



Seeing red:

searching for the truth about testosterone

Testosterone is frequently blamed for anger and aggression in men, but what does the latest science really say about its role? **Claire Nelson** investigates. Illustrations by **Nange Magro**.

Most of us are familiar with the edict 'grow some balls'. Women can be its target as much as men, but the phrase itself demonstrates that we associate owning a pair of testicles with being courageous, competitive and aggressive. At the heart of this expression is the belief that simply being male, and particularly having high levels of the hormone testosterone, is responsible for these qualities.

It's easy to see how this idea has spread. Testosterone is the principle sex hormone in males; men have ten times the level of testosterone that women have, and men are seen to be more aggressive. Information from the US Bureau of Justice Statistics (BJS) in 2005 show that men are ten times more likely than women to commit murder. Because of this visible gender gap in aggressive and violent behaviour, links to our hormones are assumed. Explanations and theories formulate reasons why men are more likely to fight than women, and many blame testosterone.

The truth is that there has never been any proof or convincing evidence that this testosterone is to blame for increased rates of aggression in men. In fact, a recent study at the Universities of Zurich and Royal Holloway London published in the journal *Nature* has produced new evidence disproving the theory altogether.

Fair and calculated offers

The study – performed by neuroscientist Christoph Eisenegger and economists Ernst Fehr and Michael Naef – saw over 120 women take part in a behavioural experiment which required pairs to negotiate over the division of an amount of money. The participants were encouraged to make an offer, which could be accepted or declined, but subjects understood that the fairer the offer, the more likely they could come to an agreed outcome. If an amount could not be agreed upon, neither party would get any money. This form of testing was used to 'investigate social interaction in a controlled-laboratory environment' without encouraging any actual physical aggression.

Prior to the test, the subjects were dosed with either half a milligram of testosterone, or a placebo. The expectation was that those who received testosterone would be more aggressive and egocentric in their negotiation, taking more risks and being more forceful in order to come out with more money.

In fact, the test revealed that in most cases those injected with testosterone made fairer and more calculated offers than those who received the placebo. It would seem that if anything, testosterone encouraged more considered, 'pro-social' behaviour. The need to succeed – which at its most basic level is about ensuring

one's status – became the desired goal: but aggression was not the instinctive method for achieving it.

Christoph Eisenegger explains this idea further:

'In the animal kingdom the quest for status usually involves aggressive behaviour, as their societies are much simpler and clearer. Testosterone-induced aggression, which serves as a means to win dominance battles in non-human animals, has transformed into entirely non-aggressive means of achieving the same goal in humans.'

In other words: testosterone, in humans, might still fuel a desire for gaining status, but it doesn't fuel any desire to use aggressive behaviour to get it.

Of mice and men

So if testosterone doesn't cause aggressive behaviour, why the assumption that it does? Is it simply the fact that men, who have more testosterone, are seen as fighting and playing rough a lot more than women do? Or is there more to it than that?

Eisenegger believes there are a couple of factors which contribute to the myth. Firstly, early research on the link between testosterone and aggression was performed only on rodents, which were castrated, depriving the animals of their testosterone. The results of this showed

that, 'castration of males completely abolishes physical aggression and that exogenous administration of testosterone restores aggression in these animals in a dose-dependent way.'

The castration of these rodents did show a reduction in combativeness, but the assumption that removing testosterone would produce the same effect in humans as in mice has always been unfounded, and – as the recent negotiation study now seems to show – is completely false.

In addition to the original assumptions following these studies on rodents, Eisenegger also believes our own societal assumptions have fuelled the stereotype.

'In humans, there is no convincing evidence available that testosterone causes physical forms of aggression. The well-known fact that males have higher testosterone levels compared to women, (who usually show less physical aggression) certainly biased the public opinion about the hormone.'

This was something proven further in the negotiation study. Some of the subjects who had received the placebo, while believing they had been given testosterone, seemed to 'play up' to the myth of the hormone, making 'conspicuously unfair' offers.

Cause and effect

While testosterone isn't the driving cause of aggressive behaviour, there still appears to be a link between the two. A study by Klimesmith, Kasser and McAndrew published in *Psychological Science* in 2006 measured the effect of aggressors and provocation on testosterone levels. The study involved 30 male students, each of whom would interact with either a gun, or a non-threatening children's toy. The impression being that those participants who were in the presence of the gun would have increased levels of testosterone, compared to those who were handling the toy. The results of the study corroborated with the theory that aggressive stimuli cause testosterone levels to rise.

