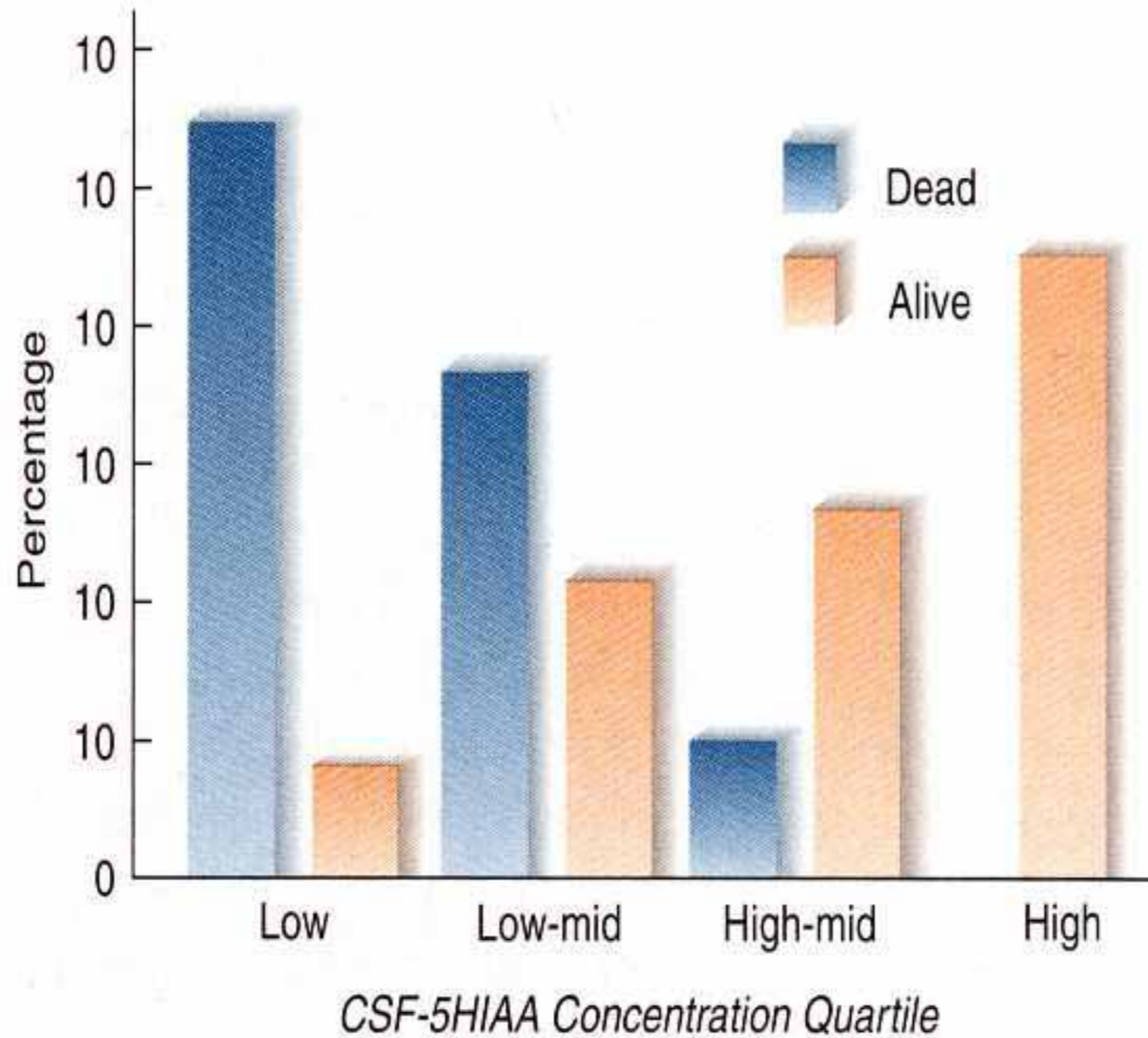
Female aggression is not preceded
by a rise in testosterone

Winning football supporters are not all bad!

In the brain testosterone facilitates responses to sensory cues
(Kendrick & Drewett Science 1979)

Brain neurochemical systems and aggression

Serotonin and aggression



Brain neurochemical systems and aggression

Serotonin and aggression

Low serotonin is also associated with poor social skills



Brain neurochemical systems and aggression

Serotonin and aggression

Low serotonin is also associated with poor social skills

Serotonin transporter gene (5-HTT)

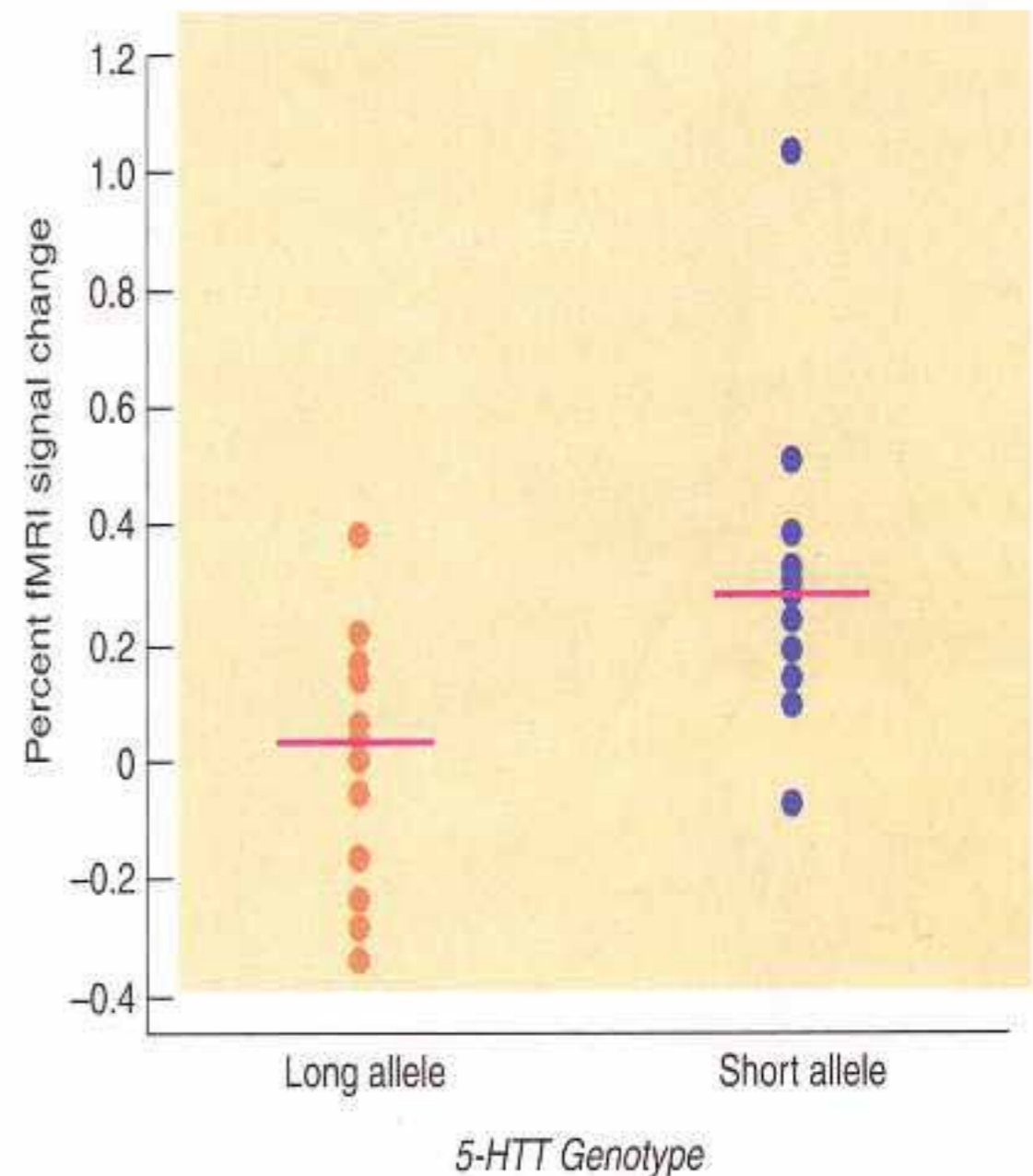


Choice1

Sample

Choice 2

(a)



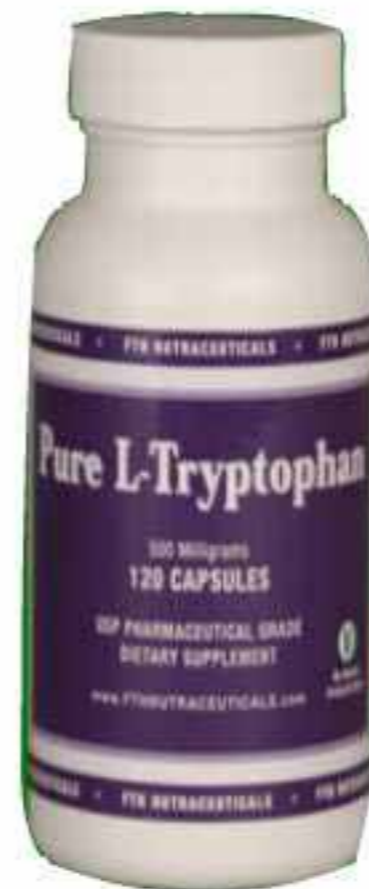
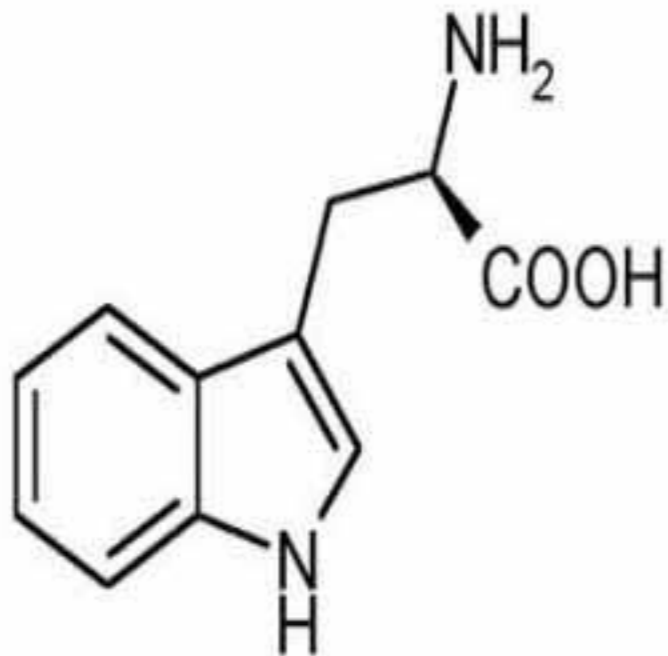
Brain neurochemical systems and aggression

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Diets low in tryptophan can increase aggression



Brain neurochemical systems and aggression

Serotonin and aggression

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What about Prozac ?



