



# SCIENTIFIC MAGAZINE

4



OUR FIRST YEAR  
TOGETHER



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# S SCIENTIFIC MAGAZINE



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## **EDITORIAL MISSION STATEMENT**

The editorial mission of the EWF - Scientific Magazine is to advance the knowledge of human movement based on the assumption that it is firstly, by any standard, the expression of muscular strength and secondly, a way of life and an ethical approach entrusted to professionals who not only are highly qualified, but also have full knowledge of the scientific facts, as well as being specifically competent. From its first issue, EWF - Scientific Magazine, has set itself the ambitious goal of bridging the gaps between the scientific laboratory and the operator on the field, enhancing both the practical experience of the coaches and the results of applied research. Consequently, the editorial rule will be a constant reference to practice and the publication of recommendations on how to apply the results of research to the practice of movement and sport.





# SUMMARY

The sports technicians must draw on all the knowledge that sport sciences provides them with, but at the same time, they must not forget that training is based on two other areas that involve experience and intuition.



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Maximum force is to be sought as it provides an important stimulation for muscular synchronisation. However, techniques designed to increase muscle mass are prohibited. Children recover much faster than adults and this should be kept in mind in the recovery stages of both maximal strength exercises and endurance training.



**EDITORIAL**

# What will become of us?

Some days ago I walked into a book store and chose a book because of the extraordinary introduction in its flap cover. The title of the book is: "On the Matter of the Mind": a classic in the field of neuroscience, masterfully written by American biologist, Gerald Maurice Edelman, Nobel Prize winner for medicine at only forty-three years of age, for having studied and contributed to the understanding of some important mechanisms of the immune system. The presentation says: "We are at the beginning of the revolution in neuroscience; in the end, we will know how the mind works, what governs our nature, and how we know the world." Immediately my mind processes the concept: What will become of us? What will become of the man we know now, of his limits and his greatness? Many things in which we have believed until now, could change, or others could be confirmed. Whatever happens and however the adventure turns out, it is of great interest not only for the entire existence of man but, in particular, in the context in which we move - the world of sports performance and human movement in general.

Often, when talking about neurology, in other words, the brain, mind and consciousness, we risk making the mistake that it is something separated from the rest of the body and we return to the famous Cartesian dualism that describes a "res cogitans" and "res extensa" to indicate that on one hand lies the spirit and on the other lies matter. Cartesian

dualism, to be honest, is already present in the Greek world. Plato thinks of a world of ideas (Hyperuranion) that is distinguished from the world of bodies and describes the body as a jail in which the soul is "imprisoned".

Today we can say that the two are neither separated, nor that the function of both is an end in itself. Both are, however, a function of the body in its entirety, and each is a function of the other. In this way we restore dignity to the body emphasising once again how their interaction constitutes a perfect equation. Recent, extraordinary advances in neuroscience show that the mind is the expression of the brain, in other words, the result of several acquisitions and experiences that man has made over time.

The brain is, however, part of the body and there are strong, very strong links between the brain and body, to the point that one is the expression of the other. After all, whatever happens in the brain, affects the body and we know today that what happens in the organs is closely related with the mind. The mind-brain relationship is a problem with a long history.

For centuries, it has interested philosophers, theologians, psychologists, psychiatrists, doctors, with interpretations more or less similar or quite different, or even irreconcilable, with no chance of finding common ground. Sometimes integration leads to the rejection of one theory.

Over time, two schools of thought were generated by these positions: dualism and monism.

Among contemporary dualists, a great neuroscientist John Eccles (1903-1997), speaks of parallelism between two completely different realities. One proceeding parallel to the other, forming a track on which human behaviour can "travel". Naturally monists were not of the same opinion, with their Eleatics movement (Eleaticism flourished in the Greek colonies of southern Italy around the VI-V century B.C.), whose founder was Parmenides of Elea. He believed, in fact, that man is always faced with two paths: the path of truth (aletheia), based on reason, which leads us to know the true Being, and the path of opinion (Doxa), based on sensations, that takes us to the apparent Being. This school of thought emphasised the actual impossibility of the intellect to put together opposites reaching the contradiction of the movement and of the manifold. According to the monists, every mental expression has a corresponding neural reaction and every neural movement has a reflection in the mind. This concept is defined as belonging to materialists, who - by reducing everything to matter - consider anything outside of it a mere illusion, a mistake.

In what historical moment does the mind reach this stage? The hypothesis, according to many authors, is to regard consciousness as the result of an evolutionary process created through natural selection (Kandel).

Harry J. Jerison, a renowned psychiatrist, among many others claims that, since the dawn of life on earth, the change in animal organisms is “connected” to a significant expansion of the size of the brain, known as the process of “encephalization”.

During evolution, the amount of knowledge increased parallel to the increase in brain size, thus increasing intelligence and making awareness of the self more acute. Scientists later discovered that the cerebral cortex, the “more thinking” part and perhaps, most noble part of the brain, was further developed in the species that lived in more numerous social groups (Dunbar). Therefore, the group, interaction, upright posture, the establishment of a language to communicate, painting (the first graffiti), the processes of migration and the processes of survival (hunting, defence etc.), clearly channelled the evolutionary path of the human brain. This container of special cells, about one hundred billion, as many as the presumed galaxies in the universe, has enthralled and continues to fascinate scholars of every branch of science, who are committed to giving the brain a face and a size that does not belong only to interpretation or imagination. It is indeed a lengthy process, but they are slowly and persistently succeeding.

In recent years, neuroscience has embarked on a fascinating journey along a broad spectrum that includes our brains, our minds, our consciousness, our feelings,

our social world, and including our moral systems and religion. As always, the human brain has been recognised either for its “uniqueness” or its lack of uniqueness. Humans were considered the only animals capable of reflecting on their own thoughts. Today, a series of data shows that this ability is also present in the animal world. We present the same chemical components and demonstrate the same physiological reactions of animals. We share the majority of our genes and the architecture of our brain with them. Nevertheless, the differences are huge, unfathomable, obvious. To understand the brain and the mind, is to understand man, his being and his essence. The main question of this world is to provide an answer to how the brain enables the mind to be and to work. Mental processes are still part of the dark mystery of the brain that neuroscientists are desperate to understand. Michael S. Gazzaniga, American psychologist and neuroscientist and professor of psychology at the University of Santa Barbara, California, where he also directs the new SAGE Center for the Study of the Mind, says that very soon neuroscience will replace psychology, which no longer has the means to answer questions.

Hence, the severe judgment of Gazzaniga, already expressed in “The Mind’s Past”, that “psychology itself is dead”, replaced by neuroscience, a discipline in which amazing discoveries are made practically every day. Unquestionably a strong statement, but as

good, patients and interested spectators, we will certainly understand the evolution of this field of research.

Neuroscience can, therefore, not only probe interiority, as a process of awareness of our ability, but it can also explore the “human consciousness”.

The major contribution to the understanding of the latest concept of consciousness has come from studies of people living with the two cerebral hemispheres separated, following trauma or surgery, which has interrupted the lines of communication between the left and the right hemisphere. The experiments conducted by Roger Sperry and Michael Gazzaniga on a split brain, show that each hemisphere can have its own awareness. These individuals live as if they have two separate minds that have their own characteristics and ability to learn, remember and feel emotion.

Normally, the two halves of the brain communicate with each other: if the right half sees an apple, the message passes through the corpus callosum to the left hemisphere, which can give a name to that apple. If there are no connections, Sperry observed, it is as if these people had “two distinct realms of conscious awareness, two systems of intuition, perception, thought and memory.” Inspired by these studies, Gazzaniga, began to support the concept of “interpreter”, emphasising the ability of the left to “interpret” our thoughts, our behaviour and our responses, both cognitive

and emotional, to environmental stimuli, giving a sense to all processes of consciousness, of the mind, showing for example that the left hemisphere has many more mental capacities than the right, having the ability to think and generate hypotheses.

It is the centre of thought, of language, of speech and of the resolution of problems. It is superior in verbal, analytical and sequential tasks. The right brain, on the other hand, specialises in spatial recognition tasks, and is more inclined to synthetic, globalising and ideational tasks, including music, but is not able to “think or communicate”. It can only solve simple problems.

Together they build a system that gives a “sense” to all the information that the brain receives, interpreting thoughts, ideas, actions, cognitive and emotional aspects and connections.

Such a mechanism cannot help but “give rise to the concept of self”. We understand the concept of cognition of oneself as the “product” of various processes and as a “knowledge structure” (Kihlstrom and Klein). This level of self-awareness demonstrated by humans is “unique”.

An important part of the evolution of this magnificent structure stemmed from the fact that man is able to move, thus having the opportunity to explore new environments and to adapt to them.

Therefore, if an organ evolves, it means that it represents a plastic capacity. On this topic neuroscience shows that, over time, the brain is always willing to re-adapt and change. The brain, like life, is not a static thing, it is in constant evolution, a process of self-creation known by the term autopoiesis. The idea, then, of an immutable intelligence is “false”, declares Rose.

Research shows that it is possible to increase one’s intelligence (Dean, Morgenthaler). In experiments with chicks, rats and mice, a new experience translates into an increased neuronal activity (Kim, Baxter). These scientists strongly affirm that today’s brain of today is not like that of yesterday and will not be like tomorrow’s brain.

Dynamism produces neural connections that can be changed in two ways: from experience and from biological evolution as referred to by Aamodt, Wang. It is a phenomenon that affects our ability to think, learn, remember and plan behavioural strategies. Deprivation in childhood can, for example, interfere with brain development. Research on this matter shows that children who spent their childhood in an institution manifest disorders of brain development and behavioural problems that persist into adulthood. This dynamic process is known as the phenomenon of “synaptic plasticity” or “neuronal”.

A phenomenon that begins in the womb: a newborn baby recognises the voice of his mother and that of other people and prefers the music heard before birth (Michael Fifer). It was later discovered that the intelligence quotient (IQ) increases or decreases depending on the type of stimulation to which the infant brain is subjected.

In 1965, thanks to the discoveries of Altman and Das, the idea that the brain was made up of a fixed number of neurons and could not generate new neurons, was vanquished. Neurogenesis in the adult is now a certain fact.

However, in all this movement, what is the impact of physical activity and sport on the evolution of the brain? A great deal indeed.

Physical and mental activity stimulates the secretion of neurotrophins, which support the development of neurons; It improves mental and physical agility and the health of the body during aging; it prevents damage caused by Parkinson’s and Alzheimer’s, “sculpting” our brain, always creating new connections between neurons. In conclusion, for now, we can say that - whatever will become of us - we are already sure that: sports, and movement in general, favour the evolution of our brains and our intelligence.

**Antonio Urso**  
EWF President



# THE B-SIDE OF THE BRAIN

In 1676, Antonie van Leeuwenhoek, the Dutch inventor of the microscope, observed the movement of tiny entities and realised that he was witnessing living cells, which he then referred to as *animalicula* (little animals). In 1838, German naturalist, Christian Gottfried Ehrenberg, was the first to call these cells *bakterie*, from the Greek word βακτήριον (rod or cane), describing the shape of the majority of these microorganisms. In actual fact, the so-called *little animals* are not only bacteria, they also include yeast, protozoa, fungi, algae and mould. Most importantly however, they are not little animals.

**BY MENOTTI CALVANI**







### Man, the tamer of microbes, invents biotechnology.

Long before they were actually seen, man had begun to exploit *animalicula* for his own needs, creating what we now call biotechnology. 7,000 years before Christ, in modern day Iran, beer was produced when yeast present in the air transformed the sugar in cereals into alcohol.

The ancient Egyptians and the inhabitants of the entire Mediterranean basin had learnt to leave a mixture of water and ground cereal in the open air so that it would increase in volume (rise) before cooking it; in order to repeat the phenomenon, they would add beer, thus the discovery of brewer's yeast. From 6,000 BC, there is evidence that wine was produced in Armenia by fermenting grape juice. Even before the invention of the concept of agriculture, which led to the cultivation of cereals, man drank mead, a hydroalcoholic liquid produced by the fermentation of honey harvested from beehives.

Mead is considered the first doping substance for men and gorses in the history of sport. Pliny the Elder tells of barbaric tribes that drank sour milk; ancient Persian traditions recount that Abraham's fertility was all down to his regular consumption of sour milk. In actual fact, Yoghurt, a word of Turkish origin, was widely consumed by Neolithic man in Central Asia. It was made with horse milk which fermented with the bacteria present in the vessels used to transport milk across the steppes, the vessels being made from animal intestines!

### FIGURE NO. 1

A) GENGHIS KHAN, LIKE HIS ANCESTORS OF THE NEOLITHIC AGE, WAS A GREAT CONSUMER OF YOGHURT.

B) EGYPTIAN BREAD DISCOVERED IN A TOMB. C) CUNEIFORM TABLET WITH INGREDIENTS FOR MAKING BEER.

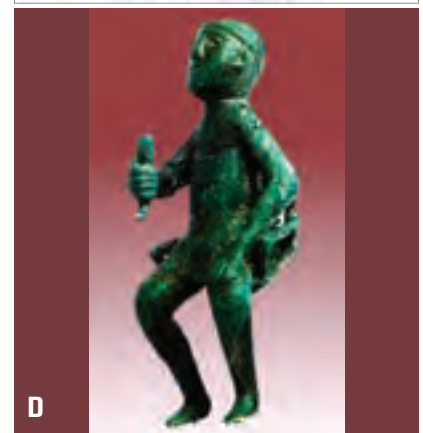
D) A MAN WITH A CUP OF WINE, ARMENIA 4,000 YEARS BC. E) MEAD, THE FIRST ALCOHOLIC BEVERAGE PRODUCED BY MAN, WAS ALSO THE FIRST DOPING SUBSTANCE USED TO ENERGISE HORSES.

HORSES.

### Small and bad

In 1800, Louis Pasteur and Robert Koch demonstrated the bacterial origin of major diseases such as Tuberculosis, Cholera and the Carbuncle. Pasteur investigated the way in which the bacteria spread the disease and showed how an often deadly fever that killed many women after childbirth (the dreaded puerperal fever) was transmitted by the dirty hands of the midwives (!). However, it was not Pasteur, but an Hungarian doctor, Ignác Semmelweis (1818-1865), who adopted the very first measures of hygiene: wash your hands! In this way the number of cases of puerperal fever dropped, but he was considered crazy and locked away in a mental hospital where he died from beatings inflicted upon him<sup>1</sup>.

Bacteria very soon became an enemy to fight (antibiotics as of yet had not been invented) and in order to stop the spread of the tiny menaces, Pasteur invented pasteurisation, a method for sterilising food and preventing the transmission of diseases to humans. Pasteur, however, also showed how the fermentation processes were actually the work of microorganisms. He was responsible for



1. <http://vimeopro.com/bunkostudios/sid-the-science-kid-grandmas-flashback/video/80301859>



demonstrating that the formation of alcohol, starting with wine, is a biological process that occurs in the absence of oxygen (“life without air”), and not a spontaneous chemical reaction. The passage from this knowledge to intestinal fermentation was brief and, above all, on observing that many psychiatric patients had intestinal problems, it was hypothesised that mental illness was a consequence of **auto-intoxication** induced by bacteria.