The participants were then tested further. After being in the presence of the gun or the toy, the group were given a chance to add hot sauce to another subject's drinking water. Those people with higher levels of testosterone added more hot sauce – which, of course, is aggressive behaviour. So this study shows that aggressive cues can cause a rise in testosterone levels, and that this increase in testosterone can even heighten an aggressive reaction to those cues and to provocation.

Robert Sapolsky, in his book *The trouble with testosterone and other essays on the human predicament*, writes further on this connection. The author's theory backs up the concept of the 'aggressive cue', like that of the study with the guns: rather than testosterone causing aggression, aggression elevates the secretion of testosterone, so the hormone only exaggerates aggression already present. Sapolsky writes:

'Study after study has shown that if you examine testosterone levels when males are first placed together in the social group, testosterone levels predict nothing about who is going to be aggressive. The subsequent behavioural differences drive the hormonal changes, rather than the other way around.'

This theory also plays out in the world of men's sports. Studies have shown that testosterone levels are greater during competition, and that the rise was even greater in winners than for those who lost. In

addition, there is some evidence which shows that the testosterone levels in the supporters of a successful team will also rise, most likely through a vicarious feeling of triumph. Based on the newer

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studies, this makes sense. Competition is, of course, all about achieving status.

Young aggressors

Someone who has observed aggressive behaviour and the quest for status on a regular basis is Andrew (name changed for anonymity), a mental health nurse who has worked in a variety of situations from prisons to dealing with low-security inpatients. He believes that women are just as capable of being aggressive as men; and that generally, the cause of aggressive behaviour will differ from person to person. He explains:

'In my opinion it is definitely both nature and nurture that affect aggression – not necessarily both in everyone either. Reflecting back on my observations in the young offenders' prison, I believe that the amount of aggression seen in the younger men was due to puberty, social factors outside the jail and – most importantly – fear.'

Puberty seems like the most obvious driving force for aggression in young men. Hormones are skyrocketing during this phase of life. It seems safe to assume that as young men have naturally higher levels of testosterone during puberty and their teenage years, this is why they are more likely to fight, and act staunch. Again, statistics from the BJS back this up, with a huge number of violent crimes being committed by young men. Yet Dr John Archer, a Professor at the University of Central Lancashire's School of Psychology, believes this assumption is 'at best, an oversimplification'.

In fact it seems that early experiments on rodents have thrown the facts into confusion yet again. A study undertaken on house mice nearly four decades ago found that increases in testosterone during puberty caused a considerable increase in aggressive behaviour. However, aggression in other animals is not the same in humans, and now there is scientific research which confirms this difference.

A study by Dr Archer reveals that there is 'little evidence for increased aggression as a function of testosterone at puberty in boys.' He writes that, 'five studies and a meta-analysis of developmental trends in sex differences in direct aggression, showed no sign of increased aggression coinciding with testosterone increases at puberty in boys.'

What we do now know is that competitive situations or aggressive provocation will cause testosterone levels to rise. This is a more accurate explanation for the rise in aggressive behaviour in young males. For many young men the fight for status is crucial at such



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a critical time in their social development. Their advancement into adulthood drives the quest to be a dominant male: ascertaining their position in their peer groups, attempting to impress an attractive female, and proving their strength and worth. These aggressors are more common for young men, and will cause a rise in their testosterone levels. It is not, as we have tended to assume, the other way around.

Looking at this evidence, Andrew’s observations in the young offenders’ prisons make sense. He says,

‘I observed a definite need in the juvenile prisoners to assert themselves among their peers. Violence and aggression were commonplace; from their confrontational stances to rows over territory or property. I expected to see this continue into adult prison settings, but was surprised to see incidents decrease, despite a much larger population.’

Dr Archer’s paper also makes this point, saying that ‘men also showed increased testosterone in response to competition with other young men.’

More complex factors at play

It would seem that while there appears to be a link between the two, testosterone does not cause aggression. For example, a woman – with lower testosterone than the man beside her – is just as likely to be aggressive as he is, although how quickly she becomes so, and the extremity and method of her aggression (physical, or otherwise) will depend on her background, personality and the situation she finds herself in.

A hormone on its own cannot control what is essentially complex human behaviour. It might encourage, or restrain the development of aggression that is already there, but for the most part it is the manifestation of aggressive cues and competition which will bring about a rise in testosterone, rather than vice versa. Based on this, ‘growing some balls’ is all very well, but – unless you’re a mouse – it probably won’t make much difference. ■

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