Other inhibitors of aggression

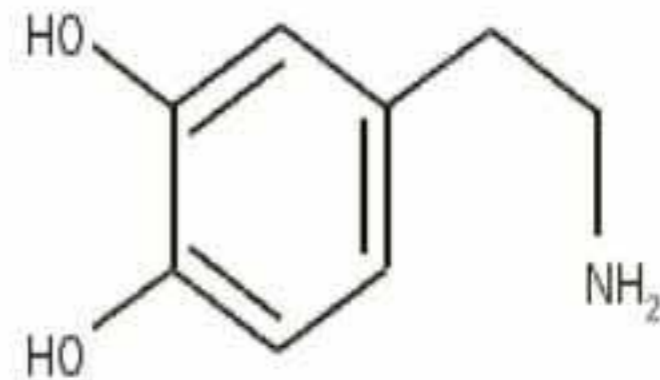
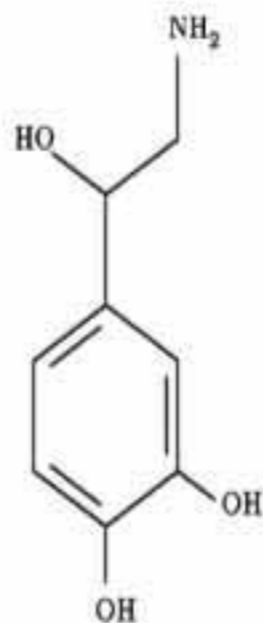
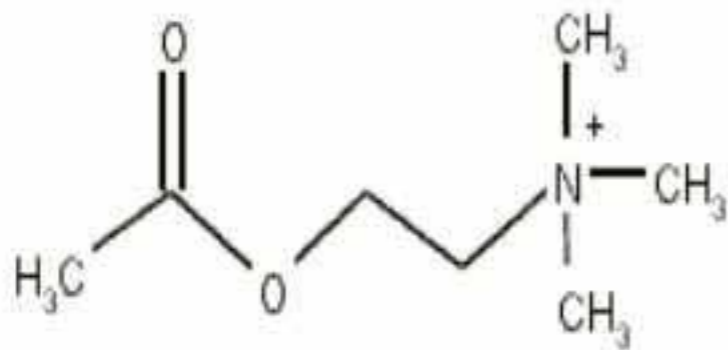
Gamma-aminobutyric acid (GABA), endogenous opioids, endorphins
(barbiturates, benzodiazepines and morphine)



Other inhibitors of aggression

Stimulators of aggression:

Acetylcholine, noradrenaline and dopamine, cholecystokinin, substance P, and arginine vasopressin



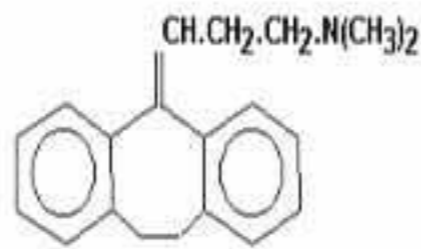
H₂N-Phe-Asp-Met-Trp-Gly-Met-Tyr-Asp-Arg-Asp-Ser-Ile-Arg-His-Ser-Pro-Asp-Leu-Ser-Glu-Leu-Asn-Lys-Ile-Met-Ser-Val-Arg-Gly-Ser-Pro-Ala-Lys-COOH

Cys-Tyr-Phe-Gln-Asn-Cys-Pro-Arg-Gly-NH₂

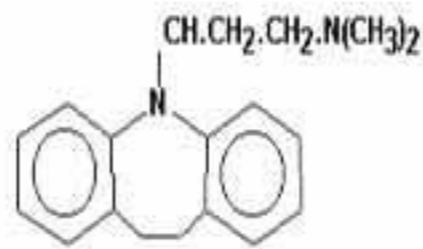
Other inhibitors of aggression

Increased aggression:

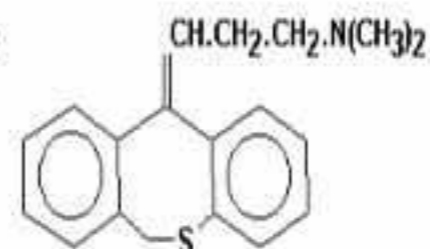
Tricyclic antidepressants and monoamine oxidase inhibitors