### We and Bacteria

Bacteria made their first appearance on Earth some 3 billion years ago, in just one spoonful of earth we can find up to 10,000 billion: they are everywhere, including on every surface of our body.

Over 90% of the cells in the human body are actually not human, they are microorganisms, to a great extent bacteria. There are over 40,000 bacterial strains in our body, for a total of more than 100 trillion (1 trillion = a million billion) microorganisms that in the intestine alone weigh 1-2kg, almost the same mass as the brain, which weighs approximately 1.5kg.

Bacteria are not only present in the intestine, they are also in the mouth, vagina, on the skin, etc. (see Tab. 1).

Vital for the synthesis of vitamins and cofactors of enzymes, bacteria break down complex fats and sugars which cannot be digested and assimilated by our intestine. They also detoxify toxic substances present in foods or produced by other microorganisms, and they are capable, in some cases, of extracting up to 40-50% of the

THE CELLS IN OUR BODY (EXCLUDING BLOOD AND NEURONS)	10 <sup>12</sup>
BACTERIA ON THE SKIN	10 <sup>12</sup>
BACTERIA IN THE MOUTH	10 <sup>10</sup>
BACTERIA IN THE INTESTINE	10 <sup>14</sup>
WEIGHT OF INTESTINAL BACTERIA	> 1 KG
NUMBER OF BACTERIA IN 1 GR. OF FAECES	10 <sup>12</sup>
MICROBIOTA	> 100 TIMES THE NUMBER OF GENES IN HUMAN GENOME

TABLE NO. 1

- MATURATION OF THE INTESTINE
- NUTRITION OF THE HOST
- RESISTANCE TO PATHOGENS
- REGULATION OF THE PROLIFERATION OF THE INTESTINAL EPITHELIUM
- PRODUCTION OF ENERGY FOR HOST
- IMMUNE RESPONSE TO INFECTION
- MATURATION OF NERVOUS SYSTEM

TABLE NO. 2

energy present in foods, contributing to an energy excess that leads to obesity.

Intestinal microbes can also metabolise drugs and medicines (there is a long list), reducing their supply or even increasing their duration in circulation, as may be the case for oestrogens and morphine.

### The origin of our guests

Throughout its life in the womb, the foetus lives in a bacteria-free environment. At birth, the first gift from a mother to child is the vaginal bacteria that the newborn comes into contact with during its passage through the birth canal. Up until that moment, the baby's digestive system has been sterile, but it is also not completely mature. The cells that make up the mucous do not provide an adequate barrier to separate blood from food in the state it is ingested. In fact, the gastro-intestinal tract breaks down the food into its essential components (sugars,

fats, proteins, salts, vitamins, etc), which are then absorbed by specific proteins known as carrier proteins. The bacteria that a mother passes to her child during birth and breastfeeding are good microbes that the mother has selected for her own body and that can be guaranteed as good also for her baby: they digest baby's first food in an intestine that is not quite ready and “seal the cracks” between the single cells of the intestinal mucosa, to allow only authorised substances to pass into the blood (maturation).

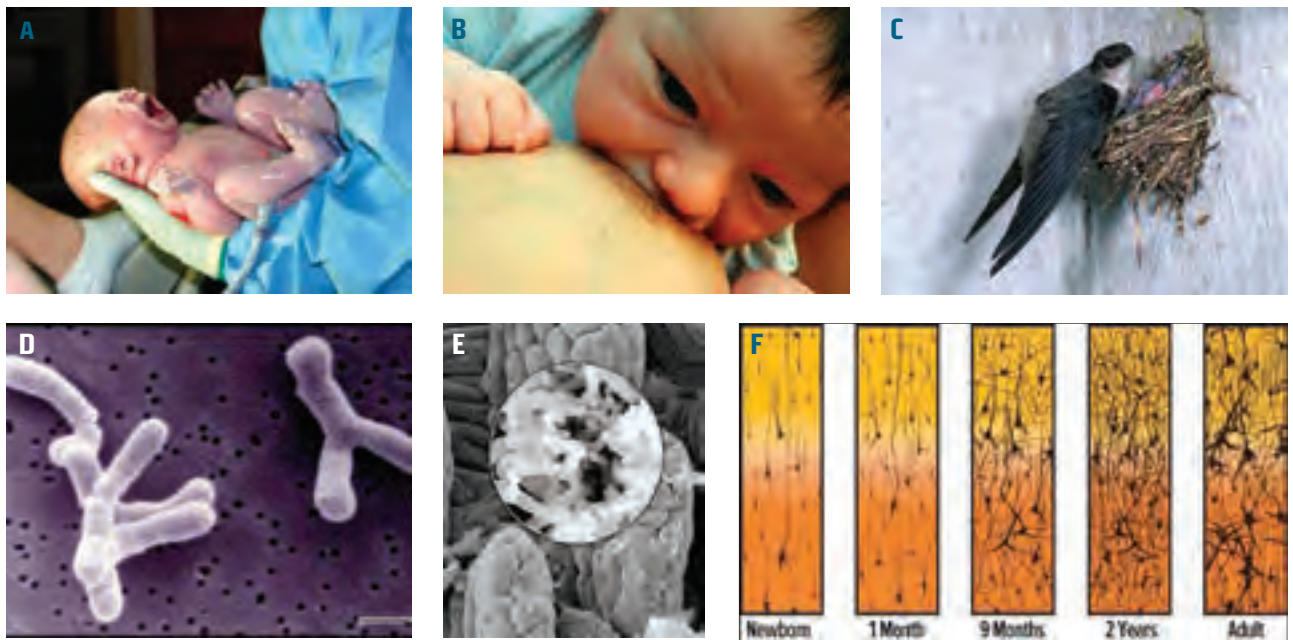
Breast milk is the food with which a mother provides her baby with all the necessary nutrients to live and grow. This milk contains proteins, fats, vitamins, salts, hormones, small sugar molecules and oligosaccharides, such as lactose. Mothers also provide the bacteria that feed on oligosaccharides: **Bifidobacteria**, so-called for their y-shaped appearance. The bifidobacteria, well-nourished with their



favourite food, are destined to overwhelm their rivals, ensuring a defence against microbes that carry diseases (microorganisms fighting microorganisms): this is the principle of the antibiotic, first used in 1939 with the discovery of *Penicillin* by Fleming). Milk contains circa 200 types of oligosaccharides, that work as a trap for hostile

bacteria which, mistaking the oligosaccharides for surface molecules of the intestine, attack them, thus saving the intestine from dangerous contact. Breastfeeding reduces the incidence of respiratory infections, sudden death in infants, inflammatory bowel diseases, etc. With weaning and the arrival of solid foods, the baby's gut flora gra-

dually changes and *Bacteroidites* appear - little rod-shaped bacteria capable of digesting fibres of plant foods. At the age of 2-3 years, the gut flora is further enriched and is already similar to that of an adult. It is no coincidence that our intestinal microbiome, our extra organ, reaches maturity at the same time as our brain!



#### FIGURE NO. 2

- ON PASSING THROUGH THE BIRTH CANAL, A BABY RECEIVES ITS MOTHER'S VAGINAL AND INTESTINAL BACTERIA.
- WHEN BREASTFEEDING, A MOTHER GIVES HER BABY THE FIRST BACTERIAL PATRIMONY THAT MAKE DIGESTION POSSIBLE, THAT DEVELOP THE INTESTINE AND DEFEND AGAINST MICROORGANISMS (PATHOGENIC BACTERIA, FUNGI, ETC.).
- CHIMNEY SWIFTS CHEW THEIR FOOD BEFORE FEEDING IT TO THEIR YOUNG; THE CHICKS WOULD NOT SURVIVE FOR MORE THAN A FEW DAYS IF THE FOOD WAS NOT CHEWED, WITH THE ADDITION OF PARENTAL BACTERIA.
- BIFIDOBACTERIA WITH ITS Y-SHAPED FORM, AN ESSENTIAL ELEMENT FOR THE DIGESTION OF SOME SUGARS DURING BREASTFEEDING.
- ROD-SHAPED BACTEROIDITES, IMPORTANT FOR THE DIGESTION OF FIBRES DURING WEANING, SHOWN ATTACHED TO THE INTESTINAL VILLI.
- DENSITY OF HUMAN BRAIN NEURONS AT DIFFERENT AGES; NOTE THE DENSE NETWORK AT TWO YEARS OF AGE, WHICH CORRESPONDS TO THE MOMENT IN WHICH THE INTESTINAL ACQUIRES THE GUT FLORA SIMILAR TO THAT OF AN ADULT.

**The microbe-intestine-brain axis**  
The ensemble of microbes that live in our body has been defined as the **microbiome**, those of the gut weighing > 1.0 Kg, comparable to that of the brain or the

liver. It has also been defined as the "**forgotten organ**": in actual fact, not much study has been dedicated to it as an organ, but nature and evolution have done an excellent job of creating a system

that favours dialogue between the intestine and the microbiome. With the appearance of vertebrates, circa 500 million years ago, complex nervous structures in the intestine also were developed, ca-

pable of integrating information which was useful to the management of a very long structure, such as the gastro-intestinal tract, with its vast surface area: it is a network of approximately 500 million neurons, equal in number to those of the spinal cord, and known as the **visceral brain** or **second brain**. It employs at least 40 neurotransmitters, uses over 60% of the **serotonin** and 50% of the **dopamine** produced by our bodies. To communicate with the brain, the intestine uses the X pair of cranial nerves, the **Vagus** nerve (from the Latin word meaning vagabond), but it also keeps in contact via the **lateral chains of the sympathetic nervous system**.

There are approximately 30,000-80,000 fibres of the vagus nerve that carry information from the intestine to the brain. The ratio of these fibres to the neurons that transmit from the brain to the intestine is 9:1.

### ***The brain is a careful listener!***

The vagus nerve enervates the entire intestine, including the colon, and its terminals have receptors for an enormous amount of chemical substances or transduction systems sensitive to mechanical stimuli, such as the distension of the intestinal walls. The information that arrives to the brain via the vagus nerve is transferred to the cortical and sub-cortical areas responsible for the perception of well-being, anxiety and stress. ***The intestine works in unison with the second brain, constructing our emotions, which are not always pleasant.***

### **The microbiome-intestine brain axis**

A little bit of history

John Harvey Kellogg, an American physician and inventor of *Corn Flakes* in 1887, became a vegetarian because he was convinced that a meat-based diet led to many diseases, caused by the putrefaction of animal protein when acted upon by intestinal bacteria. To back this up, he boasted that he never left any foul smells in the bathroom! He made his patients follow a vegetarian diet, prescribing enemas with large amounts of water, to be performed several times with a machine he himself invented, followed by - each time - a pint of yoghurt, half to be eaten and half by enema! Health for Dr. Kellogg meant a clean intestine, devoid of fermentation produced by bad bacteria. The same concept of the Egyptians who had created the figure, the *Guardian of the Anus*, whose task was to prepare enemas for three consecutive days every lunar month, in order to keep the intestine pure and clean. Since 1860, German physician, Hermann Senator, attributed mental illness to an "auto-infective" process, triggered by bacteria in the intestine. In 1887, French physician, Charles Bouchard declared that bacteria were capable of influencing the human brain, via substances that some produced when breaking down food. He defined this phenomenon as "auto-intoxication". In 1898, the journal *JAMA* published the first paper that linked depression to intestinal bacteria: it was intestinal bacteria's debut into the world of neuroscience. As antibiotics did not yet exist, doctors decided

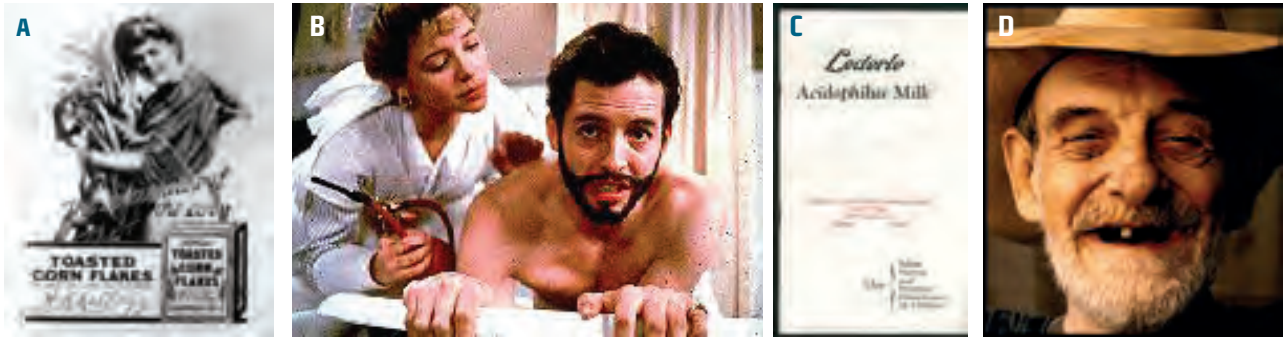
to eliminate the origin of auto-intoxication in depressed patients and they began to cut their colon, with a mortality rate of 16 - 30% of the patients operated on. When bacteria were discovered in the mouth, they began to extract teeth and remove tonsils!

Elie Metchnikoff, Nobel prize-winner for medicine, replaced bad bacteria with good ones (*Lactobacillus Bulgaricus*), present in yoghurt. Thus the practice of bacteriotherapy was introduced. It was, however, discovered that *Lactobacillus Bulgaricus* is destroyed by stomach acid, and some American companies launched onto the market a milk containing *Lactobacillus Acidophilus*, with the ability to colonise the intestine.

### **The Mind Factory Emotionally "visceral"**

Bacteria, however, are not the sole cause of disease. Cohabitation between bacteria and the animal kingdom over thousands of years has developed systems of cooperation that benefit all involved and has allowed evolution take place: man could not survive without bacteria.

Among other things, bacteria are important for the formation of the brain, in particular for the areas related to stress and responses to stress, such as anxiety and depression. Animals born by caesarean birth and nourished with sterile food in a sterile environment have no microbes in their intestine (Germ-Free) and they have an exaggerated hormonal response to stress, manifesting higher levels of anxiety in difficult situations, compared to animals with



**FIGURE NO. 3 KELLOGG UNDERSTANDS THE ROLE OF HEALTHY INTESTINAL FLORA AND INVENTS.**

- A. CORN FLAKES, ADVERTISED IN 1903.
- B. ESTABLISHES THE USE OF HYDROCOLONOTHERAPY WITH ABUNDANT WATER ENEMAS, FOLLOWED BY YOGHURT PARTIALLY INTRODUCED BY ENEMA (SCENE FROM THE FILM, THE ROAD TO WELLVILLE, THAT TELLS THE LIFE OF KELLOGG).
- C. MILK ENRICHED WITH ACIDOPHILUS AS A CEREBRAL ACTIVATOR, CIRCA 1930.
- D. REMOVING TEETH AS AN ANTI-DEPRESSION THERAPY (SEE THE TEXT).

normal gut flora. If the non-pathogenic bacteria present in the control group are inserted into these animals' intestines with a probe, their behaviour is partially normalised. If, on the other hand, particular bacteria (*bifidobacterium infantis*) are introduced, behaviour is completely normalised. If not stimulated, germ-free animals are less anxious; if placed in a maze, they explore all the areas and, if put in a special apparatus in which they can choose between a dark and a bright place, they, in contrast with the control group, choose the latter. In normal environments, germ-free animals acquire the bacteria of the environment. If such a shift occurs in adulthood, by which time the formation of the brain is complete, they maintain low levels of anxiety, confirming that there is a window of time for the role of bacteria in the maturation of some structures.

