

An underwater photograph of a swimmer in a pool. The swimmer is wearing a black swim cap with the name 'MANAUDOU' in white letters and black goggles. The water is clear blue, and lane lines are visible on the pool floor. The swimmer's body is in a streamlined position, moving forward.

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INSIDE CHAMPIONS' MIND

or neurosciences in the race for the Olympic medals

A 52' documentary

Directed by Jean-Yves Cauchard

Produced by ARTE FRANCE,
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Pitch

« Citius, Altius, Fortius »

Faster, higher, stronger. The motto of Olympism seems to be getting more and more obsolete with the approach of the Tokyo Olympics in 2021. It misses a word which could be: «Intelligentius», «more intelligent». For several years, the performances of the athletes have been stagnating and studies show that we could have reached the end of the human species' physiological capacities. In the race for medals, the contribution of neuroscience on the mental state of champions appears today as the last frontier to explore, the last remaining weapon of performance.

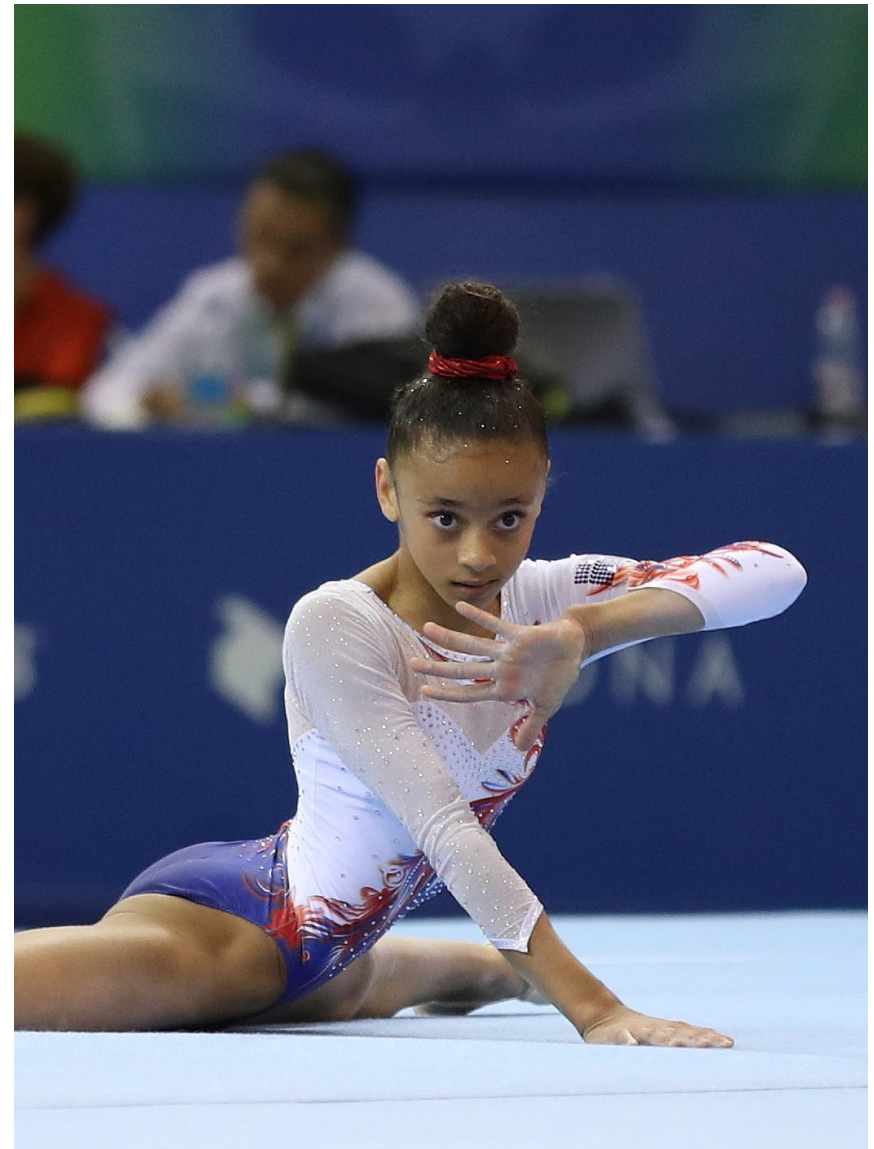
Synopsis

The Olympics are an opportunity for millions of television viewers to marvel at the athletes and their physical prowess. But behind these prodigies is an even more impressive mental prowess, cultivated over years to train the mind to ignore distractions, reduce stress and anxiety, and build the focus and stamina necessary to achieve optimum performance. «He is mentally strong!», they say of the person who wins a competition with panache. When they win, champions are elevated to the pinnacle and regarded as demigods. But when they lose, the litany of sports commentators in the aftermath of major debacles is always the same. «They lost because of their mind...».

But what is an athlete's mind? How does it work? What are the new weapons to improve one's mind and be even more successful?

Neurosciences now provide clear answers and explanations as to why and how these new practices have developed. Today, more and more athletes are using mental imagery to complement their training, train their minds to ignore distractions, reduce stress and anxiety and build the focus and stamina necessary to achieve optimum performance.

Following in the footsteps of mental trainers, researchers and athletes, this film offers a journey «Inside the Minds of Champions» between pure science and immersion with athletes preparing for the next Olympic Games.