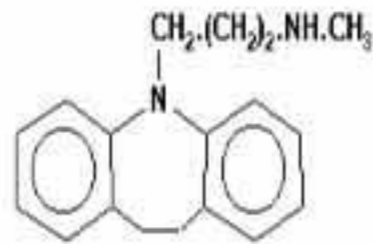
AMITRIPTYLINE



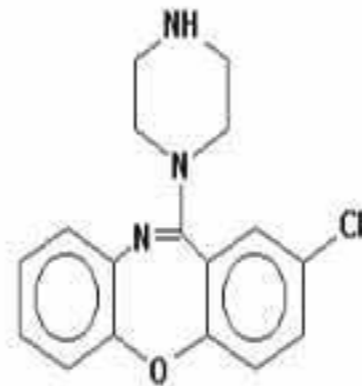
IMIPRAMINE



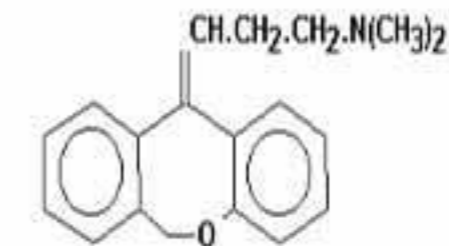
DOTHIEPIN



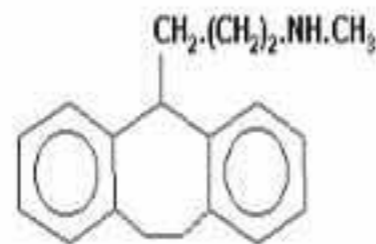
DESIPRAMINE



AMOXAPINE



DOXEPIN



PROTRIPTYLINE

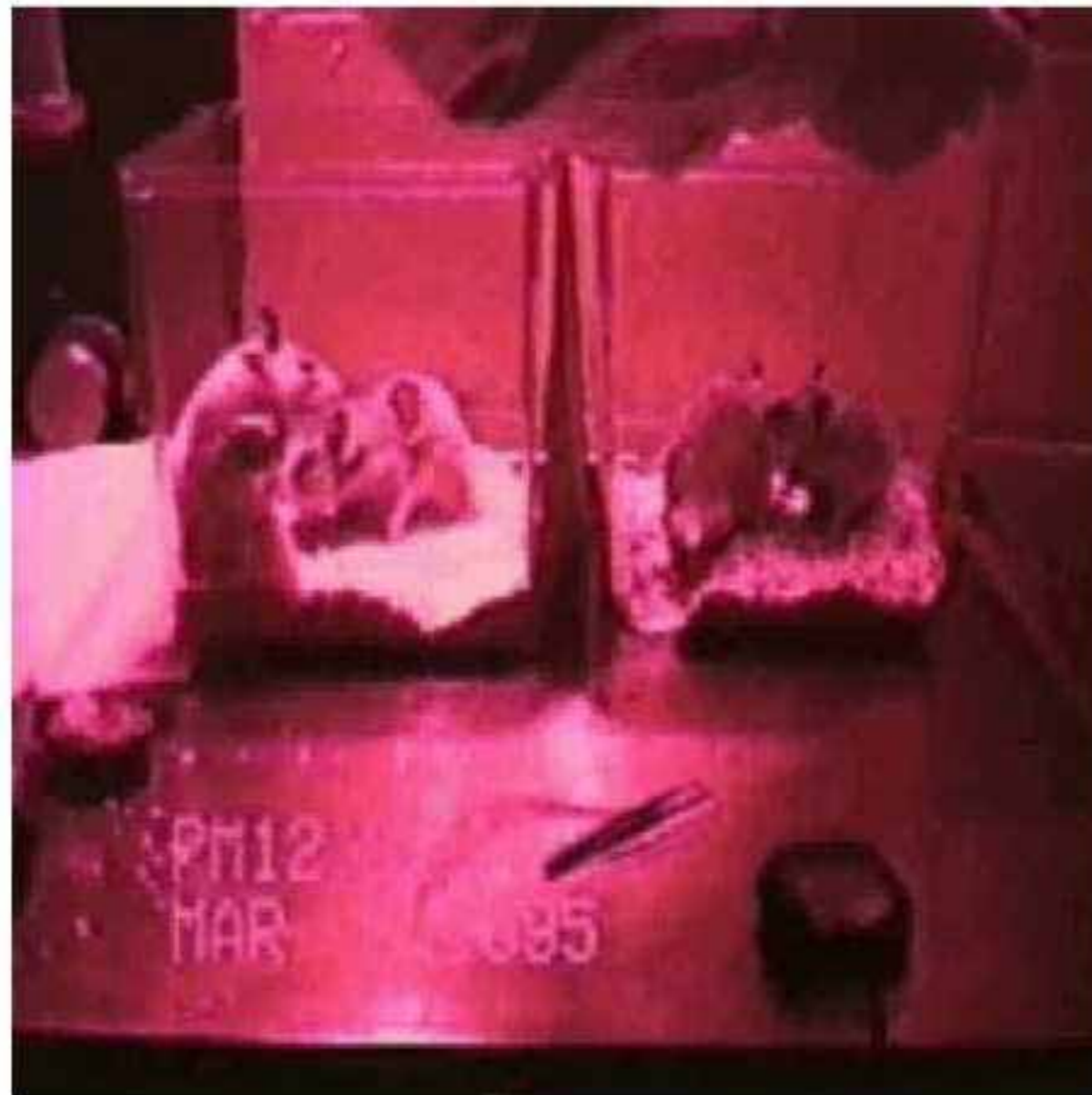
Other inhibitors of aggression

Decreased aggression:
Beta-blockers and haloperidol



Other inhibitors of aggression

Arginine vasopressin and male aggression

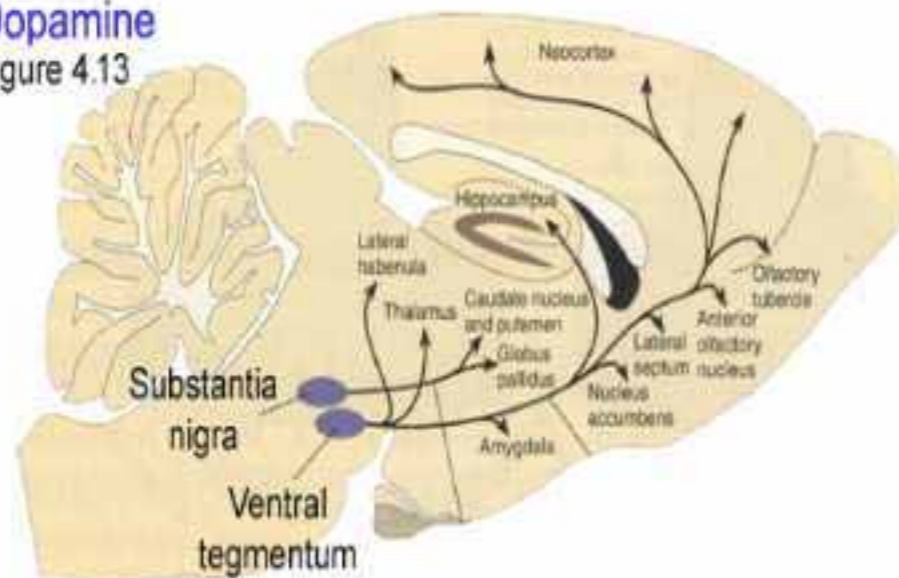


Other inhibitors of aggression

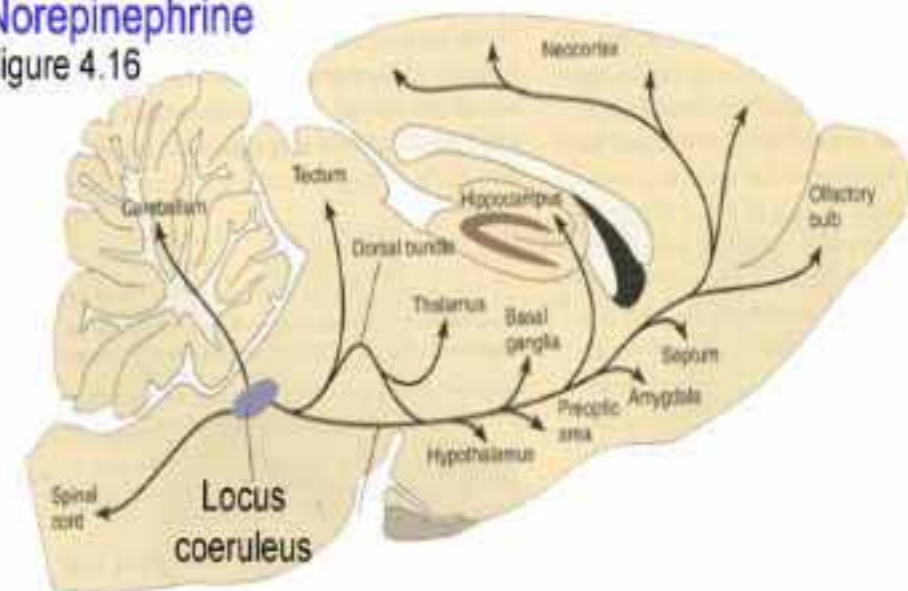
Arginine vasopressin and male aggression