Treatment with antibiotics, after birth, reduces anxiety in mice regularly exposed to environmental bacteria, creating a situation

similar to that of the germ-free group.

Some strains of intestinal (among which *Bifidobacterium Infantis*) possess the ability to produce particular proteins (*neurotrophins*), such as Brain-Derived Neurotrophic factor, Synaptophysin and PSD-95, capable of increasing the number of connections between the cells and the brain, especially in the hypothalamus and in the Striatum.

Neurotrophins are expressed to a lesser extent in germ-free animals, the brain develops less and presents alterations in motor activity and in stress response. Bacteria can communicate with the brain via the vagus nerve. The administration of pathogenic bacteria to animals through food allows to specifically activate certain areas of the brain; likewise, the introduction of good bacteria (defined by the FDA as probiotics) reduces anxiety and activates neurons in the **hypothalamus**, responsible for stress response.

The same neurons are activated even more if pathogenic bacteria are introduced instead of probiotics. The former are capable of inducing a strong inflammatory response.

The selective introduction of bacteria (for example, *Campylobacter jejuni*), induces anxiety; whereas, the introduction of other bacteria (*Lactobacillus rhamnosus*) reduces anxiety: the mechanism is put into effect through the stimulation of the ascending neurons of the vagus nerve. This stimulation appears to vary depending on the strains of bacteria introduced. **In all these cases, the cutting of the vagus nerve blocks everything!** *The composition of bacterial flora becomes a critical element in the bacteria-brain relationship: the use of antibiotics, the type of diet and the use of probiotics could have major effects on the state of anxiety and/or stress response in the general population and in athletes, especially in the run up to a competition.*



## The immune system

The gut contains 60-70% of the whole organism's immunocompetent cells. The microbes in the

digestive tract have an intense dialogue with these cells, which makes them immune-tolerated or leads to the development of an intense inflammatory reaction. The composition of the intestinal flora is important for the purpose of bowel health, as well as for the whole organism.

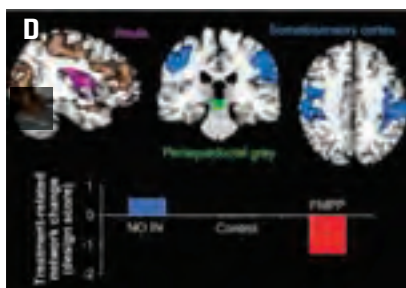
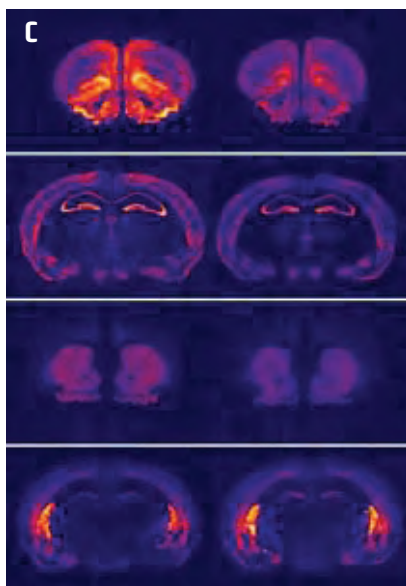
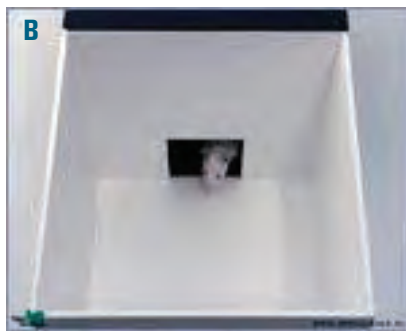
The immune system is divided into two categories- innate and adaptive. In germ-free animals, the adaptive system does not develop if the inflammation is very low: as the level of inflammation is related to anxiety, these animals have low levels of anxiety. In normal animals, the administration of pathogenic bacteria increases inflammation and the level of anxiety, in the same animals, the administration of probiotic bacteria reduces anxiety: *inflammatory substances, induced or controlled by bacteria, can reach the brain and give it information, independently of the vagus nerve. Also in this case the diet may favour some bacterial strains to the detriment of others and have an effect on brain activity.*

Bacteria are responsible for maturing the intestinal epithelium.

In bacteria-free animals, the epithelium is not a barrier that separates the inside from the outside. The premature use of antibiotics in the first months of life destroys the intestinal flora and is the cause of allergies later in life.

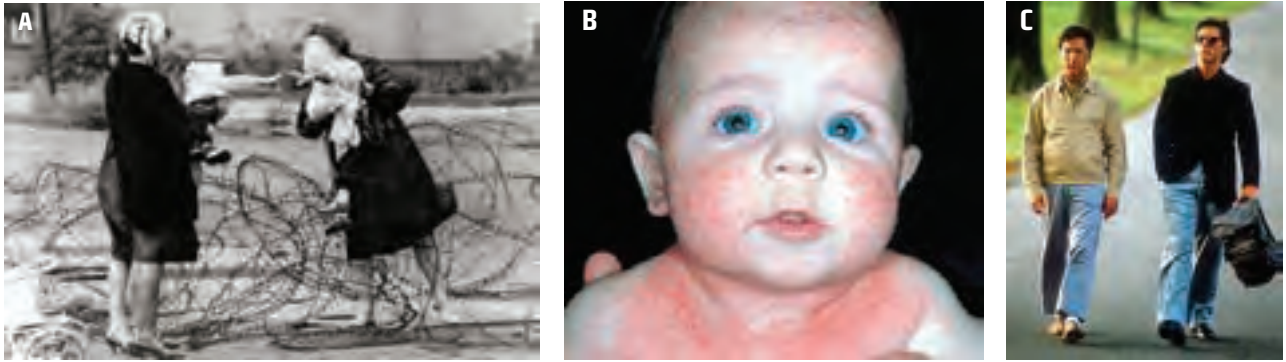
After the collapse of the Berlin Wall, it became evident that the children of West Berlin, who had consumed large quantities of antibiotics, had a higher incidence of allergic reactions than the children of East Berlin, where the use of antibiotics was much lower.

However, an intestine which is too permeable can admit substances having psychotropic activity, produced by the bacteria that otherwise would not pass. It is to be noted that bacteria are capable of producing substances having a psychotropic activity such as bile acids and short chain fatty acids, the latter starting from the digestion of vegetables. In some cases, the substances produced are toxic, inflaming intestines and blocking the formation of certain brain structures, leading to severe psychiatric disorders such as autism.



### FIGURE NO. 4 GERM-FREE ANIMALS:

- A AND B. BACTERIA-FREE ANIMALS, UNLIKE NORMAL MICE, PREFER THE OPEN PART OF A MAZE OR THE BRIGHT AREA OF A LIGHT/DARK BOX, IGNORING THE INSTINCT THAT WOULD HAVE THEM STAY IN DARK, PROTECTED AREAS.
- C. NEUROIMAGING OF THE NERVOUS SYSTEM OF MICE WITH AND WITHOUT GERMS (RIGHT), RED INDICATES THE AMOUNT OF SYNAPSES (NERVE CELL ENDINGS) CONSIDERABLY REDUCED IN GERM-FREE ANIMALS.
- D. R FUNCTIONAL MAGNETIC RESONANCE: IN WOMEN SUBJECT TO ATTENTION TESTS, THE ADMINISTRATION OF PROBIOTICS REDUCES THE ACTIVATION OF BRAIN AREAS RELATED TO STRESS.

**FIGURE NO. 5**

- A. TRANSFERRING INFANTS ACROSS THE BORDER OF THE TWO GERMANY: CHILDREN FROM THE EAST WILL IMPROVE THEIR QUALITY OF LIFE, BUT BECAUSE OF THE CHANGE OF INTESTINAL BACTERIA, WILL FACE GREATER RISK OF ALLERGIC DISEASES.
- B. THE CASES OF CHILDREN WITH ATOPY ARE GREATER IN WEST GERMANY THAN IN EAST GERMANY DUE TO THE GENERAL USE OF ANTIBIOTICS IN THE FIRST YEAR OF LIFE.
- C. THE USE OF ANTIBIOTICS AND THE PRESENCE OF SPECIFIC BACTERIAL STRAINS, IN CRITICAL MOMENTS IN BRAIN DEVELOPMENT IN EARLY CHILDHOOD, APPEAR TO BE AT THE BASE OF THE ONSET OF AUTISM, A NEURO-PSYCHIATRIC DISEASE ADMIRABLY PORTRAYED BY DUSTIN HOFFMAN IN THE FILM RAIN MAN.

### Bacteria and neurotransmitters

Some bacteria interact with the nervous system by producing themselves the neurotransmitters that the nerve cells produce to communicate with each other:

- *Lactobacillus spp.* and *Bifidobacterium spp.* produce **GABA**;
- *Escherichia spp.*, *Bacillus spp.* and *Saccharomyces spp.* produce **norepinephrine**;
- *Candida spp.*, *Streptococcus spp.*, *Escherichia spp.* and *Enterococcus spp.* produce **serotonin**;
- *Bacillus spp.* produces dopamine;
- *Lactobacillus spp.* produces **acetylcholine**.

### The choice of partner

Fruit flies (*Drosophila melanogaster*) fed with molasses or starch tend to mate, favouring the partner who follows the same diet. The choice depends on the different intestinal bacterial strains selected from food. In the case of fruit flies, the bacteria responsible are tho-

se of the *Lactobacillus plantarum* strain benefitting from the diet of starch, and manufacturers of pheromones, volatile substances that signal "availability" for mating to the brain of the opposite sex through the olfactory pathways. The smell of bacteria also gives dogs information in their mutual sniffing, and some products of the intestinal bacterial flora are eliminated through the sweat glands and further metabolised by the skin bacteria producing volatile substances involved in the choice of partner.

### Bacteria and social relations

The bacteria with which we live accompany us throughout all the stages of our lives.

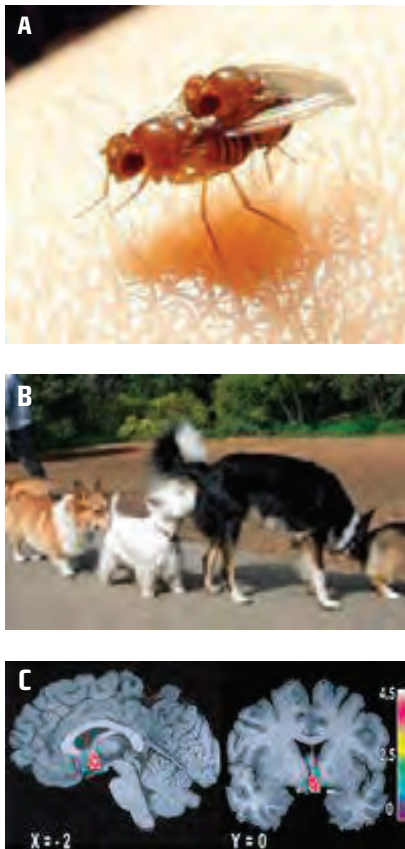
We acquire them from our mother during birth and breastfeeding, we increase their variability, acquiring and selecting others based on their compatibility with our gender and our genes.

The identification of the bacterial strains, by genetic analysis, has demonstrated the great inter-individual variability of intestinal flora.

Identical twins separated at birth, show a greater homogeneity of the bacterial flora with the people with whom they share their daily life, starting with the food.

In reality, the everyday environment offers the possibility of bacterial exchange, regardless of diet.

Typical examples are kissing, sexual activity, sharing cutlery, kissing religious objects, the exchange of sweat towels when athletes wipe down during competitions, etc. In the ritual and the social value of these acts, also present in animals, bacteria make their mark as belonging to a community with all that this entails.



### Recommended reading

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 Cryan JF, Dinan TG. Mind-altering microorganisms: the impact of the gut microbiota on brain and behaviour. *Nat Rev Neurosci.* 2012 Oct;13(10):701-12  
 Selhub EM, Logan AC, Bested AC. Fermented foods, microbiota, and mental health: ancient practice meets nutritional psychiatry. *J Physiol Anthropol.* 2014 Jan 15;33(1):2

### FIGURE NO. 6

- A. THE PRESENCE OF *LACTOBACILLUS PLANTARUM* IN THE GUT AND THE ODOROUS SUBSTANCES THAT THIS BACTERIA PRODUCES INDUCES FRUIT FLIES TO MATE WITH PARTNERS WHO FOLLOW THE SAME DIET.
- B. THE SNIFFING DOG SENSES THE HORMONAL STATUS, BUT ALSO THE METABOLIC PRODUCTS OF INTESTINAL BACTERIA AND THE STATE OF STRESS OF HIS FELLOWS.
- C. SOME ODOROUS SUBSTANCES, PHEROMONES, PRODUCED BY MEN AND WOMEN INDUCE THE ACTIVATION OF THE HYPOTHALAMIC NEURONS (RED) IN THE OTHER SEX.



### FIGURE NO. 7

SO MANY WAYS TO SHARE OUR BACTERIA, FEELING PART OF A GROUP AND... HAVING SIMILAR EMOTIONS?



