

## WARM UP

# Can woodpeckers play rugby or Charles Darwin, where are you when we need you?

P McCrory

There are those unenlightened folks out there who see rugby players as the classic example of coming from the shallow end of the gene pool. This is, of course, contrasted with the sport of cricket, which is seen to represent the pinnacle of human endeavour. So sublime is cricket, that Americans simply cannot understand it.

There is also an argument to be made that cricket represents intelligent design, being hand delivered from God to Moses along with the Ten Commandments, whereas derivative sports, such as baseball, represent evolution. I guess for Moses' followers who spent forty years wandering in the wilderness, a game that took five days to finish seemed like a good idea at the time.

At a future sports medicine meeting, we should have a debate on this issue, which could be modelled on the famous Oxford evolution debate of 1860 where Thomas Huxley notably replied to Samuel Wilberforce, then Bishop of Oxford, that he "would rather be descended from an ape than from a cultivated man who used his gifts of culture and eloquence in the service of prejudice and falsehood". The apocryphal story that arose from that quote was that Huxley had said he would rather be an ape than a Bishop. Perhaps the sports medicine equivalent would be that he would rather be an ape than a rugby player. That is, of course, assuming that there is a difference.

But what of the evolution of sport and individual athletes? Have we room to swim about in the gene pool and improve our sporting lot in life?

We know that sports performance improves slowly and incrementally, but why not go the whole hog and drive evolutionary mechanisms to their limit. Survival of the fittest and fastest could be the new motto. We wouldn't need to worry about the drugs in sport issue because it will be evolution not medicine that is the solution.

What of evolution? Well for those who missed that day in school, in

November 1859, Charles Darwin (1809–1882) an English naturalist, published a book called *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life* (usually abbreviated to *The origin of species*), which established evolution by common descent as the dominant scientific explanation of diversification in nature.<sup>1</sup> This seminal idea remains one of the cornerstones of modern biology and set in train a debate that continues to this day. In recognition of scientific pre-eminence and despite being a self-described agnostic, Darwin was buried in Westminster Abbey close to Isaac Newton.

As a humorous celebration of evolution, there is an annual "Darwin Award", which is bestowed on individuals who inadvertently improve the human gene pool by removing themselves from it following an episode of questionable judgement. There is no monetary prize, only eternal recognition.

Although sounding suspiciously like an urban myth or at least the subject of the *Mythbusters* TV series, to qualify, one must die (or render oneself incapable of reproducing) in an extraordinarily unwise manner. Past winners have performed feats such as juggling live hand grenades, jumping out of a plane to film skydivers while forgetting to wear a parachute, cutting off one's own head with a chainsaw in a macho-contest, and using a lighter to illuminate a fuel tank to make sure it contains nothing flammable. Although most Darwin Awards are made posthumously, self-sterilization is also sufficient, such as the man who had sexual intercourse with a vacuum cleaner. Full details of the winners and documentation can be found at [www.DarwinAwards.com](http://www.DarwinAwards.com).

"Honourable mentions" also go to those who, despite immense stupidity, fail to kill themselves. Although they remain alive, their foolish and dangerous acts are still found worth mentioning. Some of these include getting hit by

a train while trying to see how close to the train one could safely place one's head, and the novel Australian sport of petting sharks during a feeding frenzy.

What about sport I hear you cry. Can we apply social Darwinian principles to sport?

The idea of social darwinianism subsequently evolved from the concept of eugenics described by Francis Galton, but the term social darwinianism was initially proposed by the American historian Richard Hofstadter in 1944 to describe 19th and 20th century thinking developed from the original pre-Darwinian ideas of Thomas Malthus and Herbert Spencer, who applied the notion of evolution and "survival of the fittest" to societies or nations competing for survival in a hostile world.<sup>2</sup>

This approach has eerie echoes in the genetic breeding strategies that Eastern block countries once used to promulgate with their elite athletes in a search for sporting success. One could argue that the more socially acceptable sports talent identification programmes that are widely used by sports institutes remain the last descendants of such ideas, albeit on a more modest and politically correct scale.

So how can we evolve the über-rugby player of the future?

Given that concussion and head injury are issues of concern, let us look at that first. There is a widespread belief that athletes can become punch drunk through repeated blows to their heads such as seen in rugby. If this is the case, then can we look to nature for a solution? There are birds, such as woodpeckers, whose lifelong activity is to make holes in trees with their beaks, and, despite this seemingly pointless behaviour, do not seem obviously punch drunk. Various studies have used techniques such as high speed videoanalysis to study woodpeckers in some detail.<sup>3-5</sup> They found that the head impact trajectories of woodpeckers were essentially linear and that the impact velocity was of the order of 600–700 cm/s, which is approximately one tenth of that seen in human sport concussions.

Could we therefore postulate a skull and brain shape to minimise concussive impact for sportsmen? There would need to be very strong neck muscles (to absorb force), some shock absorbing material (or a springy, perhaps cartilaginous skull) between the brain cavity and the impact site, a narrow cerebrospinal space with minimal cerebrospinal fluid, and a relatively small brain with a smooth surface and a high surface area to weight ratio. Ideally all impacts would be relatively slow and in a purely linear direction, and these adaptations

would spread the impact force over a large area of the brain.

Mind you, a fairly sluggish rugby player running in a straight line with a long thin head and a little brain may not necessarily look out of place on the pitch when compared with his peers; however, he would rest contented knowing that the potential for chronic brain injury would be minimised.

A simpler strategy rather than evolving rugby players with long thin heads, which would presumably take many generations

(mind you, that may be quicker than the English teams likely prospect of beating Australia again!), would be the eugenic route whereby rugby players are selected on the basis of their genes. If the inherited ApoE genotype was favourable, then this may reduce the risk of sporting brain injury.

Or even simpler—just gene dope! Why wait for evolution in the pursuit of sporting glory?

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This paper is authored by Dr Paul McCrory. During 2021 and 2022 there was an investigation by BJSM and BMJ which found that some of his work was the product of publication misconduct. Such misconduct includes plagiarism, duplicate publication, misquotation and misrepresentation in publications in respect of which he was listed as the sole author.<sup>1</sup> We are placing a notice to readers on all content in relation to which he is identified as the sole author to alert them to the conclusions of our investigation.

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