Modulates serotonin, noradrenaline and dopamine

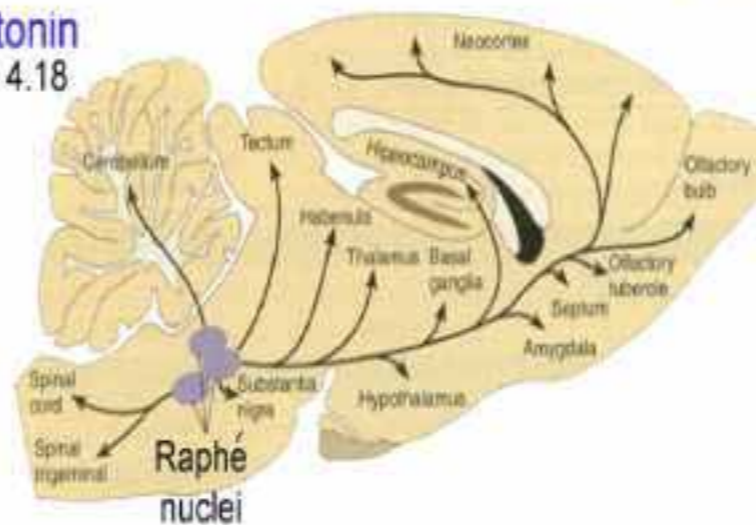
Dopamine
Figure 4.13



Norepinephrine
Figure 4.16



Serotonin
Figure 4.18

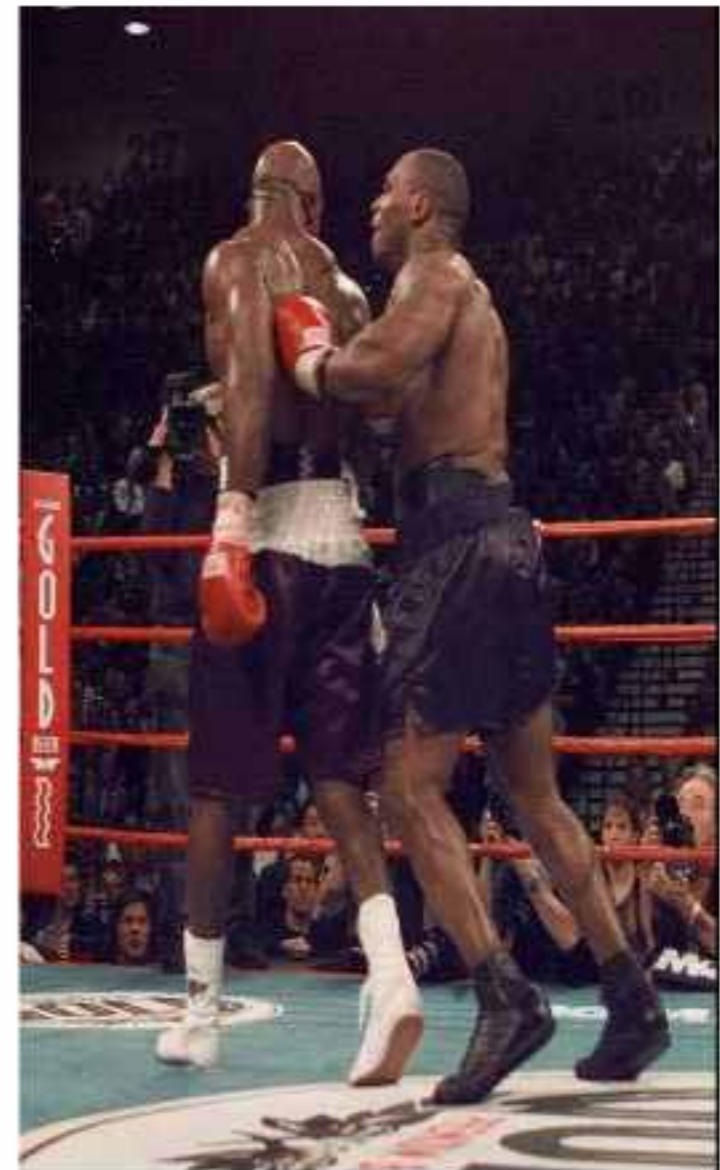


Other inhibitors of aggression

Arginine vasopressin and male aggression

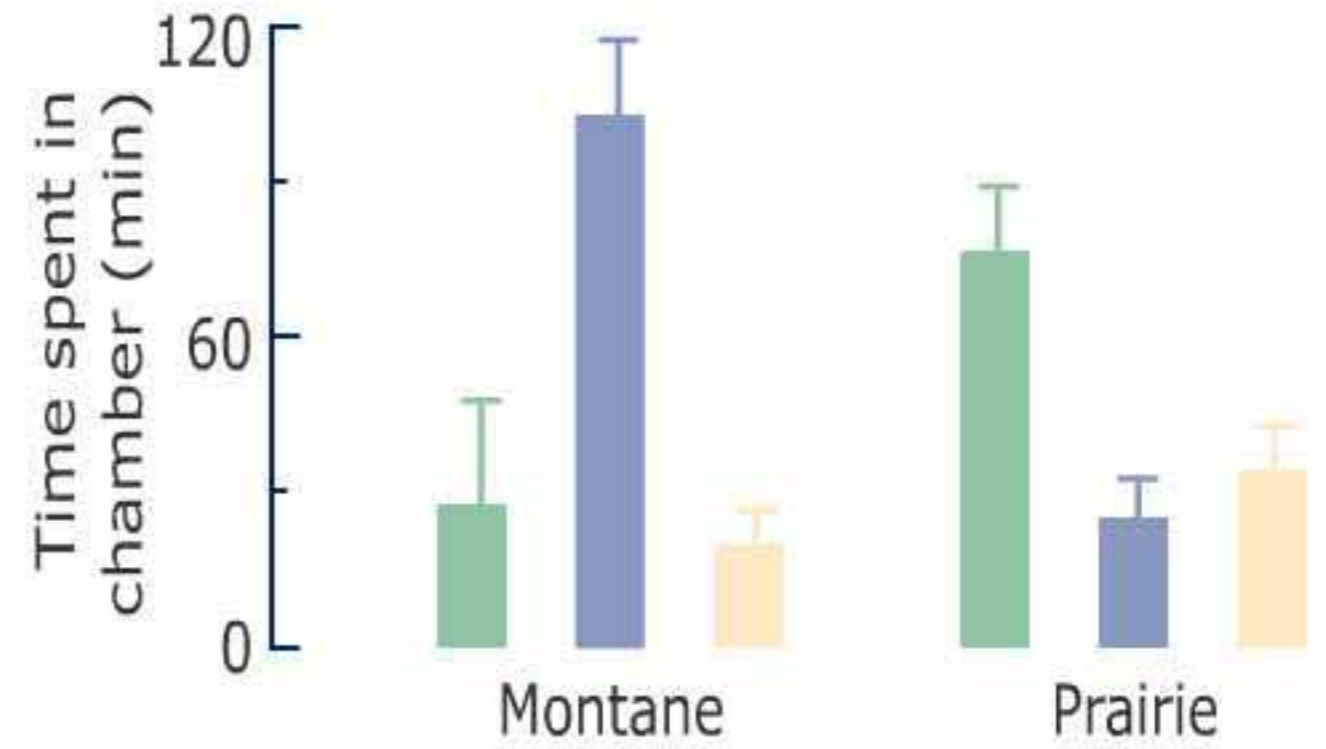
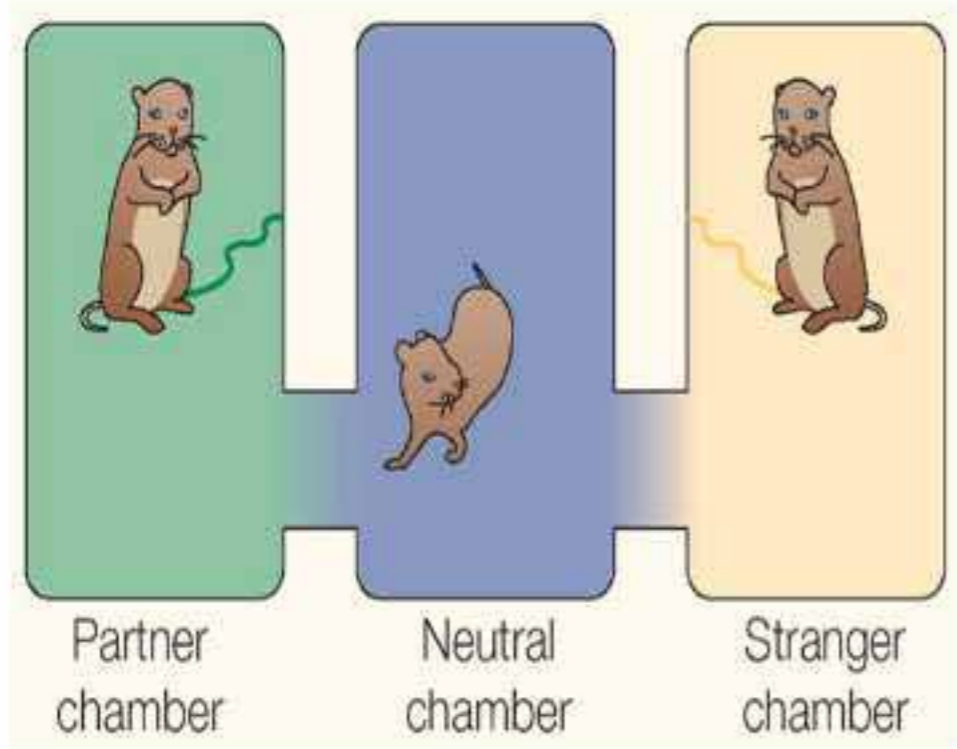
Modulates serotonin, noradrenaline and dopamine

High levels in brains of aggressive humans



Other inhibitors of aggression

Vasopression also stimulates social bonds in male voles and mice



Other inhibitors of aggression

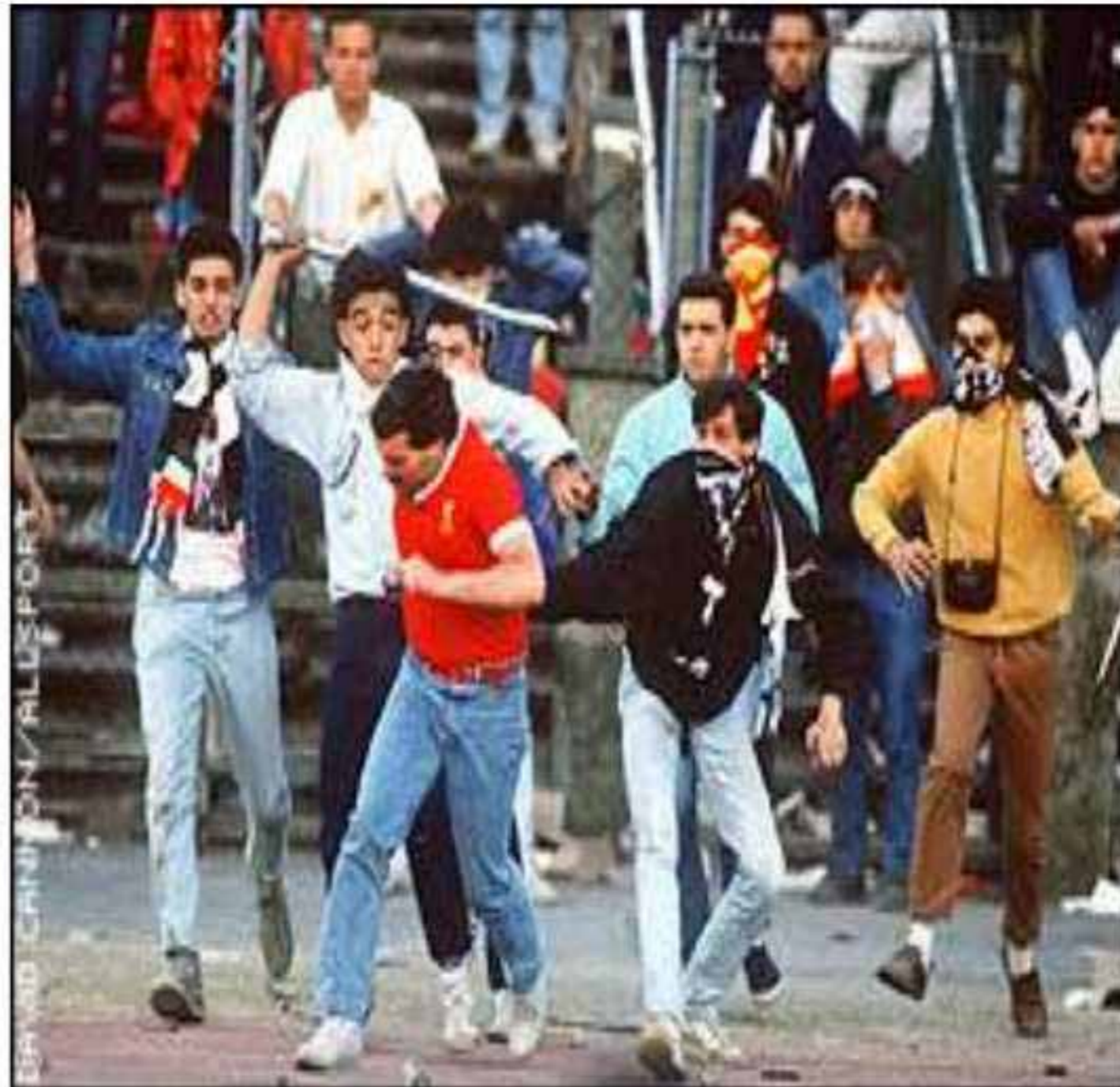
Vasopression also stimulates social bonds in male voles and mice

Oxytocin, which stimulates bonds in females inhibits aggression!