# COACH- ING SKILLS

*Part of this article taken from the book:  
Learning to win  
by A. Cei (2011), Calzetti & Mariucci.*

**BY ALBERTO CEI**

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Courtesy of FIPE/ VANDA BIFFANI

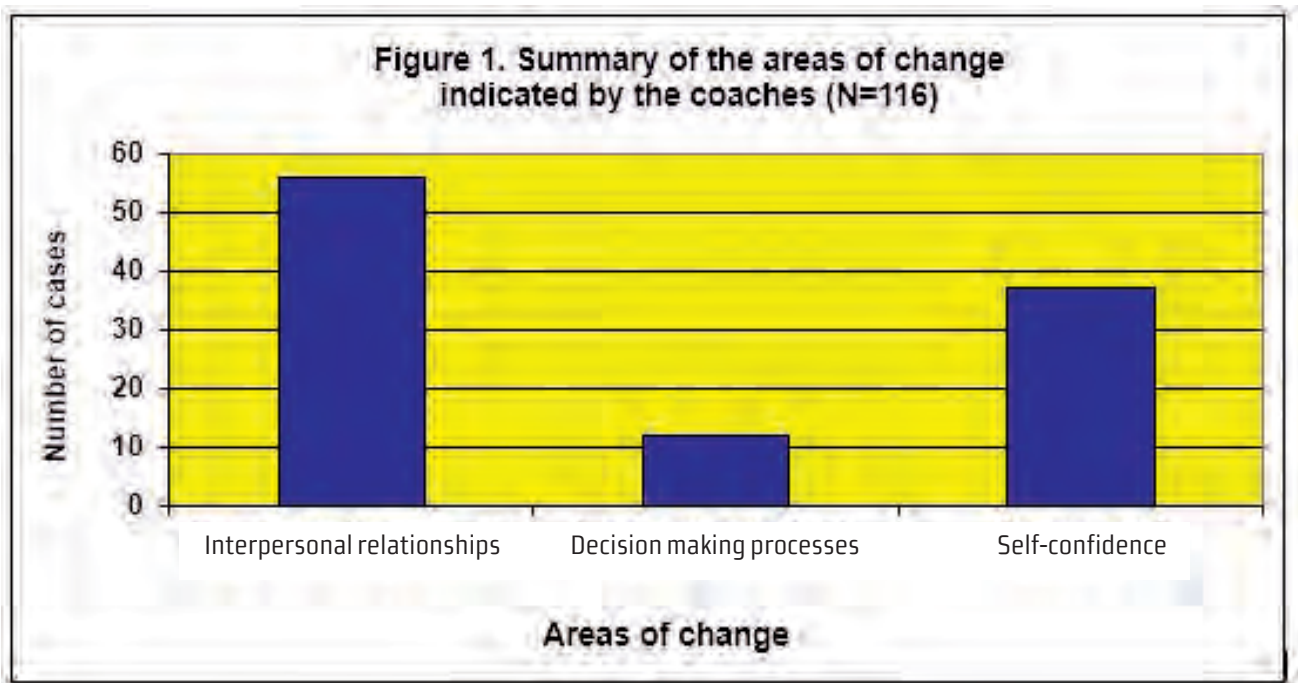


Athletes are ultimately the ones who compete, but the quality of their performance is forged during training, **a situation which focuses on the interaction between coach and athlete, where both are fully aware of the importance of this relationship.** So much so, that the only research carried out on a significant number of athletes (N = 817), and that includes members of the US Olympic team in the period 1984-1998, has highlighted the belief that their success was determined to a large extent by the interaction with excellent coaches (Ricvald and Peterson, 2003). Having emphasized the impor-

tance of the athlete-coach duo besides that of an excellent training programme, draws attention to the existential component of the role of the coach, understood as an essential factor in this relationship, in addition to the purely technical-professional role. Similarly, the activity that I carry out with coaches, in order to develop their psychological skills, has given me an insight into the main psychological areas in which they want to improve: interpersonal skills, self-confidence and, to a lesser extent, decision-making (**Figure 1**).

**Figure 2** illustrates in detail the

specific skills that are included in these three major categories. Based on these results, it can be said that the areas that are continuously brought into play by the coach-athlete relationship can be identified by three extensive factors. The first refers to the scope of the scientific and methodological training. In fact, the knowledge which has proven valid in the development of effective programmes is applied during field work. The scientific aspects of training methodology is taught in university courses and training courses organised by the Italian Olympic Committee and by Sports Federations.



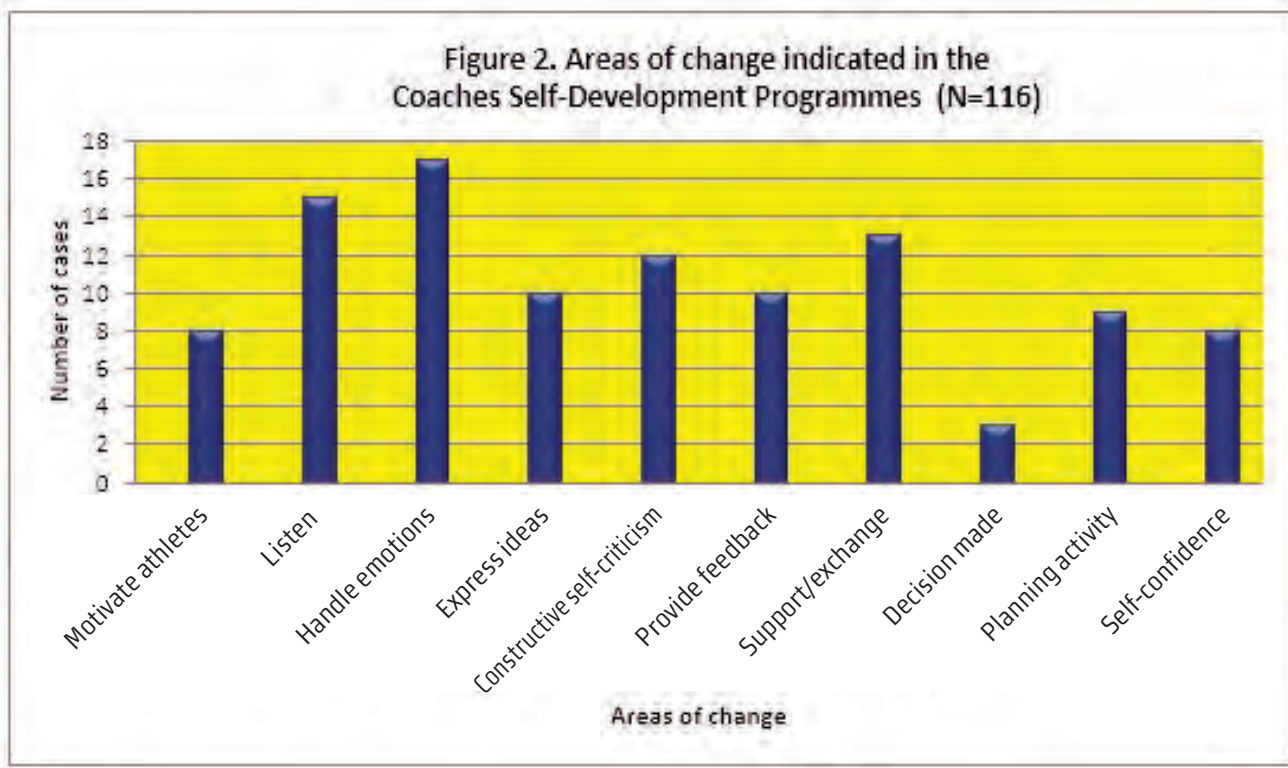
**FIGURE NO. 1**

Furthermore, with regard to this, coaches have dedicated most of their training and refresher courses to this professional component. The combination of these skills allows the coach to manage training rationally, with an intelligent and flexible implementation of the scien-

tific knowledge and assessment procedures acquired (Beccarini and Madella, 1998). A coach is not a scientist who abstractly applies workloads, records data, analyses and proposes new approaches, a coach analyses and decides what is best, based on his/her knowled-

ge of the psycho-physical and technical/tactical characteristics of the athletes, on the time available, on the goals and on many other aspects (e.g., gender, age, competitive level, stage of career, sports experience, calendar of events, club expectations of the club).



**FIGURE NO. 2**

Furthermore, with regard to this, coaches have dedicated most of their training and refresher courses to this professional component. The combination of these skills allows the coach to manage training rationally, with an intelligent and flexible implementation of the scientific knowledge and assessment procedures acquired (Beccarini and Madella, 1998). A coach is not a scientist who abstractly applies workloads, records data, analyses and proposes new approaches, a coach analyses and decides what is best, based on his/her knowledge of the psycho-physical and technical/tactical characteristics of the athletes, on the time available, on the goals and on many other aspects

The sports technicians must draw on all the knowledge that sport sciences provides them with, but at the same time, they must not forget

**“In particular, The coach should constantly ask him/herself, “What specific goal do I want to achieve?”, and “What are the factors that may limit or affect the accomplishment of these goals?” On this basis, a coach will decide the training programme, the kind of relationship with the athletes, the form of assessment and organisation ... it is only with a clear idea of the goals, and the factors that can restrict their achievement, will the coach can be effective.” (Beccarini and Madella, 1998, p.14).**

that training is based on two other areas that involve experience and intuition. An excessive focus on the role of science may lead to the belief that there is only one right way to develop and improve sports skills.

The second factor that characterises the figure of the coach refers to the role played by his/her professional experience, which reflects on their activities, focusing in particular on the interaction with the

athlete or team, in training and in competition. As shown in the figures, this is area in which the coaches feel they need to improve, The coach should assess the effectiveness and efficiency of his/her work, as well as the reactions of the athletes; he/she must also analyse the difficulties encountered, how they were addressed and what solutions were experimented. This activity must be carried out consistently over time, focusing on what hap-



Courtesy of EWF

pens during the sessions and during competitions. It is therefore, not a sporadic commitment, or a solution to an immediate problem, it is not first aid activity, it must be part of the normal course of action. In this sense, the coach is a facilitator, as he/she fosters the creation of a suitable training environment, developing in athletes the desire to compete and a winning mentality. The coach cannot help but reflect on his/her professional experience and must be aware of:

1. **the decisions he/she makes;**
2. **what are the parameters that will show the training was effective;**
3. **what he/she expects from the athletes in relation to the practice they put in;**
4. **the difficulties they may face and solutions to be adopted;**

5. **how to face competition and how to evaluate the results;**
6. **having a plan to deal with unforeseen and unexpected events;**
7. **what distinguishes a successful season from an unsatisfactory one;**
8. **how to handle difficult periods that will inevitably arise;**
9. **how to deal with the stress related to the coaching profession;**
10. **how to liaise with staff and management.**

The third basic factor refers to intuition. It concerns the ability to predict in advance what is going to happen and to find a solution immediately. The coach must know the right thing to do at the right time. This means, for example, replacing a football player who has already been cautioned and you know instinctively that

he is going to commit another foul that could lead to him being sent off. In training, the coach must be convinced of his/her actions and should be totally focused on what happens on the field, precisely in order to facilitate, with both attitude and words, what the athletes are going to perform. If a coach senses that athletes are tired, he/she may decide to insist, in order to test their ability to react to this physical and psychological condition, or he/she may stop the workout. The coach's choice will be based on the ability to understand the athletes' condition and correlate it with the goals of the training session (**Figure 3**). A coach who mainly implements only one of these three factors manifests an impoverished skills profile and is more likely to make mistakes. In fact, emphasizing the scientific component may lead to an overly abstract approach, to a reduction in the hu-



**FIGURE NO. 3** CHARACTERISTICS OF THE COACH-ATHLETE INTERACTION DURING TRAINING

man component of training and to adopting an approach based on the idea that it is the athlete who has to adapt to training. The outcome will be that there is apparently only one way to improve, and that is what the coach will propose. On the other hand, the coach who tends to emphasize the other two areas is likely to have an approach to training based on his past experiences and to show an excessive psychological sensitivity which is not based on scientific expertise. It is therefore necessary to develop a balanced interaction in the use of these three factors, whose objective is also to play a mutually moderating role, so as not to allow the domination of one component to the detriment of the others. In the training of champions, six main areas of the coach's influence on the athlete were highlighted (Gould, Dieffenbach and Moffett, 2002). Among these, the quality of the coach-athlete relationship emerges as particularly important for elite athletes and in the phases immediately prior to this period of their career. According to the athlete,

important aspects are mutual trust, confidence in respective abilities, good interpersonal communication, especially during the listening phase, as well as high levels of cooperation.

**For athletes, it is a priority to be recognized not only for their performance, but also as individuals who have needs and problems just like other people.**

A second aspect, which has emerged as relevant, refers to the coach's ability to display a relatively wide variety of behaviour. In fact, athletes prefer coaches who know how to be firm and challenging in their demands but also friendly and inclusive. This underlines that the greater the motivation and the higher the performance quality of the athletes, the greater is their need to work with coaches that lead them to excel, but that at the same time understand their needs. This does not mean that this approach is not equally as useful with inexperienced or amateur athletes. On the contrary, in

those cases where there is the quest for absolute performance, positive and friendly relations should be the norm. In order to meet these inherent needs of the athletes, training should be organised through teaching situations that take into account fun, technical improvement and success.

The first aspect fulfils the need to have moments when leisure and recreational components are used to release the stress that accumulates in the phases in which athletes are driven by the desire to succeed and to search for continuous improvement. In particular, in the early stages of the development of the sports career, the dominant aspects are enjoyment and technical improvement. In adolescence, on the other hand, all three of these aspects are predominant - fun, improvement and learning how to win. In the third phase of the sports career, these aspects are still present but success becomes the dominant goal: nevertheless, **having fun and the desire to improve tech-**





### nically must always be cultivated and fostered during the training sessions.

A third factor that was highlighted concerns the extreme importance of the encouragement that coaches must provide when their athletes are fully committed to achieving ambitious goals. In this context, the coach must be able to provide unconditional support even after a defeat

it may be more motivating to compete with peers, rewarding the winner with a prize. The coach must show flexibility and establish better systems for athletes so as to present them with fun and demanding challenges. What clearly emerges is that the coach is not only the person who organises the work of the athletes, setting exercises and tests. He/she is first

ped skills: In a nutshell, the last two characteristics of the coach's work emphasize the enormous difficulty he/she faces, because on one hand, a coach must listen to the athletes, but at the same time should want/know how to take responsibility for his/her decisions. He/she must be equally aware that exaggerating in one direction may lead to com-

- strive to acquire and expand new tactics and strategies to add to your training repertoire;
- constantly self-assess and make adjustments when necessary;
- maturing as a coach takes time. You must be patient and honest with yourself;
- knowing that just because something has worked over the last three years does not guarantee that it will continue to do so in the near future. You need to know how to assess and adapt your approach and strategies;
- it is important to work hard and accept that you must do it;
- be aware that it will take many more hours than expected to become an expert;
- you do not want to emulate the style of training of others, just because they have been successful;
- you should find your own style of training that respects your personality and allows you to fully express yourself;
- you should be able to help athletes identify and achieve their goals;
- you should be genuinely interested in the personal and sporting development of your athletes;
- you should know how to win the respect of the athletes, setting an example by respecting them;
- you should show the athletes a professional attitude;
- you must be able to create an environment that is perceived by athletes as educational, supportive, fun and challenging;
- you should communicate your expectations, thoughts and beliefs clearly to athletes;
- you should be able to plan reactions and responses in advance, so you can communicate with the athletes more effectively;
- you should allow athletes to express their opinions without making them feel intimidated;
- you should know that the final decision lies with the coach.

and athletes must feel that they are understood by the coach, regardless of the result.

**The motivational spirit in training is another key factor** and each coach can decide how to apply this to athletes with behaviour and ways that reflect their beliefs and are in tune with their personalities, with the understanding that some systems work only with certain athletes while others are more favourably influenced by different ways. Some, such as junior athletes, can be stimulated by training with Olympic athletes so as to understand how they train; for others,

and foremost a professional who makes decisions, bearing in mind the characteristics of the athletes, their motivations and the competition they will face. On this basis, the coach will determine the training programme and the subsequent assessment phases of the work done. To complete this more overall vision regarding **the skills needed to effectively manage the relationship with athletes**, we can look at the skills that top coaches recognise (Salmela, 1996 Cei and Dini, 2004) and what each coach perceives as his/her strengths and less develo-

placency towards the athletes, and in the other direction he/she may come across as too authoritarian. It is a condition that every leader experiences, be they a teacher, coach or manager. Showing an understanding attitude of the needs of the people they are leading and at the same time making decisions, is the daily task of those who are responsible for groups of people, and as long as he/she carries out this rewarding yet difficult work, a coach will never cease to learn.

