

Neuroethics: Addressing the Ethical, Legal, Social, and Cultural Implications of Neurotechnology

Sports Preamble

Sport—testing one’s abilities, talent, dedication, and performance in fair competition—differs in meaning and execution for everyone. The competition may be head-to-head against others, against a benchmark, or against one’s own self; it could happen in a driveway, in a basement, or in an Olympic stadium. Sometimes the competition is a test of physiology, sometimes a test of grace under pressure, or sometimes of skill honed by long hours of training. The performance involved might be the raw physicality of powerlifting or might require the mental gymnastics of a chess match. Often, it’s all of the above, plus a healthy dose of pain tolerance, concentration, and whatever makes us exceed our limits when we’re a meter behind in the home stretch, in a finely-tuned interaction between body and mind.

Science and technology have influenced sport for centuries, and as the pace of progress has advanced so has the conversation around whether any given innovation contributes to or diminishes the spirit of sport, or even creates an entirely different game. Technologies that increase performance or improve competition while rewarding skill and effort have flourished: adjustable barbells in 1910, EVA midsoles in 1975, Strava in 2009. Technologies that harm competition (due to availability, accessibility, or safety) or diminish the role of skill and effort have been deemed unsporting: sharkskin swimsuits and even hidden electric motors in bicycles.

We are now entering an era of practical neurotechnology, and when we have optimized our bodies to the utmost, optimizing the brain is the next step. Our ability to measure, monitor, influence, and modify the nervous system is beginning to spread beyond medicine and research, and as we learn more this trend is likely to continue. Because human performance results from the interaction between body and brain, the advent of practical neurotechnology poses increasingly complex questions for sport—both today and in the future. Consumer neuromodulation headsets promise faster improvement from training, but the field is new, devices are not available to all, and results are certainly subject to individual variation. Sensitive neurophysiological analyses promise to make athlete recruiting more quantitative, but risk ignoring the mysterious factors that make an athlete an unexpected hero on or off the field.

In this document, we will discuss current and future applications for neurotechnology in sport; we will highlight the ethical, legal, social, and cultural implications (ELSCI) in this emerging field; and we will review regulatory and funding considerations relevant to development of these technologies.