Cys-Tyr-Ile-Gln-Asn-Cys-Pro-Leu-Gly-NH₂

Alcohol, drugs and aggressive behaviour

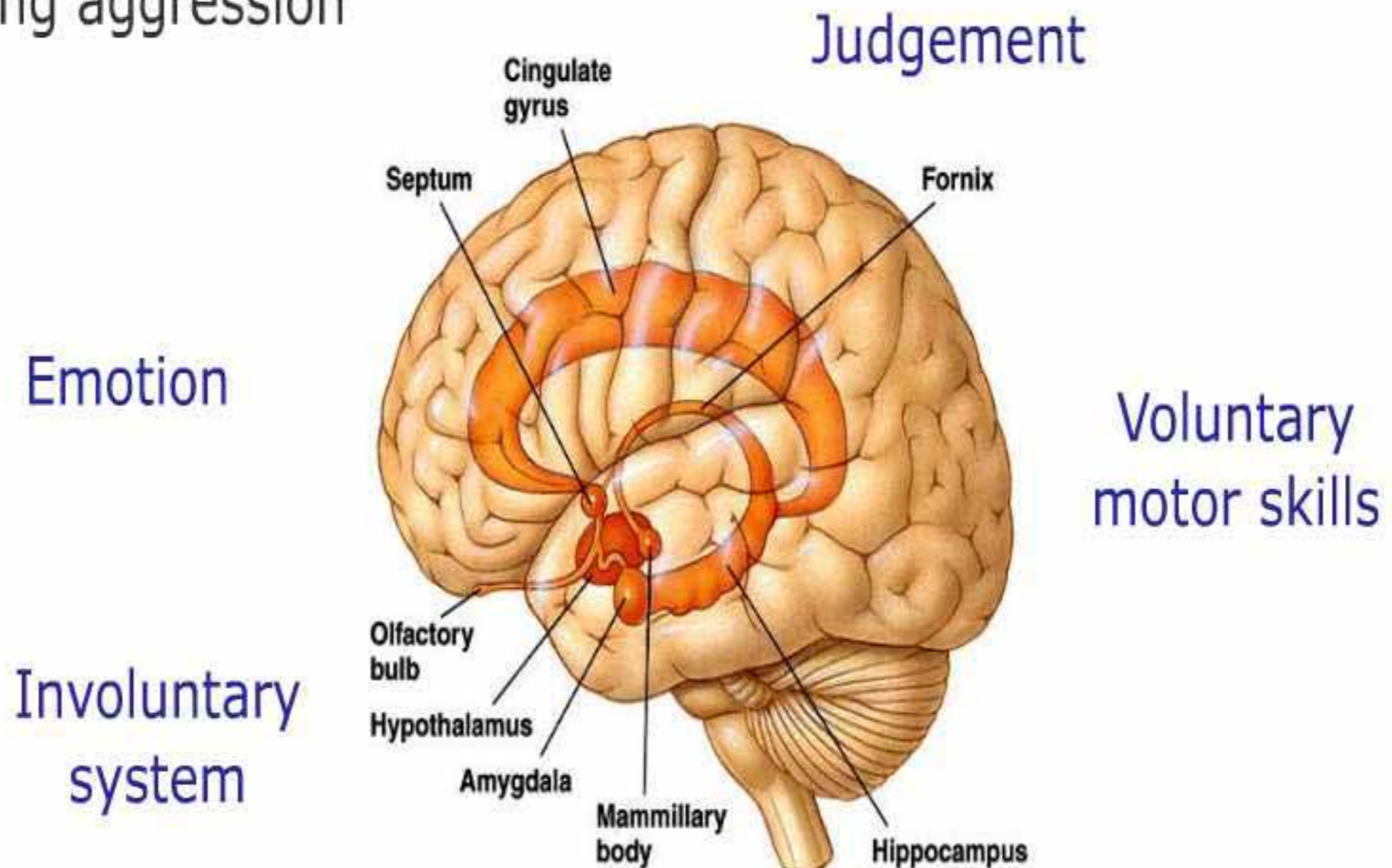
In half of violent crimes perpetrators have consumed alcohol or drugs



Alcohol, drugs and aggressive behaviour

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Alcohol inhibits brain centres
controlling aggression

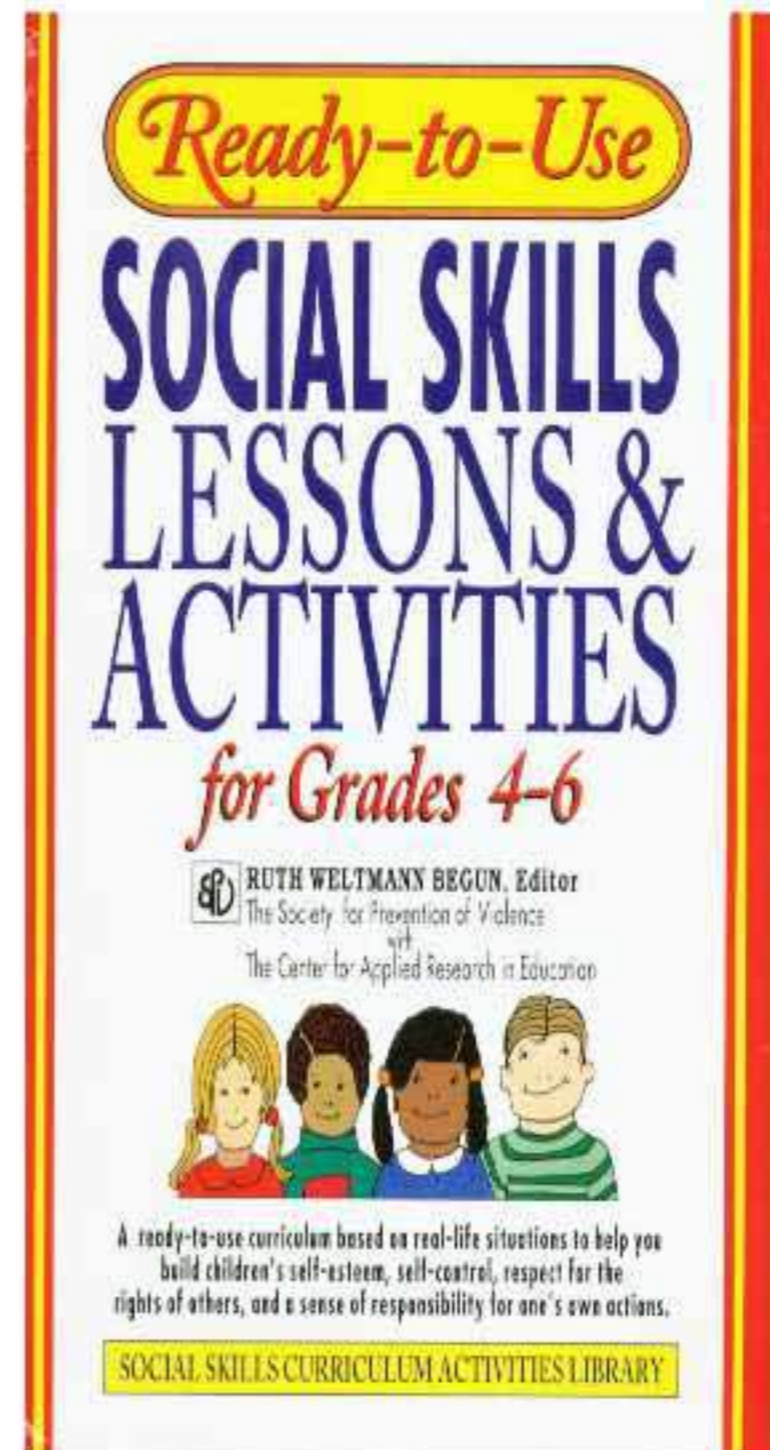


Alcohol, drugs and aggressive behaviour

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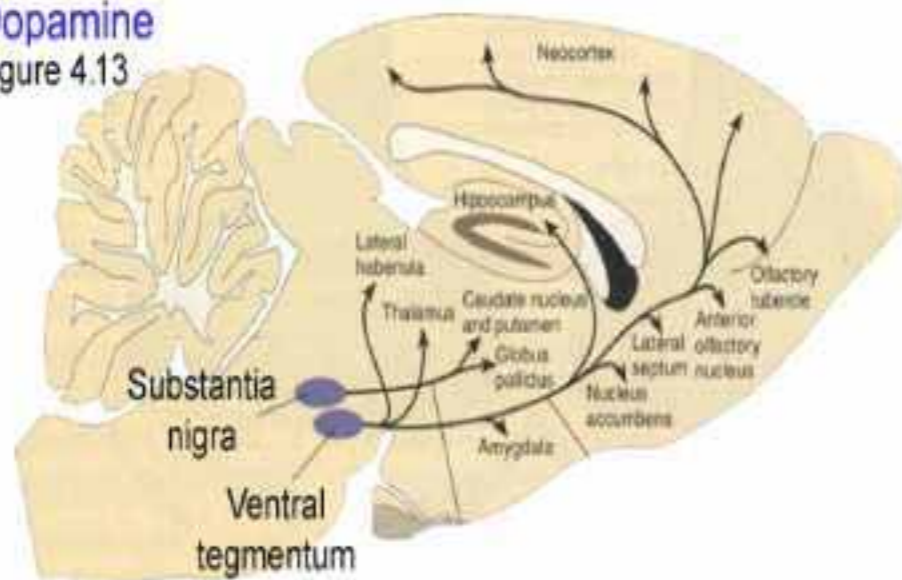
Interferes with perception and
interpretation of social signals