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# CAN THERE BE SUCH A THING AS AN ASIAN PULL?

“According to the laws of mechanics, work performed against gravity does not depend on the type of trajectory; since it is measured by the height to which the weight has been raised”.  
*I.P.Zhekov, 1976*

**ANDREW CHARNIGA, JR.**









An early rise onto the toes with knees flexed, shoulders behind the vertical projection of the bar with excessive bowing of the trunk backward are obvious errors in technique which should preclude a successful outcome. In weightlifting the outcome of the lifting is determined by the success or failure to raise the barbell in the competition exercises within the parameters of the technical rules. That is to say, the weightlifter has achieved a successful outcome by overcoming gravity; which, Soviet sport scientist I.P. Zhekov noted, does not depend on the form of the barbell's trajectory. Thanks in no small part to the work of many weightlifting sport scientists and countless professional coaches weightlifting sport has a modern protocol for raising the barbell in the most efficient manner to achieve the desired outcome. The modern protocol of weightlifting technique typically produces a curve-linear bar trajectory known as an 'S' pull. The modern protocol stipulates as well, the optimum disposition of

the feet, shins, thighs and trunk to raise the barbell in the most effective manner. A curve – linear bar trajectory in the pulling phases of the snatch and the clean produced with the optimum disposition of feet, shins, thighs and trunk; antithetical to laws of physics, becomes the shortest distance between two points, which as it turns out is not a straight line.

*"This curve – linear trajectory is connected with the performance of this exercise with the least expenditure of energy."* I.P. Zhekov, 1976  
However, bar trajectory aside, the movements of the weightlifter's body as a whole and the individual so – called kinematic links of arms, trunk, thighs, shins and feet determine the outcome of a successful or failed lift.

### Some concepts of modern weightlifting technique: THE RUSSIAN PULL

The work of numerous Soviet era weightlifting sport scientists has produced many quantitative dynamic and kinematic parameters

defining the most efficient weightlifting technique. The subject of this essay will focus on only one of the many; the position and range of movement of the shoulder joints as this relates to effective performance of the snatch and the clean. The significance of the movement of the shoulder joints to the modern weightlifting technique is obvious:

*"The force developed by the weightlifter's muscles is communicated to the barbell through the shoulder joints. The vertical speed of the shoulder girdle is transferred to the barbell through the arms....."*  
I.P. Zhekov, 1976

Consequently, the disposition of the shoulders over, in front of, or behind the bar during the pull phase of lifting is an important indicator of how force is communicated to the barbell: vertically, or at an angle forward or backwards. And, of no small significance, the vertical disposition of the shoulders defines the inter – muscular coordination involved in raising the barbell. However, it should be poin-

ted out the basic philosophy of this modern protocol of weightlifting technique is for the weightlifter's body to conform to the obvious physics of raising a barbell, instead of vice versa. That is to say, a lifter endeavors to raise body center of mass as high as possible, before beginning to descend under the barbell in the snatch, the clean and the jerk. This of course means the

movement of the shoulder girdle from start position to the full extension of the pull phase shifts within a relatively small arc.

The weightlifter typically begins to squat under the barbell from a slight lean away from the vertical with raised heels and elevated shoulder girdle i.e., barbell and body center of mass have been raised to a high

point by means of extension of trunk and lower extremities.

For instance, the angle of inclination of trunk to the horizontal is typically in the range 25 - 50° (Roman, 1978). From here the shoulder joints shift up and backwards until the trunk is leaning away from the vertical approximately 10 - 15°. Various authors (Druzhinin, 1974; Roman, 1986, Zhekov, 1976, Luka-



**FIGURE NO. 1**

DRAWINGS FROM THE TRAINING OF THE WEIGHTLIFTER BY R. ROMAN (1968; 1974; 1986). THE BROKEN RED LINES ON THE FIGURES ILLUSTRATE THE RELATIVELY NARROW ARC OF SHIFTING OF THE SHOULDER JOINTS IN THE PULL. CHARNIGA PHOTO ALTHOUGH VARIATION IS CONSIDERABLE, THE LIFTER'S SHOULDER JOINTS FROM START TO FINISH OF THE PULL ARE TO SHIFT WITHIN A RELATIVELY NARROW ARC.

shev, Medvedyev, 1986, and others) suggest it is permissible for the trunk to lean 10 - 15° away from the vertical at the top of the pull. Consequently, the trunk begins to descend from this angle into the squat position. This means the shoulder joints shift forward through an arc of approximately 10 - 15° during the descent into the squat to return the trunk to vertical, or near vertical.

This Russian technique stipulates the weightlifter must accomplish the fundamental task of raising the barbell by moving the shoulders through a total arc of approximately 80 - 95°.

Furthermore, according to Soviet specialists the shoulder joints should lie in the same vertical line

as the bar at two critical junctures in the pull phase:

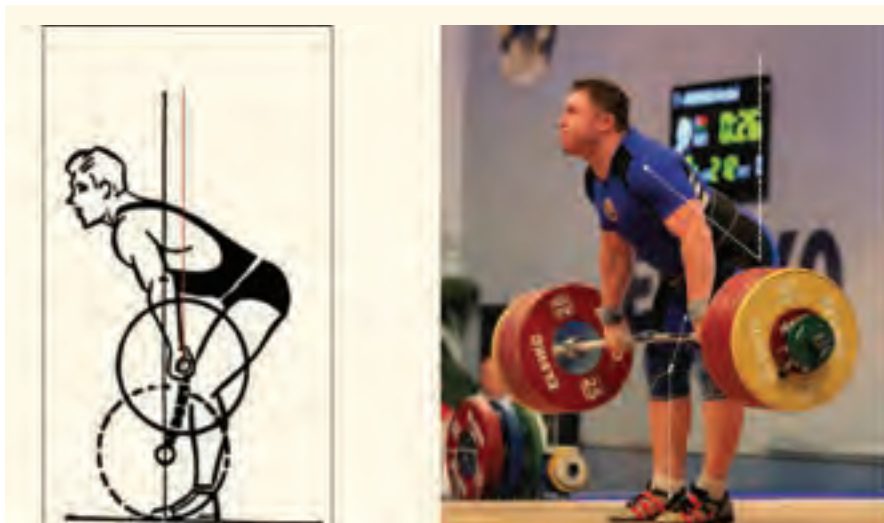
- at the instant of barbell separation from the platform (R. Roman, 1974; 1986);
- at the instant the heels begin to rise in the explosion phase (R. Roman, 1974; 1986).

Soviet sport scientists have for the most part defined the parameters of this technique, so we can call this protocol the Russian pull. Most of this Russian pull fits into a logical framework to achieve the desired outcome. However, as already noted, the lifter has to accomplish the fundamental task of raising the barbell within a relatively narrow corridor of movement of the shoulder girdle. Typically, a weightlifter's

shoulders move in front of the vertical line of the bar after barbell separation. Following barbell separation the protocol of the Russian pull stipulates the shoulder joints remain in front of the vertical line of the bar up to the point the knees stop straightening and begin to move under the barbell. From the examples presented (**figures 2 & 3**) the effort to keep the shoulders in front of the vertical line of the bar is obvious. This is to preserve a large arc of motion in the trunk and prevent a drop in barbell speed.

The athlete in these illustrations mimics the drawings by trying to get as much from the trunk extensor muscles as possible and still raise the barbell within the permissible arc of movement of the shoul-



**FIGURE NO. 2**

DEPICTION OF DISPOSITION OF BARBELL JUST ABOVE KNEE HEIGHT ACCORDING TO R.A. ROMAN (1968; 1974; 1986). NOTE THE VERTICAL PROJECTION OF THE SHOULDER JOINTS IN FRONT OF THE VERTICAL LINE OF THE BAR. APPROXIMATELY THE SAME DISPOSITION OF THE BARBELL IS DEPICTED ON THE RIGHT. HOWEVER, THE ATHLETE ON THE RIGHT HAS SLIGHTLY LARGER ANGLE IN THE KNEE.

ders. He continues straightening the knee joints as the barbell moves above knee level. In this example of the Russian pull the lifter has straightened the knees close to an angle of  $180^\circ$  with shoulders still in front of vertical line of the barbell. It should be pointed out, re-bending the knees under the bar is a reaction. This reaction allows the lifter to re-introduce the thigh and ankle extensor muscles to straighten the trunk. Moreover, the re-bending of the knees reduces the moment force on the hip and more importantly, the lumbar spine. Even after re-bending the knees, the shoulders can be still in front of the vertical line of the bar:

*“The athlete’s shoulders are an average of 4% of the athlete’s height in front of the line of the bar for the snatch and 4.6% for the clean when the knees stop bending under the barbell, carried out flat footed.” (R. A. Roman, 1978) (see figures)*

However, this means relatively speaking, there is a prolongation of the loading on the lumbar spine. As the athlete continues to straighten the trunk, while keeping the shoulders in front of the line of the bar; re-bending the knees and with it the re-introduction of the extensors of the lower extremities can be delayed. The knee bend under the bar is minimal. (see second position

in figure 3) Consequently, this element of technique illustrates part of the underlying logic of the Russian pull:

*“It is natural that the lifter – barbell should move in such a way that the joint moments are as small as possible.” I.P. Zhekov, 1976*

Keeping the shoulders in front of the bar as long as possible, in addition to minimizing movement minimizes a drop in barbell speed. Furthermore, straightening the knee joints to an angle close to  $180^\circ$  lengthens three of the four parts of the hamstring group which are two joint muscles. This sets up these muscles to perform like

**FIGURE NO. 3**

RELATIVELY PROLONGED STRAIGHTENING OF KNEE JOINTS IN THE RUSSIAN PULL; WHICH, IN EFFECT IS A DELAYED RE-BENDING OF KNEES WITH SHOULDER JOINTS IN FRONT OF THE VERTICAL LINE OF THE BAR. THIS ACTION PROLONGS THE LOADING ON THE LUMBAR SPINE.

a bow string: to flex the knees and hip joints very fast.

It would seem logical, that the carefully worked out parameters of the Russian pull fit the physics of a modern protocol; such that, the movements of lifter's joints and the barbell are as small as possible. And, as a result barbell center of mass is raised concomitantly with the highest raising of body center of mass in the pull.

However, the basic precepts of the Russian pull technique were, for the most part, formulated during the early period of an extensive application of performance enhancing substances. The weightlifter's training system was further developed during this period of special enhancement; consisting of complex patterns of loading, the introduction of a large number of special assistance exercises and special exercise techniques. Many of these exercises and techniques were devised specifically to strengthen the athlete to better perform the various phases of Russian pull. So, more to the point, how much can we attribute our understanding of training and weightlifting technique developed during a period of special enhancement to biomechanics and training methodology; and, how much to chemistry? It is common knowledge (Medvedyev, 1994, 2000; Charniga, 2012) the advent of no notice out of competition testing in the wake of doping scandals at the Seoul Olympics of 1988 effectively stopped the progress of male world records in weightlifting. A brick wall was erected, so to speak, still standing in front of the male weightlifter to this very day.

A prolonged loading on the lumbar spine to keep the shoulders in front of the vertical line of the bar is a singular characteristic of the Russian pull. Why? Because, if for no other reason, the weightlifter, struggling to overcome gravity, is forced to get as much as is humanly possible out of the limited arc of movement allotted the shoulder girdle.

Most of the research which supports the protocols of the Russian pull, exercise techniques and training methodology dates from the period of special enhancement.

Consequently, the singular question to consider: would today's widely accepted parameters of technique, the training loading, exercise techniques and so forth, look

different had there been no period of special enhancement?

If the answer to that question is no, this of course means a shifting of the shoulder girdle significantly outside the acceptable arc of movement would constitute an error in technique. An unsatisfactory outcome would be anticipated due to varying degrees of mechanical inefficiency connected with irrational technique.

/Russian pull: trunk tilted forward more than 30°; shoulder joints significantly in front of vertical line of the bar; knee angle close to 180°; a large moment on lumbar spine; feet flat; explosion phase has just begun.

Asian pull: Trunk tilted approxi-



**FIGURE NO. 4**

CONTRASTING POSITIONS OF BAR AND SHOULDER JOINTS BETWEEN RUSSIAN PULL AND AN ASIAN PULL; BAR APPROXIMATELY KNEE LEVEL. THE SHOULDER JOINTS ARE IN FRONT OF THE VERTICAL LINE OF THE BAR TYPICAL OF A RUSSIAN PULL WITH BAR AT KNEE HEIGHT (FIGURE ON LEFT).

THE ATHLETE ON THE RIGHT PERFORMING A CLEAN WITH ASIAN PULL TECHNIQUE HAS ALREADY SHIFTED SHOULDER JOINTS BEHIND THE VERTICAL LINE OF THE BAR WITH BARBELL SLIGHTLY BELOW KNEE HEIGHT. THE RE-BENDING OF THE KNEES HAS ALREADY BEGUN WHEREAS ATHLETE ON THE LEFT HAS CONTINUED TO STRAIGHTEN THE KNEE JOINT.

**FIGURE NO. 5**

CONTRASTING POSITIONS OF THE SHOULDER JOINTS BETWEEN RUSSIAN AND ASIAN PULL WITH BAR AT APPROXIMATELY MID - THIGH.

mately 45° away from the vertical, behind the vertical line of the bar; shoulder joints significantly behind the vertical line of the bar; knees are bent; heels raised; explosion phase almost complete. Charniga photos.

The obvious, excessive shifting of the shoulder joints relative to the vertical line of the bar depicted in the figures 4 & 5 should not result in a desirable outcome. A large shifting of the shoulder girdle is outside the logic of the physics involved to achieve the optimum barbell height, i.e., to raise barbell center of mass and body center of mass concomitantly as high as possible. However, we should emphasize the movement potential of the human body is extraordinarily complex. The body has innate, reactive - protective mechanisms and innate redundancy to accommodate complex movement patterns. Perhaps, as the saying goes, “there is more than one way to skin a cat.”

### An Asian Pull

“And, this is why a “self - tuning” system can select the optimum trajectory of movement for the given system, which has limited ener-

gy resources.” I.P. Zhekov, 1976

I.P. Zhekov (and the entire Russian biomechanics community) believed the physics of weightlifting dictated small joint movements to apply and maintain vertical forces to a heavy barbell.

However, by the same token, the human organism tasked to raise a heavy weight is a bio- cybernetic entity, i.e., a “self - tuning” system capable of adjusting the limitations of body’s myriad of bone levers, muscles, tendons, ligaments and fascia to achieve the desired outcome restricted by “limited energy resources”.

There is reasonable consensus in the weightlifting literature to define optimum technique as the ability to raise a maximum weight to the minimum height and to descend extremely fast into the squat. (cited by Verkhoshansky, 1988) The high class lifter’s speed of descent under the barbell exceeds the acceleration of a free falling body.

