

Sporting bodies and evolving technologies

In 1894 Pierre de Coubertin adopted the Latin words for Faster, Higher, Stronger (Citius, Altius, Fortius) as the official Olympic motto. To me, this motto reflects an essence of sporting activity, to push at the boundaries of what is deemed possible in terms of bodily performance. Sporting bodies do not, however, exist or compete in a vacuum. Sports technologies advance; records are broken; improved assistive technologies (e.g., prosthesis, wheelchairs and exoskeletons) widen participation; new sports emerge as technologies are invented and people find ways to compete with/through them; sporting arenas shift and previously unexplored frontiers for bodily performance are pursued *with* new technologies.

Against this shifting terrain, notions of (dis)ability, gender/sex and ethnicity come in and out of focus when new categories or rules are introduced – but not without controversy.

Public debates in sport often revolve around creating or maintaining the so-called ‘level playing field’ where all bodies, despite their differences, can participate and compete *fairly*. Here, blurred lines of what is deemed fair are frequently encountered and contested. These debates stretch into areas such as the use of ‘performing enhancing’ substances or the inclusion of athletes based on ‘[gender identity and sex variations](#)’ (e.g. the news stories and decisions that surrounds [Caster Semenya’s](#) track career). Perceptions and rules that govern participation/competition related to such matters shift over time and athletes who make use of various body technologies to compete in sports often occupy contested spaces.

In the 1904 St. Louis Olympics, American Gymnast [George Eyser](#) became the first athlete to compete with a (wooden) prosthetic leg. Thereafter bodies with prostheses were not seen in the Olympics for over a century, an absence due largely to the establishment of the Paralympics in 1948 (when many contestants were post-war amputees).

The introduction of the Paralympics created a separated space for different types of bodies and enhancements to compete against each other. For many years both global events ran in parallel with few athletes or technologies crossing between until Beijing 2008 when [Natalie du Toit](#) carried the South African flag during the [opening ceremony](#) wearing her prosthesis before going on to place 16th in the marathon swim.



Du Toit removes her prosthetic before racing, just as she does when competing in the Paralympics ([see rules](#)). Therefore, whilst du Toit’s presence was an important milestone, because of presumptions that she didn’t gain an advantage when swimming, it provoked little debate about the nature of disability sport itself.

In London 2012, Oscar Pistorius became the first double amputee to race against able-bodied sprinters at the Olympics. He was not the first and will not be the last athlete to [compete at both the Paralympic and Olympic Games](#), but unlike other athletes on this list, the decision allowing him to compete became a particularly high-profile and controversial case.

Initially Pistorius was banned by the International Amateur Athletic Federation (IAAF) on the basis that his 'Flex-Foot Cheetah' prosthesis gave him an *unfair* biomechanical advantage - one report claimed that Pistorius used 25% less energy. The Court of Arbitration for Sport [revoked this decision](#) after hearing conflicting results from comparative studies in applied physiology.

Grey areas remain when comparing relative performances between bodies that are biomechanically different. Firstly, *what gets measured?* [One scientific paper](#) considers metabolic energy expenditure and endurance as well as sprint mechanics (including contact forces vertical/lateral, contact/aerial/swing times, step cadence, stride/leg length). Then, because all 'natural' limbs or biomechanical systems are different, *how are samples or frames of comparison agreed upon* for elite competitors? And, *what deviations from these norms are tolerated to police constructed notion of fairness?*

Pistorius' case sparked scientific research to navigate these questions. A decade later and no other sprinters have competed in the Olympics with prosthetics. Decisions around (non)participation appear conservative: Blake Leeper was banned from the US Olympic trials (for Tokyo 2020) based on conclusions that he ran "unnaturally tall". The methodology that produced these findings was disputed on the basis that data had not been validated against black athletes of African descent, but the original decision was upheld.



These recent cases expose how, by themselves, scientific methods are inadequate devices for defining and policing the 'level playing field'; objective/scientific processes of categorisation are sociopolitical activities with marginalising and normalising consequences, factors that go unacknowledged. Conditions and rules for (non)participation evolve over time and will continue to do so - especially as future technologies create previously unimagined possibilities.



Eyser's wooden leg of 1904 is far removed from modern day prosthesis. The dizzying possibilities of future sporting (techno)bodies are rapidly expanding and are made partly visible through the [Cybathlon Games](#). The below images from these games display open invitations to imagine the ways in which sport could evolve to better accommodate bodily difference.



Figure 1- Powered arm prosthesis race (Cybathlon, 2016)



Figure 2- Powered leg prosthesis race (Cybathlon, 2016)

The prostheses here have sensors, processors, and actuators. Engineered moving joints make it possible in theory for above-the-knee amputees to run and jump. Similarly, functional electrical stimulation uses electrical pulses to stimulate muscles in patterns to perform desirable movements, a process that has already enabled individuals with spinal cord injuries to cycle. Possibilities for this technology stretch into many more established and future sporting arenas.

Why should these bodies be excluded from competition? If relevant data sets are comprehensive and available, then why object to calibrating these technologies against normative values for key performance variables? This may be a complex process, but it is enabling and inclusive.

The Cybathlon provides another parallel space to the Olympics/Paralympics with disciplines where competitors can flex their muscles and metal against each other. The question of whether differently able bodies should have separate competitions in the future is convoluted; ideas of the superhuman should be resisted, but might exoskeleton races be viewed as a new class of sport where, in theory, *anybody* can compete? I for one would enjoy someday watching such races blended with elements of Parkour!



Figure 3 Powered exoskeleton race (Cybathlon, 2016)



Figure 4- Brian-Computer interface race



Figure 5- Functional electrical muscle stimulation race