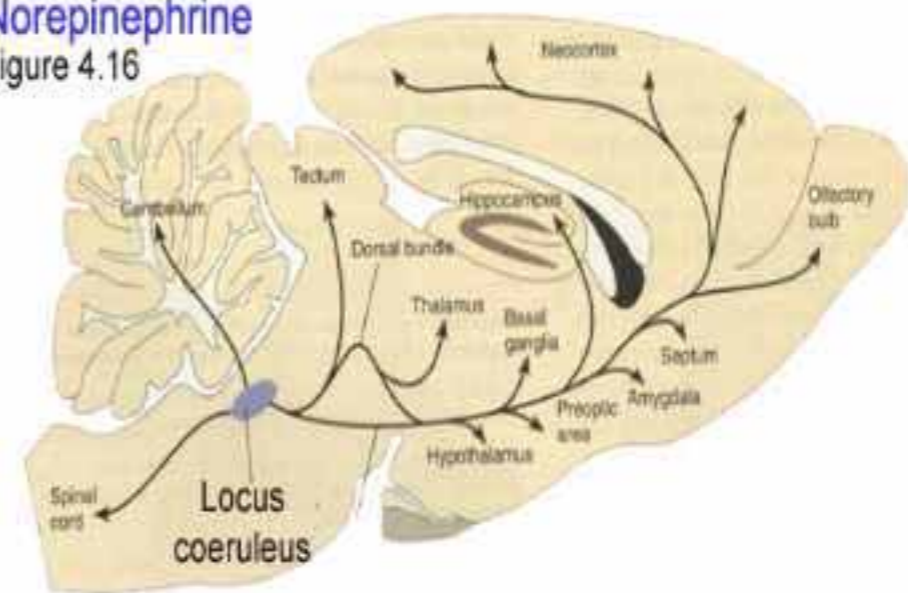
Alcohol, drugs and aggressive behaviour

Amphetamine increases aggression by releasing noradrenaline and dopamine

Dopamine
Figure 4.13



Norepinephrine
Figure 4.16



What effects does experience have on levels of aggression?

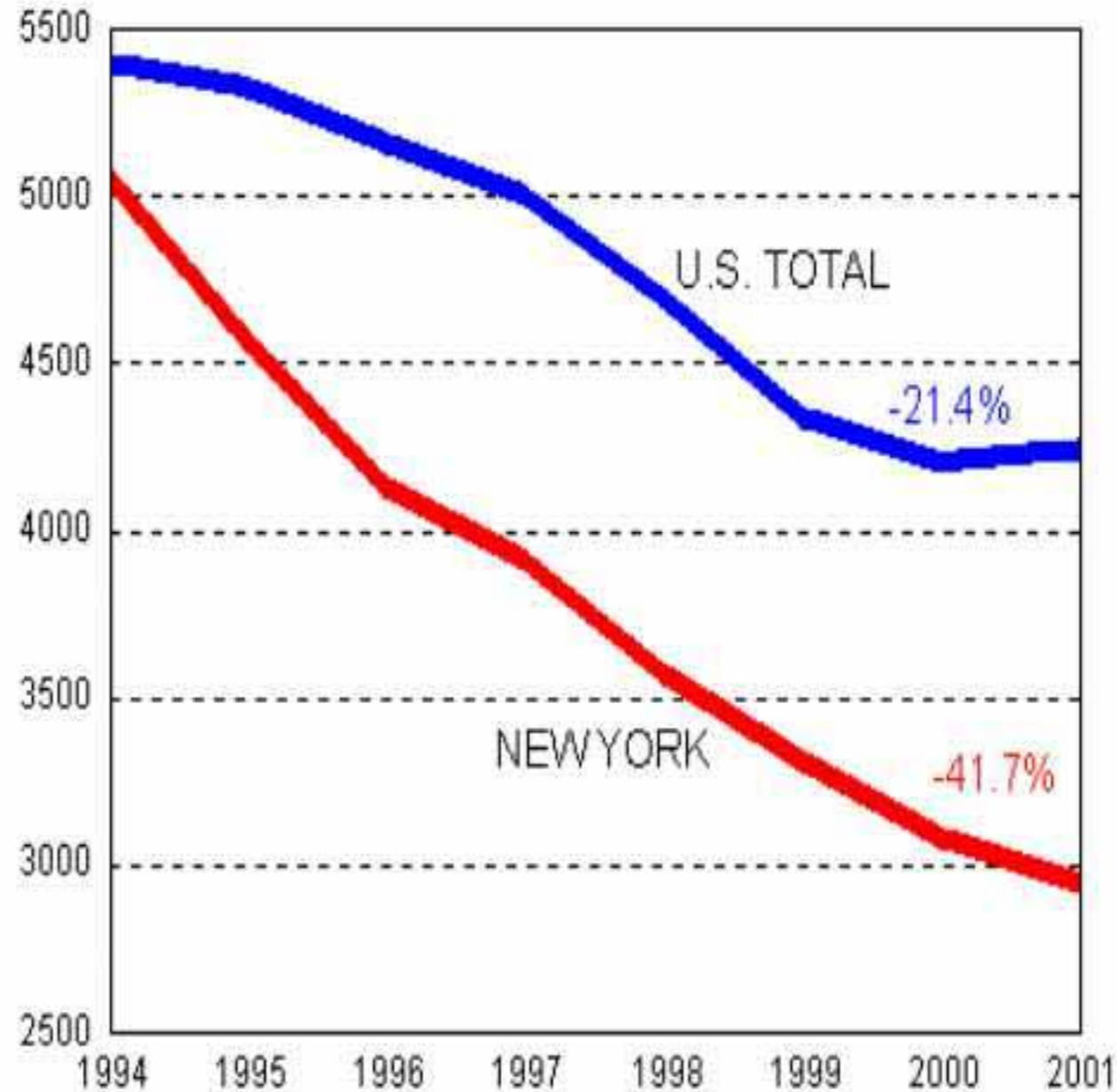
Increased media/computer game violence, and weapon ownership?



What effects does experience have on levels of aggression?

Increased media/computer game violence, and weapon ownership?

Violent crime rates have declined during the 1990's



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Exposure to violence does increase aggression but not violent crime
(Savage 2004)



What effects does experience have on levels of aggression?

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Exposure to violence does increase aggression but not violent crime
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Macho, frontiersman American culture?



What effects does experience have on levels of aggression?

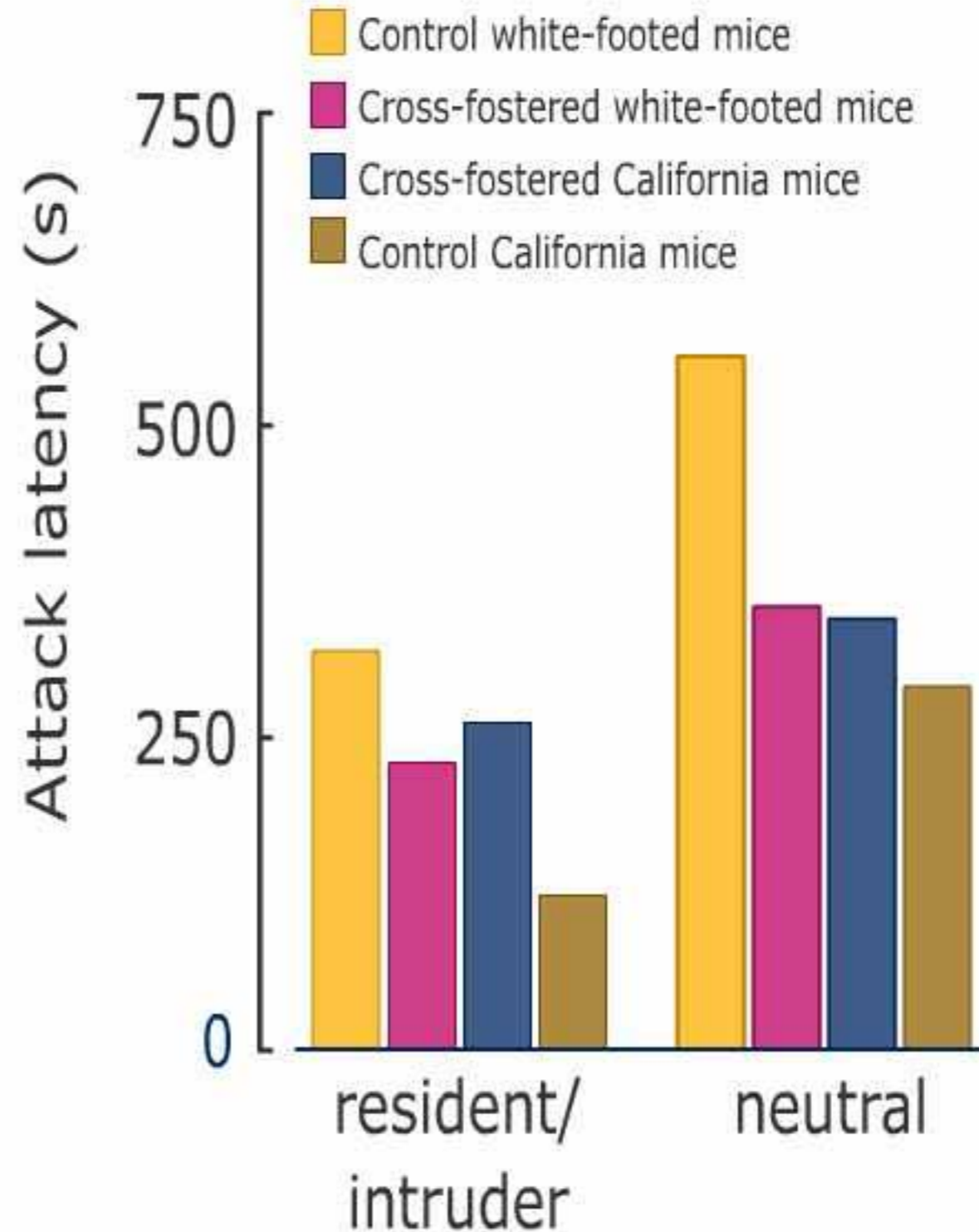
Children raised by aggressive parents have an increased risk of becoming aggressive

Children suffering early physical abuse are more likely to become abusers



What effects does experience have on levels of aggression?