Consequently, it is relatively safe to say the speed of the descent is the single most important factor to raise a maximum weight overhead in the snatch or to the chest in the clean. Since you really cannot drop

slowly under a heavy weight raised to a low height, a low height of lifting and high speed of descent are for all practical purposes one and the same thing.

“...the faster the descent the greater the weight one can lift.”

R.A. Roman, 1974

The obvious question arises as to whether the following illustrations of what we call an Asian pull automatically constitute errors in technique.

- a significantly larger arc movement of the shoulder girdle;
- an unusually large rise onto the toes throughout the final acceleration, which bends knees in the process;
- an unusually large deviation of shoulder joints behind the vertical line of the bar;
- a shifting of the emphasis of power generated in the explosion from the trunk to the feet.

This ‘Asian pull’ technique is in all probability an effort to circumvent gravity by finding the path of least resistance for the body’s movements, which means these movements need not be designed to raise body center of mass center as high as possible (as in the Russian



**FIGURE NO. 6**

XI HONGLI (CHN) 69 KG CLEANING 154 KG AT 2013 CHINESE NATIONAL GAMES WITH UNORTHODOX ASIAN PULL.

pull) before squatting under the barbell.

An atypical large amplitude of movement of the shoulder joints characteristic of the Asian pull can be also considered as the weightlifter's reaction to the geometric constraints of the modern Russian protocol.

The reason for coining this technique an 'Asian pull' is that one observes this technique most often with Asian lifters, especially females. This technique can be considered truly reactive, because virtually everyone teaches the Russian pull technique.

Consequently, even though Asian lifters and especially the females,

are taught essentially the "proper" technique; many top lifters react to the conditions of raising a maximum weight in the snatch and the clean with an atypical shift of the trunk backwards coupled with an early, large rise onto the toes.

The Asian pull technique is antithetical to Russian protocols which stipulate the lifter remain flat-footed as trunk and thighs straighten in unison during the explosion phase (see figure 3). Much of the explosion phase of the Asian pull is carried out with shoulder joints behind the vertical line of the bar with heels raised as legs straighten.

That is to say, the vertical support reaction created by simultaneous

trunk and knee extension is carried - out over a limited area, consisting of the lifter's toes. Pushing - off raised heels is very similar to how many (vertebrates) animals jump (A. Biewener, 2007).

Conventional wisdom dictates how does one lift a maximum weight by this unorthodox use of the trunk extensors?

Moreover, how does a lifter generate power with the legs in the explosion phase of the pull when trunk is shifting backwards behind the vertical line of the bar while knees are straightening and heels are raising at one and the same time? Isn't the force generated by the knee extensor muscles dampened by the feet

**FIGURE NO. 7**

EXAMPLES OF SHOULDER JOINTS SHIFTING FORWARD AND DOWN AND RELATIVELY FAR AWAY FROM THE BARBELL IN THE DESCENT OF THE SNATCH BY WORLD CHAMPION DENG WEI (CHN).

when a lifter is raising the heels and trying to straighten the knees at the same time? Moreover, the shoulder joints have to return from what should constitute an exaggerated rearward deviation to move under the bar. Without question, this should be considered a significant, unnecessary expenditure of energy.

An Asian pull stands in stark contrast to the Russian pull which is rather straight forward: an attempt to overcome gravity vertically such that "joint moments are as small as possible". However, as Zhekov said, the body as a self-tuning system, sensing "limited energy resources" can adapt to the task of raising the barbell. The Asian pull seems to ignore the logical dictates of physics. Which, without a doubt would have surprised even Zhekov.

Indeed, these specific skills and qualities are not new to weightlifting; they are just re-emerging, in an era where the opportunity for special enhancement is quite limited. On the surface, this Asian pull looks terribly inefficient and by all rights should not work.

However, practical experience indicates this is not so.

Although the technique of record lifts of the period leading up to 1989 would seem to be logical, the lifts from the era before no notice out of competition testing must be classified as just that: weights male weightlifters are still unable to pick up to this very day (Charniga, 2012). Consequently, do we know the Russian pull to be the optimum biomechanics or a biomechanics one can only perform effectively with performance enhancers?

The loading on the back as the bar passes knee level with Russian pull where shoulders are in front is radically different from the Asian pull where shoulders are behind the vertical line of the bar and trunk almost vertical. However, that being said, in all probability the most significant flaw in the Russian protocol is the minor role relegated to the lever system of the foot and ankle; and, especially to the limited role assigned the muscles of the shank held in reserve to raise the heels at the last instant of the pull. The significance of straightening the knees in the presence of raising the heels will be explored in a future article.

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# SETTING THE RECORD STRAIGHT ON YOUTH WEIGHTLIFTING

Record numbers of young children are engaged in strenuous youth sports such as American football, gymnastics, and ice hockey, yet youth weightlifting remains controversial and taboo. There still exists the perception among the general public and some sport coaches that weightlifting is both unsafe and unnecessary for pre-pubescent children, despite an overwhelming amount of research to dispute these claims.<sup>1-5</sup>

**BY ANNA SWISHER**







Though resistance training for youths (i.e., up to about age 11 in females and age 12 in males) has been exonerated in academic papers, the sad truth is that these findings rarely make it to the people who need them most. It is time that parents, youth sport coaches, and physical educators become aware that involving youth in strength training is safe, effective, and essential to athletic development. To be able to implement long-term athlete development (LTAD), weightlifting must overcome its image problem.

Marie Brodin, whose 12-year-old daughter Hanna has been a weightlifter in Sweden since the age of 9, notes that while most of her family and friends are supportive of Hanna's lifting, they are still asked about the wisdom of involving Hanna in the sport. "People will ask my husband and I, 'Is it really good to lift at such an early age, is it not dangerous? Will lifting weights make kids stop growing or hurt their knees and back?'"

Marie chuckles when asked if she

was ever concerned for Hanna's safety in weightlifting. "The thought [that it was dangerous] never occurred to me. Hanna practiced taekwondo for three years before she began to lift, so I was relieved when she was only dealing with a bar and not another opponent."

#### **The benefits of resistance training and weightlifting for youth**

Major health and sport organizations have historically been hesitant to endorse youth weightlifting or resistance training, but this has completely changed in the last 15 years as evidence of its benefits has mounted.<sup>1,2,5,6</sup> Following an age-appropriate training plan under a qualified coach, the risk of injury from weightlifting in youth is very low.<sup>4,5,7</sup> Furthermore, engaging in regular resistance training actually reduces injury risk in youth, perhaps from increases in strength, endurance, and coordination as a result of training.<sup>4,7</sup>

Youth who engage in resistance training gain tremendous benefits such as increased resistance

to injury<sup>4,8</sup> and increased strength,<sup>1,8-10</sup> endurance,<sup>1,8</sup> vertical jump height,<sup>8</sup> motor skills,<sup>8,11</sup> flexibility,<sup>8</sup> and self-esteem.<sup>8,12</sup> Positive gains in physical abilities and low risk of injury also result from youth specifically engaged in weightlifting rather than more general resistance training.<sup>1,7</sup>

#### **When is it okay to start weight training?**

There is no specific age where athletes should begin resistance training or become involved in the sport of weightlifting, but athletes should have a desire to lift, be able to follow instruction, and be under competent supervision when they begin.<sup>1</sup> Lifting should be done at least twice a week to be most effective.<sup>4</sup> Hanna lifts about 2-3 times a week with each session lasting about 90 minutes, and she is healthy and progressing well.

Typically, youth are ready for organized sports around age 7 or 8, though in early-maturing sports such as gymnastics and figure skating, where elite athletes are often only in their teens, organized training begins at earlier ages. While many strength-oriented sports such as rugby, American football, and throwing events in track and field are considered to be late-maturing sports, it is still critical to get kids in those sports involved in resistance training and practicing the weightlifting movements while they are young.

#### **Why is it important to learn to lift at a young age?**

Young children are primed to le-



learn a second language much more quickly than adults, so parents and schools make an effort to expose children to another language during this “critical age period” where language acquisition is accelerated. There may also exist a critical age period where learning is optimized for basic motor abilities and skills.<sup>13,14</sup>

Dr. Istvan Balyi of the National Coaching Institute in Canada maintains that there exists a “window of accelerated adaptation to motor coordination,” and that “All fundamental movement skills should be further developed and general overall sports skills should be learned during this phase. If fundamental motor skill training is not developed between the ages of eight to 11 and nine to 12 respectively for females and males, a significant window of opportunity has been lost, compromising the ability of the young player/athlete to reach his/her full potential.”

14 Other researchers have also suggested that periods of accelerated development of physical qualities do occur,<sup>13</sup> but the practical application of such a model is still debated.<sup>15</sup> Because the development of youth athletes depends on a confluence of factors (e.g., coaching, heredity, maturation rate), it is challenging to clearly show the degree to which athletic potential is limited when athletes only begin training at age 16 rather than age 12.

If a critical age period similar to that demonstrated for language acquisition exists for the develop-

ment of physical abilities, exposing young athletes to fundamental movement skills at the time when they are potentially most receptive to training would be among the most important things youth coaches and parents can do to ensure the likelihood of future sporting success for children.

Carlo Reyes, whose daughter Amy is the 2014 USA National Youth Champion in the 35 kilogram weight class, sees learning the weightlifting movements as “a great way to build all-around athleticism. The movements and the physical conditioning help with any sports and make the kids that much more competitive as they move forward in their athletic careers.”

Resistance training and the weightlifting movements lay the foundation for developing strong and explosive athletes, so there is good reason to expose younger athletes in all sports to the weightlifting movements much sooner than is currently typical (i.e., high school age).

### **Educating and training youth sport coaches**

Providing quality education and certifications for youth coaches is critical, because the success of the LTAD model hinges on capable youth coaches leading training. Youth sport coaches interact with athletes at some of the most critical times in their development, yet many countries

lack qualified or certified coaches at the youth level. Most high-quality coaches work with university-age or elite athletes, leaving undertrained (though often well-meaning) volunteer coaches to handle younger athletes in many sports.

Amy got involved in weightlifting at the age of 9 after her dad Carlo noticed her mimicking his lifts with a PVC pipe. She is both talented and lucky to have walked into a weightlifting club run by Roger Nielsen, a two-time USA Olympic team coach who has contributed tremendously to growing the sport of weightlifting and has worked with dozens of young weightlifters and athletes.



Coach Nielsen puts the focus on learning sound technique and having fun. Amy loves to compete and has developed a healthy attitude about meets. “Even if I don’t win,” she says, “I can still have a good day, set a personal best, or be proud to have qualified for the meet.” We need more people like Coach Nielsen out in the field developing young lifters, helping them progress as athletes, and getting them excited about the sport of weightlifting.

### Moving forward

It took over 50 years for the general public and coaches to recover from a 1961 proclamation that “deep knee bends” are injurious;<sup>16</sup> now the squat is embraced as a cornerstone of sport training.<sup>17</sup> How long will it take the weightlifting community to correct the pernicious misinformation about youth resistance training?

By normalizing youth weightlifting and teaching weightlifting movements during the critical age period, we will not only better prepare children for a lifetime of numerous competitive and recreational sports, but also enhance the talent identification process for the sport of weightlifting as the pool of athletes practicing weightlifting movements increases.

The scientific community, which has contributed greatly to our understanding of optimizing LTAD through resistance training, must join together with youth coaches and the weightlifting community to set the record straight about youth weightlifting. We need to communicate more effectively to parents,

athletes, and youth coaches why resistance training and weightlifting movements are not only safe but also essential to a child’s athletic development.



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# TRENDS IN RESULTS FOR MEN AND WOMEN IN WORLD CHAMPIONSHIPS AND OLYMPIC GAMES BETWEEN THE YEARS 2004 AND 2014

BY THOMAS NORLANDER





Weightlifting is a sport with roots going back to the 1896 Olympic Games in Athens. Europe has been one of the leading continents in the Olympic Games ever since. Weightlifting has had its base in Europe. In the early 20th century Austria, Germany and England (Western Europe) were leading countries. In the late 1930s Egypt proved itself to be a successful weightlifting nation. After the Second World War, the USA dominated the field up until the late 1950s when the former Soviet Union took over.

In the 1960s, Olympic weightlifting made a shift towards the East of Europe with countries such as the Soviet Union, Bulgaria, Poland, Romania, Albania, Greece and Turkey sharing the medals in the major championships. After the division of the Soviet Union in 1991, the country consisted of 15 new nations. Besides Russia, the nations of Ukraine, Armenia, Azerbaijan, Belarus, Georgia and Kazakhstan trained some of the worlds' greatest weightlifters.

In the late 20th century, countries from other continents moved forward, such as Cuba, Iran, Nigeria and China. A few years later, in particular after the 2008 Olympic Games in Beijing, China, there was another shift for international weightlifting. Now the leading continent was Asia, for both women and men. In 1987, Chinese female weightlifters established their position as a leading nation at the first major championship where woman competed. In the 1990s there was intense competition between female weightlifters in Europe. The

first time women competed in the Olympic Games was in Sydney in 2000. After the turn of the century nations like Kazakhstan, Thailand, Vietnam, North and South Korea made their appearance. Asia mainly dominated the lighter weights in the men's categories (56 to 85 kg) and female weightlifters in the heaviest categories.

In this article, the investigator has assembled a chart that displays the trend between continents and compares the medal distribution from eight World championships and three Olympic Games. The investigator looks at the results from the period 2004 to 2014, comparing men and women from all continents. The results are produced by IWF and distributed on their website. The assignment is part of the larger "Working Plan 2012-2016" within EWF's Technical & Scientific Committee.

The medal distribution in snatch, clean & jerk, and total was 72 medals for men at each championship for eight categories and for women 63 medals in seven categories. The diagram curve and results found above show what is called a simple linear regression, from which we can read the trends. Each continent is given a colour. Asia is blue, Europe is red, Africa is white and Pan America is yellow. Oceania did not receive a medal at the greater championships during this period.