An international scientific film

Developing the mind of athletes is now a concern of all national federations which, in all disciplines, seek to make their athletes shine. Some nations, such as the United States or Germany, have been developing this field of potential improvement for longer than the others. It is thus with these countries that we started our investigation, to see how athletes and scientists have set up a collaboration.

In Los Angeles, **Antonio Damasio** has been working for more than 20 years on the role of emotions in decision making. Professor of neuroscience and neurology, he directs the Brain and Creativity Institute at the University of Southern California. He explains how he developed his intuition that there were inseparable links in our nervous system between emotions and decision making. The basic idea of his work is that «emotions, current emotions and memory from past events form a system of markers to guide us and act», a system that is very useful for athletes.

In Boston, researchers at the Harvard University psychology lab, led by Sara Lazar, have revealed the amazing effects of meditation on the structure of the human brain. **Günes Sevinc** conducted a study on a population that underwent an average of 27 minutes of meditation per day for eight weeks: she explained to us, with the help of MRIs, how grey matter increases in density in the hippocampus, an area

of memory and self-awareness, and decreases in the amygdala, which is related to anxiety and reactions to stress.

In Montreal, **Marie-France Marin**, a neuroscientist and researcher, is continuing the work of Hans Selye, one of the pioneers in the study of stress. Her research focuses on the neurobiology of negative memories. In her laboratory at the Research Center of the Institut universitaire en santé mentale de Montréal, she gives us her definition of stress, which is first of all a normal physiological reaction of the organism that will release energy or produce an anti-inflammatory effect in order to respond to changes in the environment. Two hormones are thus released, adrenaline and cortisol, which obviously have physiological effects. She explains that high performance athletes are able to convert anxiety and tension into energy and concentration, which is called «good stress».



An international scientific film

In San Francisco, **Daniel Chao**, a neuroscientist at Stanford University, associated with MJP, a company founded by sprinter Michael Johnson, has developed a helmet that uses transcranial direct current stimulation, or tDCS, to act directly on the primary motor cortex and boost neural interconnection. He explains that this helmet acts directly on the brain areas responsible for learning, and insists on amazing results: American football players trained by MJP who tested this device recorded a 12% increase in their explosive capacity (standing jumps). And the U.S. Olympic team ski jumpers who tested it this winter report a 31% increase in propulsive strength. We have obviously compared this research with that now being conducted in Europe in comparable fields.

Aymeric Guillot, a researcher in mental imagery at Claude Bernard University Lyon-1, uses a cutting-edge technology of functional brain imaging, magnetoencephalography, which measures the magnetic fields produced by the electromagnetic activity of neurons during the efforts of athletes. It shows that physical training shapes the brain of athletes as much as their body, and allows them to develop unique and specific neuronal configurations that make their brain more efficient to perform movements.

Thierry Marivain, a psychology researcher at the University of Rennes, studies the management of pain in high performance athletes and the production of its «antidote», a hormone more commonly known as the happy hormone, endorphin. It leads to a decrease in the perception of pain, an anxiolytic effect and euphoria.

Stefan Vogt, a neuroscience researcher at Lancaster University in Great Britain, believes that the human brain can combine «action observation» and «motor imagery» to improve physical performance. Recent research has revealed that the activity of the cortex is even reinforced, improved, when practicing AO and MI together. Neuro-cognitive processes are often shared and this leads to beneficial effects. The brain becomes more efficient.





Great athletes

These researches are applied by many athletes in the world. Some of them have agreed to take part in the game of experimentation or testimonies, in front of our cameras.

Florent Manaudou (France, Swimming)

Maxime Margely (France, Canoeing)

Philip Lahm (Germany, Soccer)

Taïs Boura (France, Gymnastics)

Michael Johnson (USA, 200 and 400 m)

Bernard Hinault (France, Cycling)

Marvin Dogue (Germany, Modern Pentathlon)

Melina Robert-Michon, (France, Discus throw)

They have agreed to welcome us and to explain us how neurosciences came to them, through their mental trainers, who have become as indispensable as their coaches or their physical trainers. Among the latter, Thomas Sammut in Marseille who accompanies Florent Manaudou at the Cercle des Nageurs.

A film rich in archives

To tell the story of neuroscience in sports, we had to find old images of the Olympics, films on the first experiments in this field, and of course, images of sports performances. It is difficult to talk about the victory of the German team against Brazil at the World Cup in 2014 (7 to 1, with psychological preparation) without showing images of this triumph...

Here is Bernard Hinault, French cyclist, 5 times champion of the Tour de France in 1978, 1979, 1981, 1982 and 1985.





A mainstream film

The scientists, first of all, will remain perfectly comprehensible: they will only intervene in this film if their speech is intelligible to a large audience. The athletes then, perfectly played along, to resonate with their trainers and the scientists who supervise and accompany them. This film will show with them that the extension of the field of neurosciences is a field that is opening up in order to gain hundredths, milligrams or millimeters in the conquest of sports results.

Their comments will be backed up by 3D animations, which will didactically schematize the mechanisms involved in the athletes' brains.

This film, which will offer a unique approach of sports performance, will be available for viewing from mid-May, and delivered in early June. That is to say, about two months before the opening of the Tokyo Olympics, which are scheduled to take place from July 23 to August 8.





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