Cross-fostering in animals consistently emphasises parental influences



What effects does experience have on levels of aggression?

Key external factors:

Rule of law:

perceived risk of punishment associated with aggressive acts



What effects does experience have on levels of aggression?

Key external factors:

Rule of law:

perceived risk of punishment associated with aggressive acts

Cultural moral values
concerning aggression



Why engage in group-based aggression to kill neighbours?

Access to food and appropriate conditions to conceive and rear young



Why engage in group-based aggression to kill neighbours?

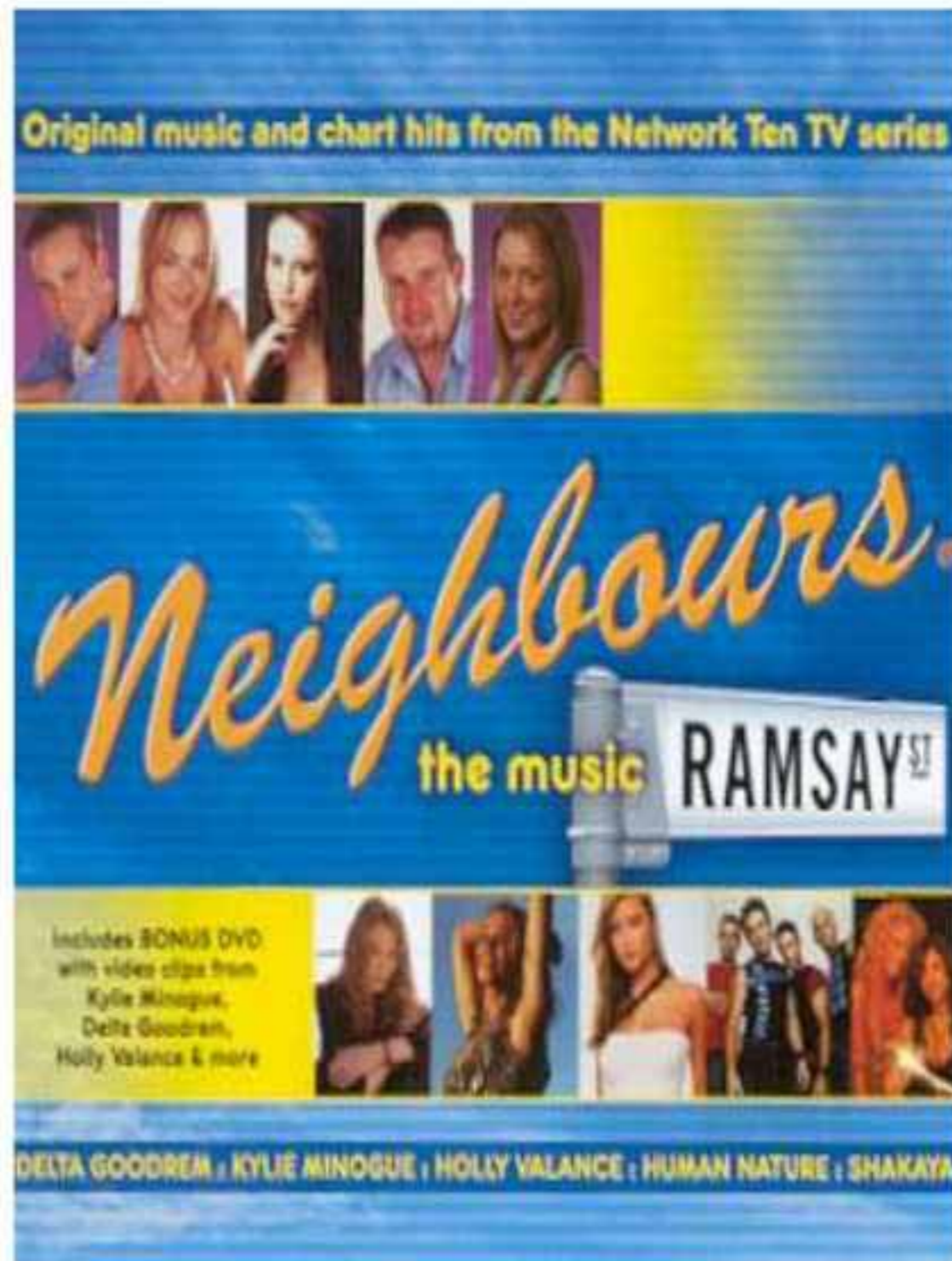
Access to food and appropriate conditions to conceive and rear young

Hunter-gatherer vs. territorial societies



Why engage in group-based aggression to kill neighbours?

Love thy neighbour vs. the neighbours from hell!



Why engage in group-based aggression to kill neighbours?

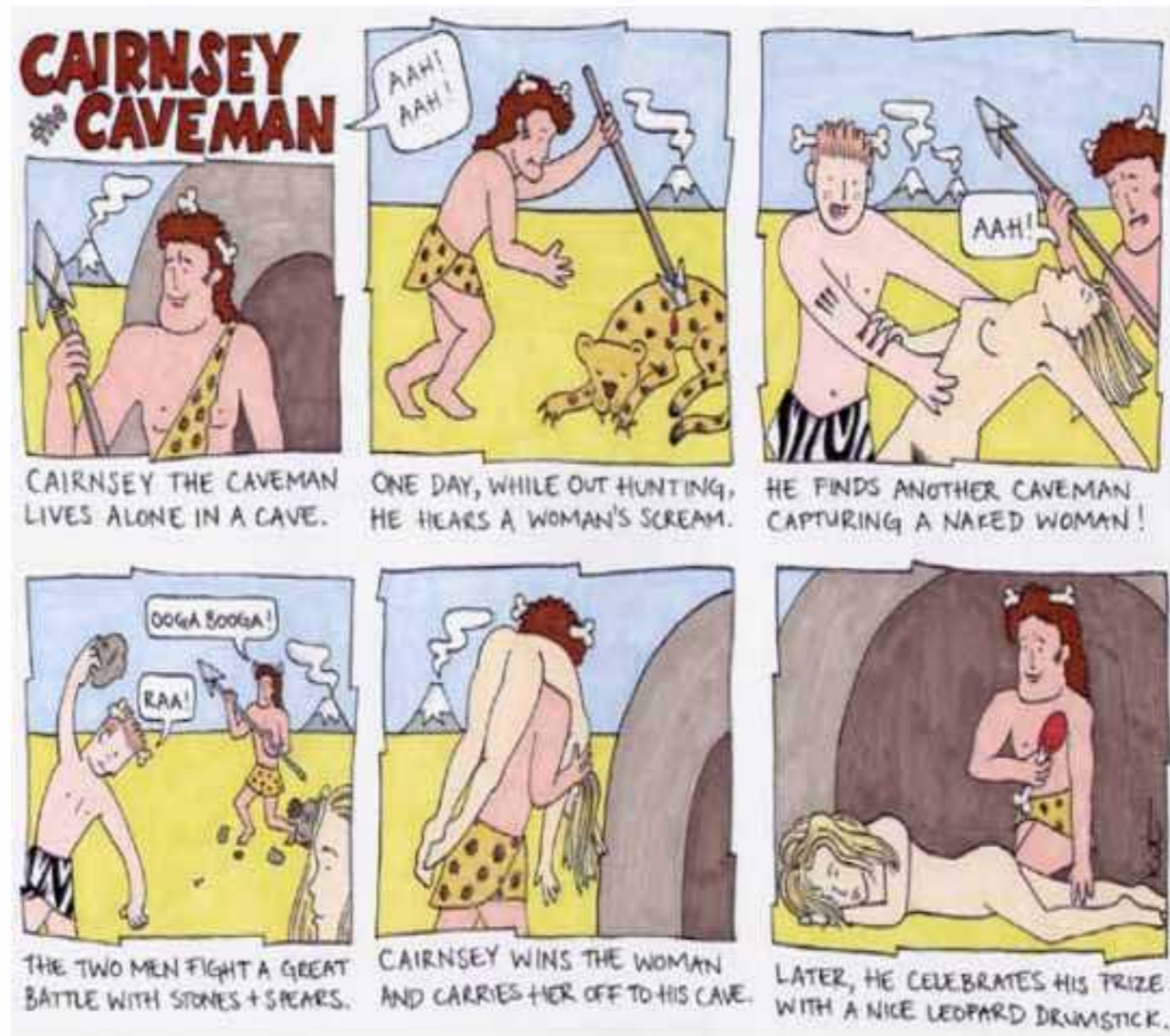
Use safe guerrilla tactics to weaken opposition



Why engage in group-based aggression to kill neighbours?