#### Results for men:

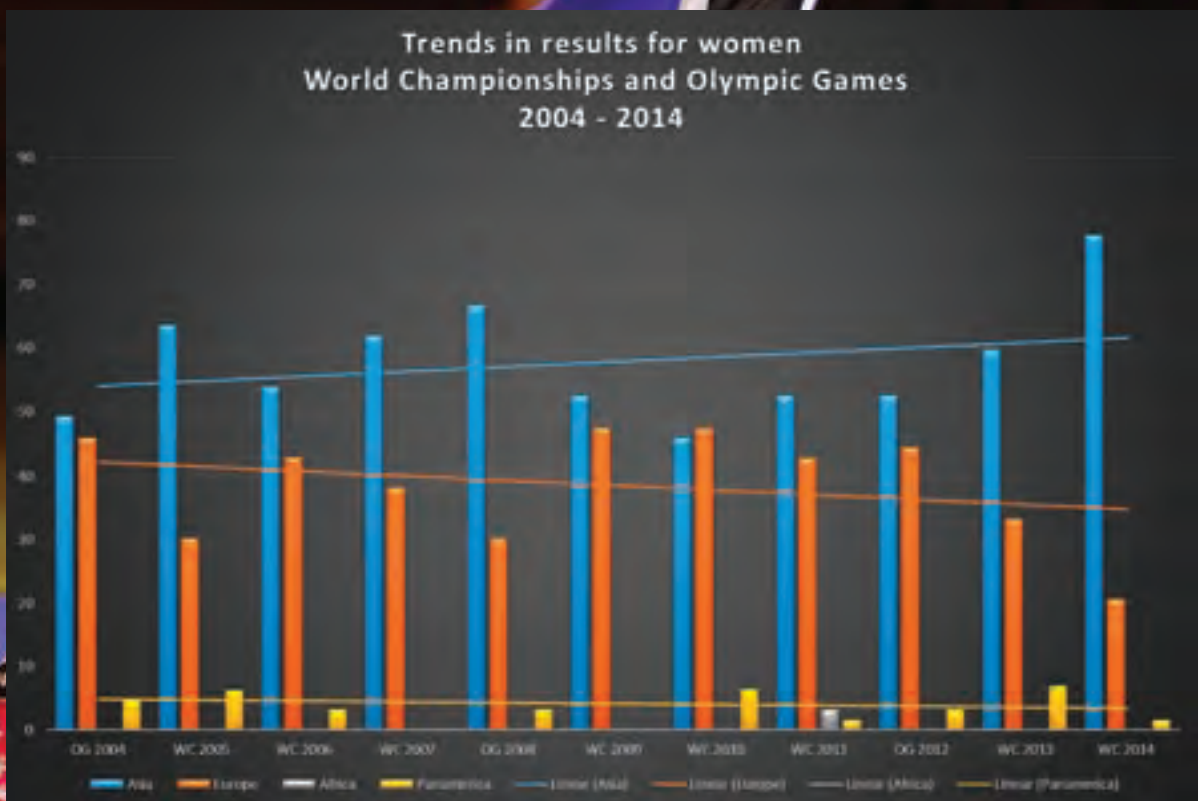
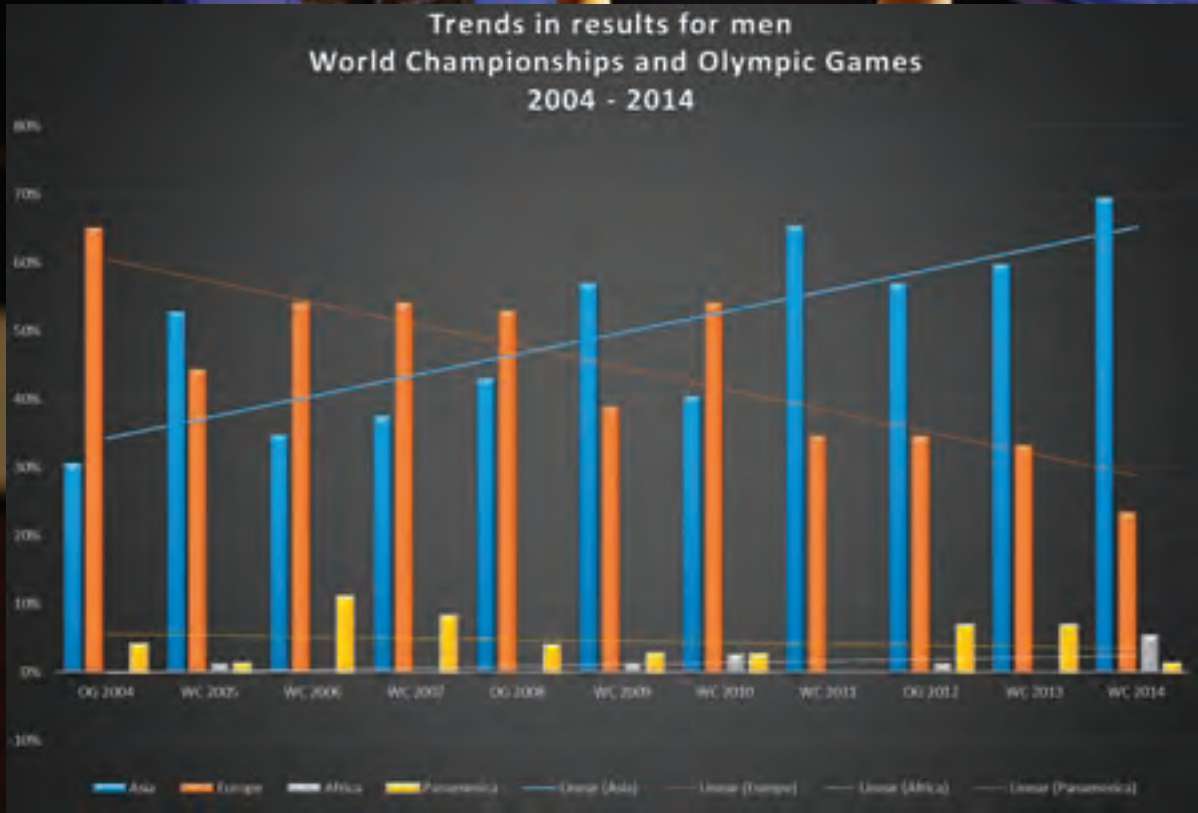
In the first table, the 2004 Olympic Games in Athens, Greece, Europe held 65% of all medals compared to Asia's 31% and Pan America's 4%.

At the Olympic Games in Beijing, China, four years later, Europe held 53% of the medals, Asia had 43% and Pan America stayed at 4%. At the latest Olympic Games in London in 2012, Asia passed Europe with 57% against Europe's 35%. Africa held 1% and Pan America once again stayed at 4%.

When it comes to World Championships Europe and Asia were more equal during the period 2005 to 2009. At the World Championship in 2005, Asia had 53% of the medals compared to Europe with 44% but the following years up till 2008 Europe became the leading continent. From 2009 to 2011 Asia dominated. The last time Europe received more medals than Asia was at the 2010 World Championship in Antalya, Turkey. Europe held 54% to Asia's 40%. The other continents shared 6%.

From 2011 till today Asia increased their distance to Europe in the battle of medals among continents. At the last World Championship in 2014 in Almaty, Kazakhstan, Asia had 70% against Europe 24%. The other continents shared 7%. The trend in the diagram shows that the crossover took place after 2008. The trend of other continents shows us that Pan America and Africa have more or less stayed the same from 2004 to 2014, except for the 2006 World Championship in Domingo, when Pan America received 11% of the medals. Pan America has always received medals except for World Championship 2011. Africa on the other hand has only received medals at five championships.





**Results for women:**

The tendency in medal distribution between the continents has been more consistent in comparison to the diagram for men. But the trend is highly visible: from the Olympic Games in 2004 onwards, Asia is the leading continent. Only at one championship in Antalya in 2010, Europe did better than Asia with a small percentage. Europe held 48% of the medals and Asia 46%. Similar to men's results this was the last championship where Europe was the leading continent. At the latest world championship in Kazakhstan in 2014, Asia held 78% of the medals compared to Europe 21%. The results for both men and women from Europe were low.

The smallest difference read from the trend line was at the Olympic Games in 2008. After this the distance has increased successively between Asia and Europe. The other continents, Pan America and Africa, have stayed the same during this period of time. Pan America has received medals at nine championships. Their results have been between 3-7%. Africa has received medals at one championship: the 2011 World Championship in Paris. The trend lines for both continents have been similar during this period of time.

**Analysing the results**

The tendency is clear and the trend line shows that Asian female weightlifters will get even higher result and continue to dominate the championships in the future. For men, 2008 was the year when the trend line had its crossover. After this Asia has increased its distance to all other continents.

**Have the number of participants from Europe decreased at the World Championships and the Olympic Games?**

International Weightlifting Federation has 189 members. It is consisting of 49 members from Europe, 45 from Asia, 37 from Pan America, 35 from Africa and 22 from Oceania. This shows that Europe and Asia are participating with almost the same amount of members in the federation.

EWF has given three members of the Technical & Scientific Committee a commission to investigate if there is a decline in weightlifting participants from Europe. The commission is also a comparison between the nations of Europe and Asia.

EWF wants to find out if countries participate with more than one weightlifter, and if European countries are participating with fewer weightlifters than those in Asia. The results of the commission will be presented at the EWF's committee meeting in Klaipeda in October 2015.

The results below are from IWF's website and consists of three Olympic Games and eight World Championships. The investigator looked into the number of participants from Europe to see if it has increased or decreased during the years 2004-2014.

**The investigator looked at the 11 primary nations from Europe in weightlifting.**

Russia is the one nation in Europe that has had most participants at these championships, 147 contestants, of which 78 were men and

69 women. Russia almost filled their teams except for the Olympic Games in 2008 and 2012 and the World Championship in 2009. Another nation that has had many participants is Poland: 130 contestants, of which 69 were men and 61 women. Greece, who used to be the dominating nation around the 20th century, has had a negative development and its contestants have decreased. They only sent 72 contestants over 11 championships, 44 men and 28 women. Bulgaria, with its long tradition in weightlifting, has not sent any participants at all in four championships. In total Bulgaria has sent 58 contestants at eleven championships. Ukraine is the one country in Europe that has sent more women than men, 53 women compared to 50 men. Azerbaijan has during this period sent nine women and 51 men.

The investigator wants to compare the above results during these 11 championships to China's, the leading nation of Asia. China has sent 138 contestants, of which 71 were men and 67 women. These numbers can be compared to Russia's, the leading nation in Europe, who sent 147 contestants. Only twice at the 2005 World Championship in Qatar and at the 2011 World Championship in Paris, China has had full teams.

The comparison of these numbers shows that the leading nation of Asia does not have more contestants than the leading nation of Europe.

Doping controls in Asia compared to Europe.

During the last European Championship in 2015, Tbilisi, Georgia, Dr. Patrick Schamasch MD, chairman of the Anti-Doping Commission, IWF gave a report. He presented that the amount of doping controls have been the same for both Asia and Europe. According to Dr. Patrick Schamasch MD, other continents have not had as comprehensive controls.

Even though the numbers of doping controls have been the same for both Asia and Europe it has been brought to IWF's knowledge that it can be difficult to perform non-pre-registered controls in North Korea, Asia. Controllers representing IWF, needs to have a visa in order to enter the nation. This complicates the ability to perform the controls.

There are 24 new sports competing to be part of the Olympic Games programme. In conjunction with the 2016 Olympic Games in Rio, Brazil, an analysis will be presented holding information about which sports will be removed from future games. If weightlifting proves to be a clean sport without doping, the chances of being part of future championships and Olympic Games increases.

**What changes can Europe make in order to compete with Asia?**

This is something that needs to be addressed by the EWF at the meeting in Klaipeda, in October 2015, where the results from the commission will be presented.





# **STRENGTH TRAINING IN CHILDREN AND ADOLESCENTS: MORPHOLOGICAL AND NEURONAL ADJUSTMENTS?**

**BY ANTONIO PAOLI, TATIANA MORO**







### Introduction

For some time and with varying degrees of success, RT (Resistance Training) or training with weights has been proposed as a form of training during the developmental phase of children and adolescents. We use this term to indicate a method of training that requires a progressive use of varying loads, different speeds of execution and various training methods, which include the use of strength-building machines, free weights (dumbbells and barbells), as well as elastics and small equipment such as medicine balls and actual body weight. We will therefore use the term RT to indicate this entire series of methods, thus differentiating them from weightlifting, which is an Olympic discipline well-known to our readers. One of the methodological “problems” in the study of RT is that it consists of more numerous and complex variables than ET (Endurance Training). In fact, RT exercises are composed of several elements such as: 1) the type of muscle action (importance given to the eccentric or concentric phase, 2) the type of load used, 3) training volume (the total number of sets and reps), 4) the

choice of exercises and how the training session is planned (for example, the number of muscle groups trained), 5) the sequence of the exercises, 6) recovery time between sets, 7) the speed of the movement and 8) training frequency<sup>1,2</sup>. This complexity and multifactoriality make it extremely difficult to define in precise terms which variable induces a certain type of adaptation.

Another necessary clarification should be made regarding what is meant by the developmental phase, as if we take paediatricians’ scope of interest as a reference (one of many), it concerns children ranging from 0-14 years of age, whereas those aged between 14-18 are con-

sidered adolescents. It is clear that the characteristics of these individuals, albeit grouped under the one definition, are extremely different. We will focus mainly on the 0-14 age bracket. By now, the traditional studies of children’s neuromotor development<sup>3-6</sup> are a thing of the past, defining sensitive ages to develop the so-called different conditional skills, which, in reality, as expressed correctly and in an intelligent manner in this journal, should be defined as organic-muscle skills (I am indebted to Prof. Bellotti for this correction/indication). In early childhood (4-5 years), children are more susceptible to the development of resistance, whereas the trend of the central nervous system promotes training in dexterity and speed up to 14 years of age (Table 1).

It is only with the onset of sexual development, when there is an increase in testosterone, GH and tiroxina<sup>7</sup>, that the foundations for strength training are laid<sup>8,9</sup>. It is

YEARS	6	7	8	9	10	11	12	13	14	15
JOINT MOBILITY										
SPEED										
RESISTANCE										
STRENGTH										

**TABLE NO. 1** STAGES SENSITIVE TO TRAINING OF THE SO-CALLED CONDITIONAL OR ORGANIC-MUSCLE SKILLS.



therefore clear how children react to strength training with primarily neural adaptations, whereas after puberty, greater importance is given to the hypertrophic response<sup>10-12</sup>. However, we shall take a closer look at the factors linked to the improvement of strength in the developmental phase.

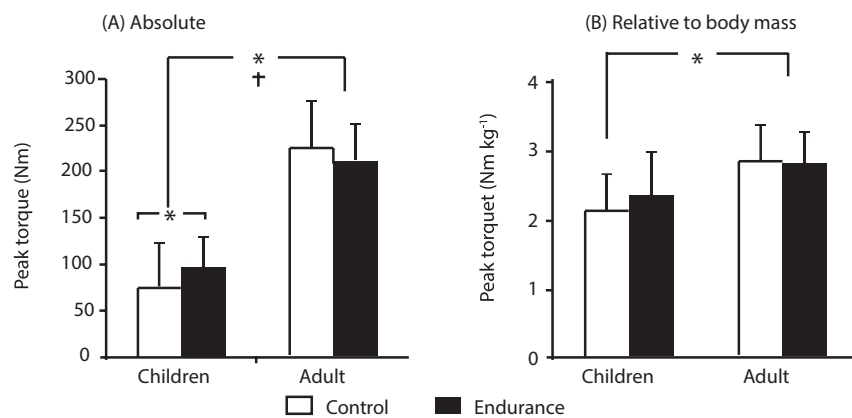
### Strength in the developmental phase

Maximum voluntary strength, speed of contraction and muscular strength in children are obviously inferior when compared to adults. These differences remain even when normalized in terms of body and muscle size (figure 1)<sup>13,14</sup>. Having ascertained this fact, (we might say, almost superfluous), we must now understand what causes such a difference. We recently put forward this list of possible causes:

1. Co-contraction of agonist and antagonist muscles
2. Different distribution of muscle fibres types
3. Different pattern of muscle activation
4. Fatigue.

