

Doping Scandals, Rio and the Future of Human Enhancement

Just in time for Rio, London 2012 has just broken a new record: the so called “dirtiest race in history” (that is, the line up with the most known dopers) is now the womens London 2012 1500m, replacing the Seoul 1998 mens 100m final.

<http://www.independent.co.uk/sport/general/athletics/athletics-doping-crisis-was-london-2012-s-1500m-olympic-final-the-dirtiest-race-in-history-a6949186.html>

It's hardly surprising. In the 4 years since 2012, athletics has been hit by a series of scandals: leaked blood data showing widespread suspicious values calling into question 2 out of 3 medal winners; the banning of the whole of the Russian athletics team and questions over their swimming team. The searchlight is turning beyond Russia to other countries such as Kenya who face urgent deadlines to reform, or face a similar ban. The most famous name so far is Maria Shaparova whose positive test for meldonium brought this newly banned drug to public attention, joining over 100 athletes who have tested positive for it since its ban commenced this year . One study showed 490 athletes who competed in last year's European Games in Baku had taken it.

<http://www.reuters.com/article/us-sport-doping-athletics-bulgaria-idUSKCN0WTOLT>

There are many important lessons to be learn about the regulation of human enhancement technologies from their test run in sport, where they are clearly effective. Firstly, as if often the case, Meldonium was invented for military enhancement

(<http://www.wired.com/2016/03/original-users-meldonium-sharapovas-banned-drug-soviet-super-soldiers/>). Most enhancers currently come on the back of military or medical innovation.

Secondly, once they are effective, people vote with their feet, despite much public protestation and social signalling prior to clear effect. Sales of meldonium have massively increased since the Sharapova story

<http://www.bbc.co.uk/sport/tennis/35758901> Not only is there a huge industry for physical enhancement in elite sport, but also in amateur and junior sport, and in recreational use.

But there are other lessons.

Sharapova claims to have not read the information circulated via email and to have been taking the drug since 2006 for a magnesium deficiency, an irregular EKG, and her family's history of diabetes. Mildronate is marketed by the company as a performance enhancer (as well as a heart drug) and is one of Latvia's biggest exports.

Should we feel sorry for her?

Every professional athlete nowadays knows:

1. strict liability obtains - that is, they are responsible for everything they put into their bodies. Ignorance is no excuse.

2. if you are taking any potentially, even vaguely performance enhancing substance you have to watch the WADA banned list like a hawk. Things appear on it on an almost daily basis. Indeed, substances may not even be specifically named but fall under a generic category of effect, such as accelerating tissue healing.

3. if you are taking a banned substance, you need to get a therapeutic use exemption. For this reason, many cyclists now have asthma (and so can take the beta stimulant, salbutamol) and baseballers have attention deficit disorder (and so can take ritalin, related to amphetamine). Of course, the distinction between health and disease is fuzzy, but that is another story. It is very possible that Sharapova would have been granted a therapeutic use exemption, if she had applied.

The more interesting question is: why was Meldonium placed on the banned list?

One reason to ban an intervention aimed at performance enhancement is because it is unsafe. The poison, strychnine, was taken in the earlier part of last century to enhance performance. Dehydration was also thought to improve performance. Both of these are unsafe at certain levels. It would be right to prevent a grossly dehydrated athlete from competing in the marathon.

Is meldonium unsafe? It is licenced in parts of Europe for medical purposes and is relatively safe (<http://www.bbc.co.uk/sport/tennis/35758901>) Sharapova says she has taken the drug for 10 years.

One way to answer the safety question is to compare the risks of Meldonium with the risks athletes take in sport. This would set the bar very low as there is a high risk of death or permanent injury in all contact, balance and high velocity sport. At the time of writing (Mar 28), 25 year old professional cyclist Antoine Demoitie died tragically in crash after he was run over by a motorbike. Two days later another professional cyclist died of a heart attack. Deaths in cycling are not uncommon.

One might object that these risks are unavoidable if you play professional sport. However the risks of taking performance enhancing substances are entirely avoidable. But we do allow performance enhancing substances in sport. Caffeine used to be on the prohibited list but was taken off in 2004. Caffeine is a performance enhancer. It increases time to exhaustion in endurance athletes. The exact amount is unclear with one early study of professional cyclists showing an increase from 75 minutes to exhaustion to 90 minutes to exhaustion <http://europepmc.org/abstract/med/723503> . A more recent review suggested a mean improvement in performance of 3.2 +/- 4.3%, with some studies showing an improvement as high as 17.3% (and others showing much less).

| <http://www.ncbi.nlm.nih.gov/pubmed/19077738>

Although the exact benefits are disputed, it is certainly a performance enhancer. So, one reason it was taken off the prohibited list may be that it is safe enough. But caffeine is not perfectly safe. Dr Jack James, in an editorial for the *Journal of Caffeine Research*, calls for policy interventions on caffeine. He notes a number of deaths or near –misses reported due to over ingestion of caffeine as a primary or contributory factor, and the physical stress of exercise exertion has appeared to exacerbate the danger in some of these cases. And, he points out, it is increasingly easy to ingest a very high dose of caffeine: it is now available not only in tablet and energy drink form, but also in a variety of medicines, foods, cosmetics, and even tights.