Use safe guerrilla tactics to weaken opposition

Kill males and abduct females

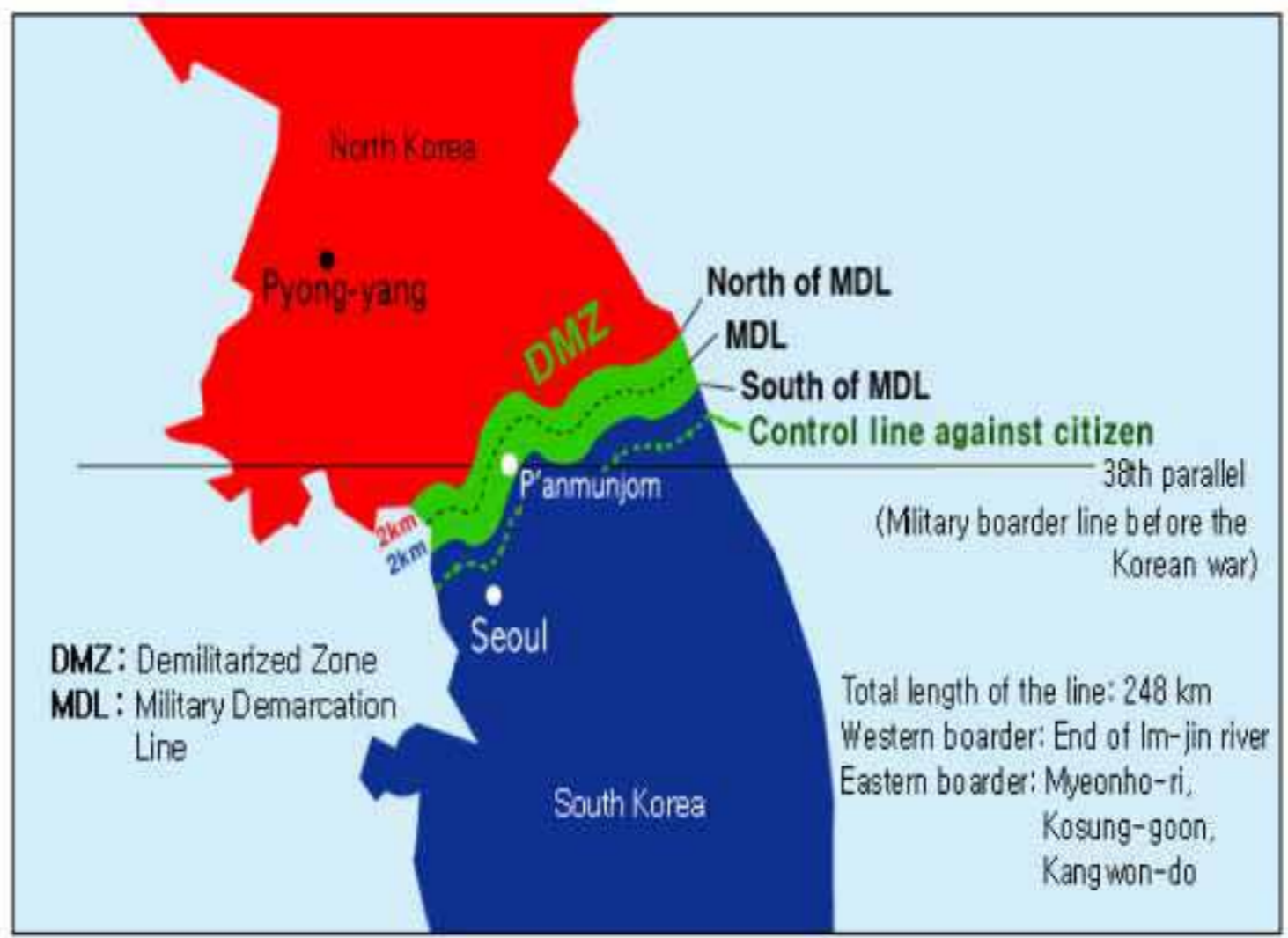


Why engage in group-based aggression to kill neighbours?

Use safe guerrilla tactics to weaken opposition

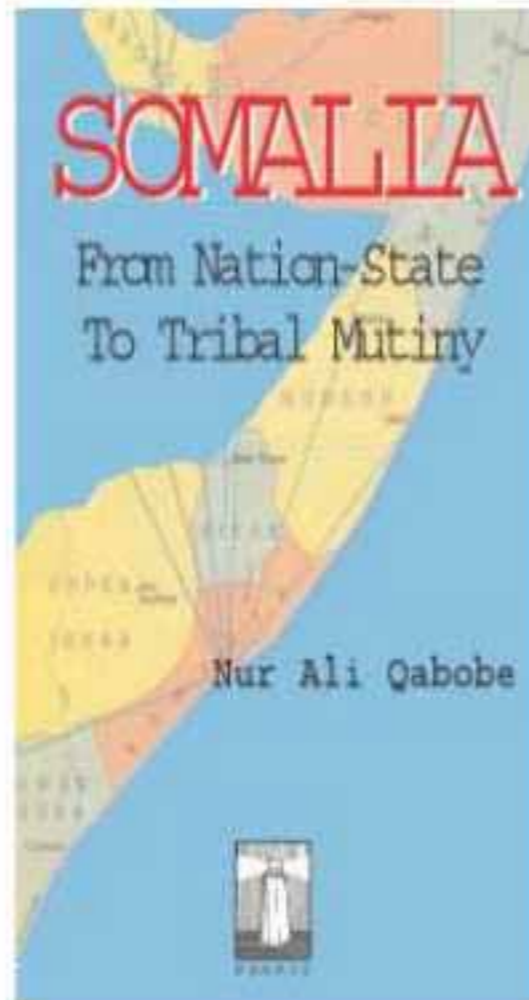
Kill males and abduct females

The creation of no-go areas



Why engage in group-based aggression to kill neighbours?

Nation states and organised vs. opportunistic warfare



Do other species engage in warfare?

Chimpanzees – Jane Goodall



Do other species engage in warfare?

Chimpanzees – Jane Goodall

Wolves – David Mech



Denali Wolves Adopt New Alpha



The Toklat pack's alpha male killed during a research project.

DENALI, ALASKA—A wolf that was moved from its home range east of Fairbanks six months ago as part of a caribou recovery plan has joined the Toklat wolfpack in Denali National Park and Preserve. The wolf roamed nearly 200 miles to join the pack whose alpha male died in March after being darted for research.

The pack is the best known of Alaska's approximately 1,000 wolf packs, and an estimated 20,000

Do other species engage in warfare?

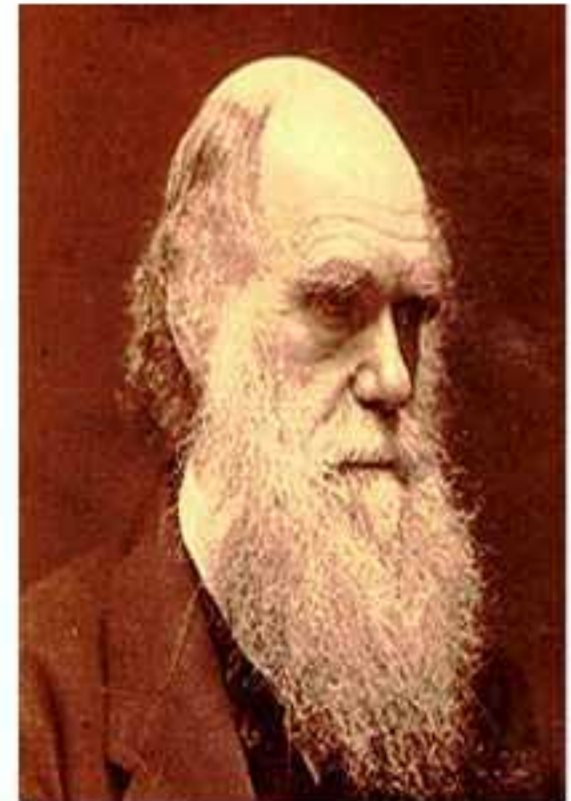
Chimpanzees – Jane Goodall

Wolves – David Mech

Death rates from violence are low and very similar

Humans: 0.1-0.3%

Chimpanzees: 0.2-0.5%



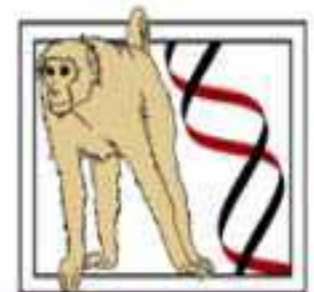
Do other species engage in warfare?

This can increase to 50% with intense competition for resources

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Logging Sets Off an Apparent Chimp War

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The New York Times

May 13, 1997

Can we learn from other species in order to live peacefully?

Few other species have a developed moral sense to suppress physical aggression and yet most seem able to control it



Can we learn from other species in order to live peacefully?

Few other species have a developed moral sense to suppress physical aggression and yet most seem able to control it

Aggression is controlled by social perception skills and submissive or threat postures



Can we learn from other species in order to live peacefully?

Animals use rough and tumble play and group activities such as foraging and hunting both to maintain social relationships and burn off pent-up aggression

The more social you are, in terms of bonds, the more potential you have for aggression



Can we learn from other species in order to live peacefully?

Avoidance of warfare may require no territorial borders and access to the same level of resources!



Make love not war – The Bonobo story



Make love not war – The Bonobo story

This could not work in a monogamous culture



Make love not war – The Bonobo story

This could not work in a monogamous culture

Being peaceful may not promote species survival



Could we completely prevent aggression?

Yes but aggression is linked to other beneficial behaviours

Our aggressive nature aids survival by motivating problem-solving

Ambition, dedication and commitment

Physical aggression is triggered by boredom,
and inability to express skills and ambitions



Some final conclusions

Aggression, dominance and impulsivity are related

For males aggression is about social dominance and competition

For females it is about protection and acquisition of resources

Affective and predatory aggression are distinctive

Female brains have more cortical aggression control

Some final conclusions

Testosterone makes an aggressive male brain but not necessarily aggression itself

Females find high T males more attractive for reproduction but not parenting!

Reduced brain serotonin is linked to increased aggression

Alcohol reduces brakes on aggression and obscures perception of social signals

Some final conclusions

Control of male but not female bond formation is linked to aggression

Experience can blunt or accentuate aggression but is not responsible

Warfare is not an exclusive human invention

Make love not war may be an option for some species but not for us

Some final conclusions

We need creative outlets for aggression