<http://online.liebertpub.com/doi/full/10.1089/jcr.2013.1226> .

As a licensed (although not in the US), and clearly and accurately dosed medication, Meldonium is unlikely to be more dangerous than many practices that we do accept: training and full contact, or other permitted substances, such as caffeine..

Of course, caffeine could be allowed because it is so widely available that it is seen as too difficult to avoid in day-to-day life. Yet it is likewise very difficult to avoid contamination for athletes. WADA's guidance covers major pitfalls: doctors who may not be able to advise athletes accurately, over the counter medicines which can contain banned substances, variations on medications of which only *some* versions may be safe, creams, eye drops and other non injected medication that affects results. It is a complex world for the athlete, who, despite the acknowledgement that medical professionals may struggle, is held responsible under strict liability rules. WADA acknowledge the enormous difficulty of this when they explain why they cannot help with an approved list: "To maintain current information with respect to prohibited substances on all products manufactured by the pharmaceutical industry around the world would require tremendous resources that are not currently at WADA's disposal." <https://www.wada-ama.org/en/questions-answers/athletes-and-medications>

So given that caffeine was taken off the banned list, why are other drugs such as Meldonium put on, lengthening the list and making it even more complex?

The reason Meldonium is now banned has to do with our broader values as a society and our attitude to human enhancement. Society celebrates some performance enhancers: alcohol (highly toxic and addictive), sugar, caffeine (the world's second largest export), creatine, beetroot extract and taurine. The reason for this is that these performance enhancing substances are seen as natural and their mode of delivery is natural.

Indeed, this is the rationale the World Antidoping Agency (WADA) takes to increasing the oxygen carrying capacity of blood by increasing haematocrit. The use of blood transfusions and human erythropoietin to increase oxygen carrying capacity are banned. However, hypoxic air tents and altitude training, which have exactly the same effect, are allowed.

People think that the natural/unnatural(artificial) distinction is moral significance. Natural therapies are seen to be preferable to medicines; complementary medicine is a massive industry, unregulated yet more trusted than mainstream medicine; education is preferable to cognitive enhancers. "All-natural" is the second most used claim on new American products, and most popular with purchasers <http://grist.org/food/is-the-natural-label-100-percent-misleading/> .

The bias to the natural is often expressed as the objection we should not play God. We lack the knowledge and power of God and so we are doomed to failure when we attempt to interfere in natural processes. If something is natural, it is a part of nature and God's plan, so it must be good, the objection goes.

It is of course true that we have had disastrous effects on complex ecosystems by overexploitation and introduction of foreign species. But is important to remember as Thomas Hobbes once said that the natural life for a human being was "nasty brutish and short." Education and science have been incredible human achievements. Bacteria and viruses are natural. Smallpox, one of the greatest killers, was eradicated by vaccination. But some people objected to vaccination because it thwarted God's will, like giving pain relief in labour. Indeed, even today the nature bias leads people to reject life-saving vaccination: one "anti Vax" website lists as number 2 in the list of "reasons" Against vaccination "ALL Vaccines are Loaded with Chemicals and other Poisons".

It is telling that those opposed to vaccination equate chemicals with poisons. But nature is a series of physicochemical substances and processes. A wonderful and splendid experiment but not fundamentally different to our attempts to emulate it. There is no

morally relevant difference between caffeine occurring in a coffee bean and caffeine in a pill. It is the same substance. To be sure, artificial constructs may have greater risks and unpredictable effects. But it is the effects that matter, not the means of achieving them. Science is now able to give us some, often reliable information on risks and benefits.

Here is an full articulation of the bias towards the natural: a chemical in a plant is preferable to the same chemical in an animal which is preferable to industrial synthesis of that chemical in a natural carrier which is preferable to pill which are all vastly preferable to an injection of the same substance. People are appalled when they see images of Chinese students connected to drips (eg https://www.google.com/#tbn=isch&q=chinese+students+with+iv+drips&imgsrc=_TG-dU4I0nDePM%3A) but are far less perturbed to see them drinking high sugar, high caffeine beverages.

What 's wrong with the nature bias?

Firstly, the bias towards the natural does not track harm and benefit. Strychnine is a deadly poison that comes from a plant. Natural alternatives to medicine have side effects just like standard pharmacology: for example Kava, a natural anti-anxiety remedy has been linked to liver damage, depression, and death. <http://www.webmd.com/vitamins-and-supplements/features/risky-herbal-supplements?page=4> .

Of course a genetically engineered substance, even if identical to the natural chemical, is most feared and perhaps the worst example of the nature bias. For this reason, GM crops are and even milk from cloned cows is banned in Europe.

Secondly, it is relevant to the regulation of human enhancement that there is natural variation. What is defined as disease is subfunctioning two standard deviations below the mean. Thus intellectual disability is defined as IQ below 70. Around 2% of people have intellectual disability. But those who have a low normal IQ, eg between 70-85, are still severely disadvantaged. Natural human variation does not track what is of value.

Another problem related to normal human variation is that it makes doping almost impossible to detect when athletes are using natural substances. Testosterone, growth hormone, erythropoietin and blood are all naturally occurring substances. When athletes supplement natural levels (which is called doping), it will be difficult to tell whether they have done this artificially or if it was natural human variation. For example, one person's haematocrit (fraction of blood that is red blood cells capable of carrying oxygen) might be 43, another's 49. The latter has an enormous advantage in endurance events. If someone's haematocrit was 49 by chance or by taking small doses of naturally occurring EPO, how can we tell?

For this reason, biological passports were invented to track changes in an individual's blood values. But athletes find ways around this, for example, starting doping early in life with very low doses of the substances that occur naturally in their bodies.

The failed attempts at regulation of performance enhancement in sport tell us two things:

1. the bias to the natural is morally irrelevant and should not be a basis for bans.
2. something enhancing performance is not a reason itself to ban it.

What should be the reasons for banning a performance enhancing substance in sport. There are two:

1. safety
2. undermining of the spirit of sport.

The bar for safety should be set at the level we allow athletes as persons to take risks. We can compare the risks of Meldonium with say spinal cord injury from horse riding or rugby or football, or brain damage from contact sports, or the risks of caffeine overdose.

Most of the substances on the WADA banned list would fail this test, especially those natural substances like blood and steroids, when taken in the physiological doses where an athlete's parameters remain "normal". For example, we now know what the safe levels of haematocrit, testosterone and growth hormone are. And we can reliably measure these. If we gave up privileging natural human variation, we could set safe levels and allow athletes to supplement up to these levels, just as they supplement their blood glucose and water levels to maximise physiology for performance. This is safe and enforceable, but it would no longer advantage the genetically lucky who happen to be on the right side of the normal distribution curve.

The spirit of sport is more complex and WADA does a hopeless job at defining this. Spirit of sport should include two components:

1. Preservation of an essentially human component to the sport. Using bionic limbs or super blades for running would confer a dominating advantage. They should be banned in ordinary sport.
2. Preservation of the test of the particular skill or strength. Beta blockers for archery or pistol shooting should be banned.

Fortunately, drugs or technologies which violate the spirit of sport in this are easy to detect because they are foreign and easily measured.

Should Meldonium be banned? I don't know enough about its precise details but I suspect it would fail both of these tests. It would neither be unsafe enough compared to the risks of sport nor would it undermine

We should shorten, not lengthen, the WADA banned list. We should give up the principles that anything that enhances performance is against the spirit of sport and that the natural/artificial distinction has moral significance. We should ban substances or practices that are clearly or likely significantly unsafe and we should ban specific substances that corrupt the spirit of a particular sport.

What, then, are the lessons for human enhancement from the continuing debacle in attempting to regulate doping in sport?

Establish a reasonable safety bar that allows people to take reasonable risks consistent with other areas of life.

People will cheat, especially when rewards are high and possibility of detection low. Pick a small number of easily enforceable rules.

Humans want to be better. It will be very difficult to stop human enhancement. People should have freedom to be better. Apart from grave risk, the other reason to ban human enhancement is because it alienates us from something valuable and human - the so called "spirit of living." This however, is notoriously difficult to define. Do computers alienate us from mental operations? Memory enhancing drugs?

To properly regulate human enhancement we need an account of well-being and the meaning of life. Because most of the current doping does not frustrate either, and it is difficult to detect, it is impossible control. Regulators have not grasped there are deep philosophical questions to be addressed before we can form rational laws on human enhancement.

What are the lessons for Rio? Every Olympics, every Tour de France, every major competitive sporting event, we are told that authorities have doping under control. They don't. If history is any guide, at least 2 out of 3 medal winners will be doping. Sadly, it is the honest athletes that are disadvantaged in this circus.

It is time to think more rationally and more philosophically about the regulation of human enhancement.