### Co-contraction of agonist and antagonist muscles

The simultaneous co-contraction of the antagonist muscles can reduce the expression of strength. Activation, above all else, must be coordinated. With regard to this, there are conflicting data in the developmental phase, however, age-related differences were found. The maximum age-related difference was found in submaximal, multi-joint and dynamic exercises, but not during maximum isometric contraction<sup>15,16</sup>, even if not all authors agree on a difference



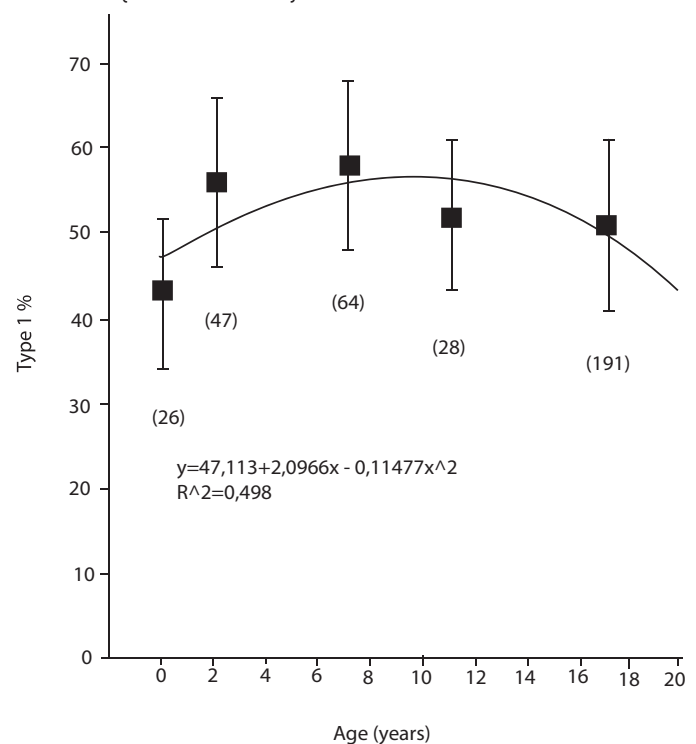
**FIGURE NO. 1** THE FIGURE SHOWS HOW, IN INDIVIDUALS TRAINED FOR ENDURANCE AND SEDENTARY INDIVIDUALS, THE DIFFERENCE IN STRENGTH BETWEEN ADULTS AND CHILDREN REMAINS EVEN WHEN IT IS NORMALIZED IN TERMS OF BODY MASS (COHEN ET AL. 2010)<sup>14</sup>

in the antagonist-agonist co-activation<sup>17</sup>. The distribution of muscle fibre types would appear to assume a pattern such as that shown in figure 2. It is common knowledge that there are fast fibres (IIX), capable of expressing greater strength and power<sup>19</sup>. The minor use of IIX fibres (linked to muscle activation, as we shall see further on), may lead to a minor development of these fibres on children, just as it cannot be excluded that there are other factors that lead to a greater presence and size of type I fibres in children<sup>16</sup>.

### Different pattern of muscle activation

Asmussen was the first, in 1955, to presume a cause linked to the activation of motor units in the reduced strength of children<sup>20</sup>. In fact, subsequent studies have confirmed that:

- maximum neuromuscular activation is lower in children



**FIGURE NO. 2** TREND OF THE TYPE OF MUSCLE FIBRE FROM 0-20 YEARS. IT CAN BE SEEN THAT AT ABOUT 10 YEARS OF AGE, THE HIGHEST PERCENTAGE OF TYPE I FIBRES IS FOUND (JANSSON<sup>18</sup>).

- children recruit a smaller amount of MU (motor units)
- there is a particularly reduced activation of type II motor units. Several studies suggest that type II MU have suboptimal activation in children<sup>16</sup>. In fact, by using the technique known as the interpolated-twitch

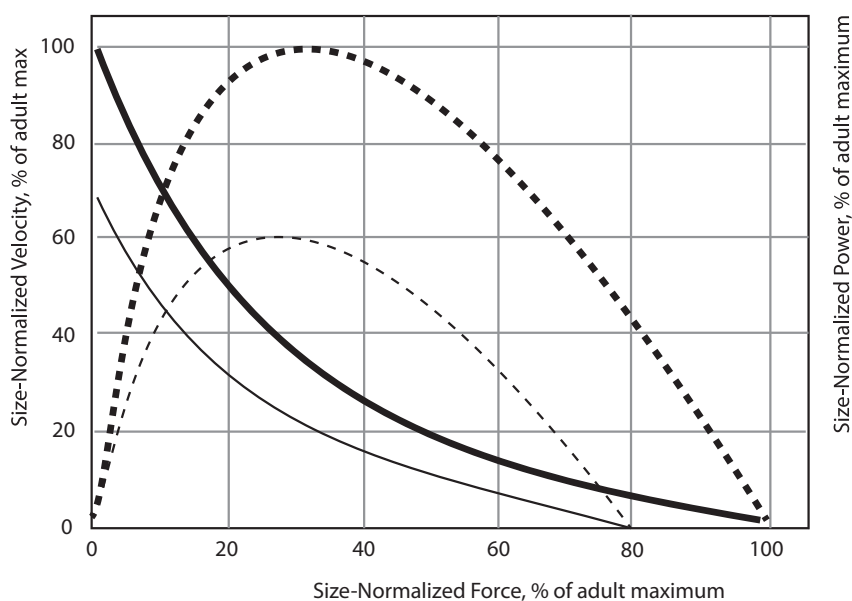
(see insert), it is shown how children recruit less MU than adults. Although this technique is criticised by some, the results have been confirmed by magnetic stimulation, that showed less activation of MU in children than in adults (68-75% vs 85-87%)<sup>21</sup>.

In addition to a general lower activation of MU in children, several studies confirm that, children specifically have greater difficulty in recruiting type II fibres<sup>16</sup>.

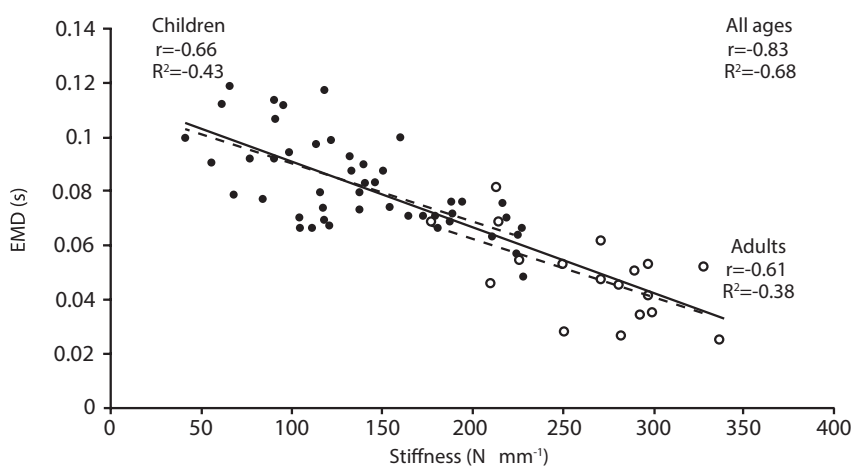
Several data would appear to confirm this hypothesis, such as the Q30 values (the integral or area under the EMGr activity curve during the first 30 seconds), as well as the velocity values in the development of force or RFD (Rate of Force Development). The latter value which indicates the ability to develop force rapidly, is reduced in children, even when normalized due to various factors. A lower RFD may be due to shorter muscles, to a lesser number or of sarcomeres, or even a reduced stiffness in muscle tendons (which may actually be caused by the fact that the muscles are shorter). The stiffness influences above all the earliest stages of force (<—50ms). Reduced, like the lowest Q30 values, may also be linked to a reduced synchronisation of MU in children: in fact, adults trained in strength exercises have a greater MU synchronisation than the control subjects<sup>22</sup>.

### Fatigue

It is due to these very characteristics that the development of fatigue is slower in children; adults, therefore, taking into account a similar % of muscle contraction, will tire before children.



**FIGURE NO. 3** THE IMAGE ILLUSTRATES THE SPECULATED DIFFERENCES BETWEEN ADULTS AND CHILDREN IN MU ACTIVATION. IN THE GRAPH, COMPARISONS ARE SHOWN BETWEEN MUSCLE FORCE NORMALIZED BY SIZE, VELOCITY (CONTINUOUS LINES) TO FORCE (DOTTED LINES). THE CHILDREN'S VALUES ARE SHOWN AS PERCENTAGES OF THE ADULTS' MAXIMUM VALUES (DOTAN ET AL 2012<sup>16</sup>).



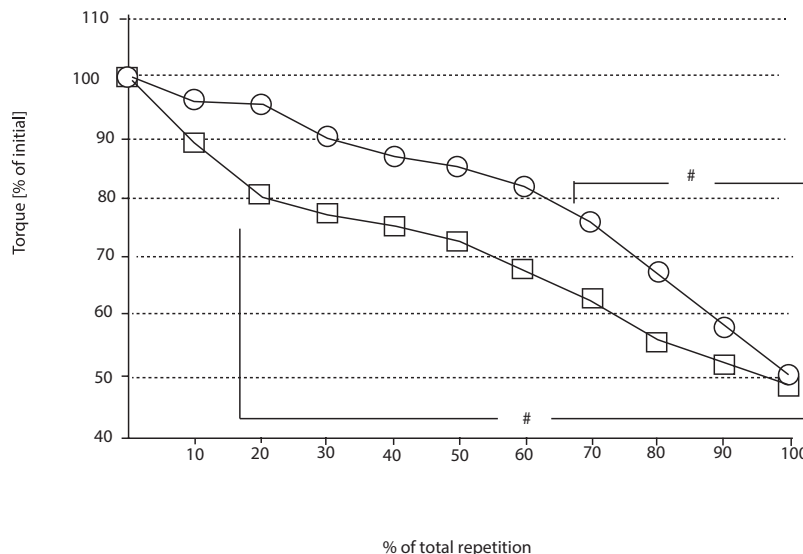
**FIGURE NO. 4** THE RELATIONSHIP BETWEEN EMD (ELECTROMECHANICAL DELAY OR THE DELAY BETWEEN THE NERVE STIMULATION OF A MUSCLE AND THE DEVELOPMENT OF MUSCLE TENSION) AND STIFFNESS IN CHILDREN'S ACHILLES TENDON (BLACK CIRCLES) AND THAT OF ADULTS (WHITE CIRCLES). WAUGH ET AL 2013<sup>23</sup>.

### Conclusions

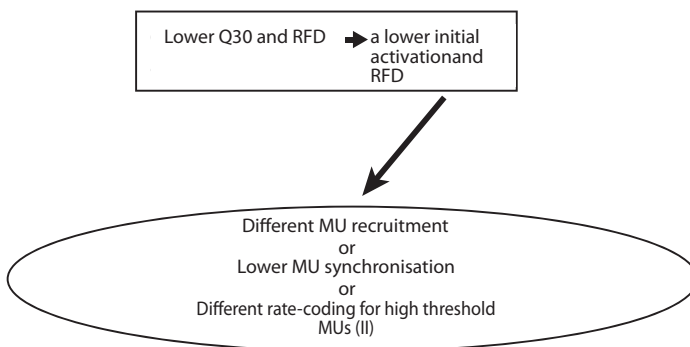
It has been widely demonstrated how RT is capable of increasing strength in children by means of increased muscle activation (+ 13-17% MU activation) and a 16.8% increase in EMG after respectively 10 weeks and 8 weeks<sup>10,11</sup>. Such changes can be attributed

to improved muscle recruitment and an improved synchronisation of motor units with mechanisms which are substantially different from those of adults<sup>25</sup>. Therefore, children respond better to high repetitions and light loads. We can therefore conclude that it is important to stimulate with

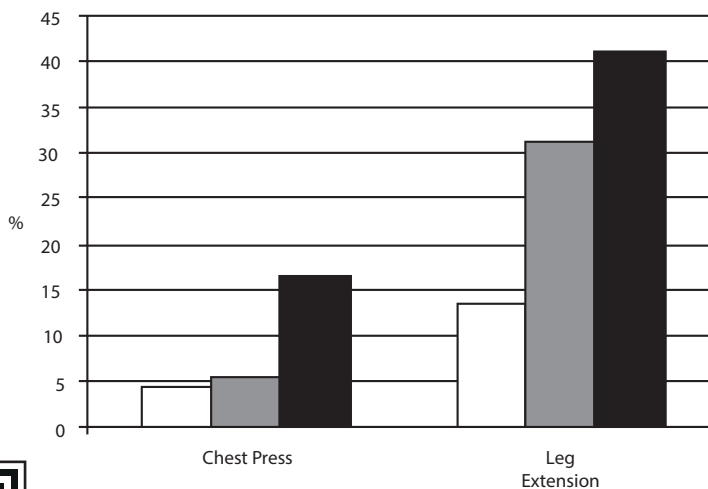
a load that mainly aims at increasing muscle recruitment and the synchronisation of motor units, as recent studies have shown<sup>26</sup>. In addition to strengthening exercises with small gym equipment, exercises and progressive training for the classic Olympic lifts are equally important. When properly performed, these exercises and the preparatory training are in fact, capable of accentuating the nervous action, rather than only pure muscular action (even if loads are to be used and not overlooked), thus acting on factors that can be better trained in this age bracket<sup>27</sup>. In conclusion, therefore, the improvement of strength with RT in the development phase comes about by correct nerve stimulation, using suitable loads which allow maximum recruitment; whereas it has been proven of little use, at least until the onset of puberty, to work on techniques that tend to stimulate hypertrophy. Maximum force is to be sought as it provides an important stimulation for muscular synchronisation. However, techniques designed to increase muscle mass are prohibited. Children recover much faster than adults and this should be kept in mind in the recovery stages of both maximal strength exercises and endurance training.



**FIGURE NO. 5** REPRESENTATION OF THE DECLINE IN STRENGTH AFTER REPEATED EXERCISES BOTH IN ADULTS AND CHILDREN. IT IS EVIDENT HOW CHILDREN MANAGE TO MAINTAIN GREATER RELATIVE LEVELS OF STRENGTH THAN ADULTS. ARMATAS ET AL. 2010<sup>24</sup>.



**FIGURE NO. 6** REASONS FOR THE SLOWER INCREASE OF STRENGTH IN CHILDREN.



**FIGURE NO. 7** PERCENT CHANGE IN CHEST PRESS AND LEG EXTENSION EXERCISES (1 RM), PRE TO POST-TRAINING). THE OPEN BARS REPRESENT THE CONTROL, THE GREY BARS LOW REPETITION - HEAVY LOAD AND THE BLACK BARS HIGH REPETITION-MODERATE LOAD. FAIGENBAUM ET AL 1999<sup>25</sup>.

The bibliography about the article is available on <http://www.slideshare.net/calzetti-mariucci/bibliography-paoli> or by this QR-code (shooting by smartphone or tablet).

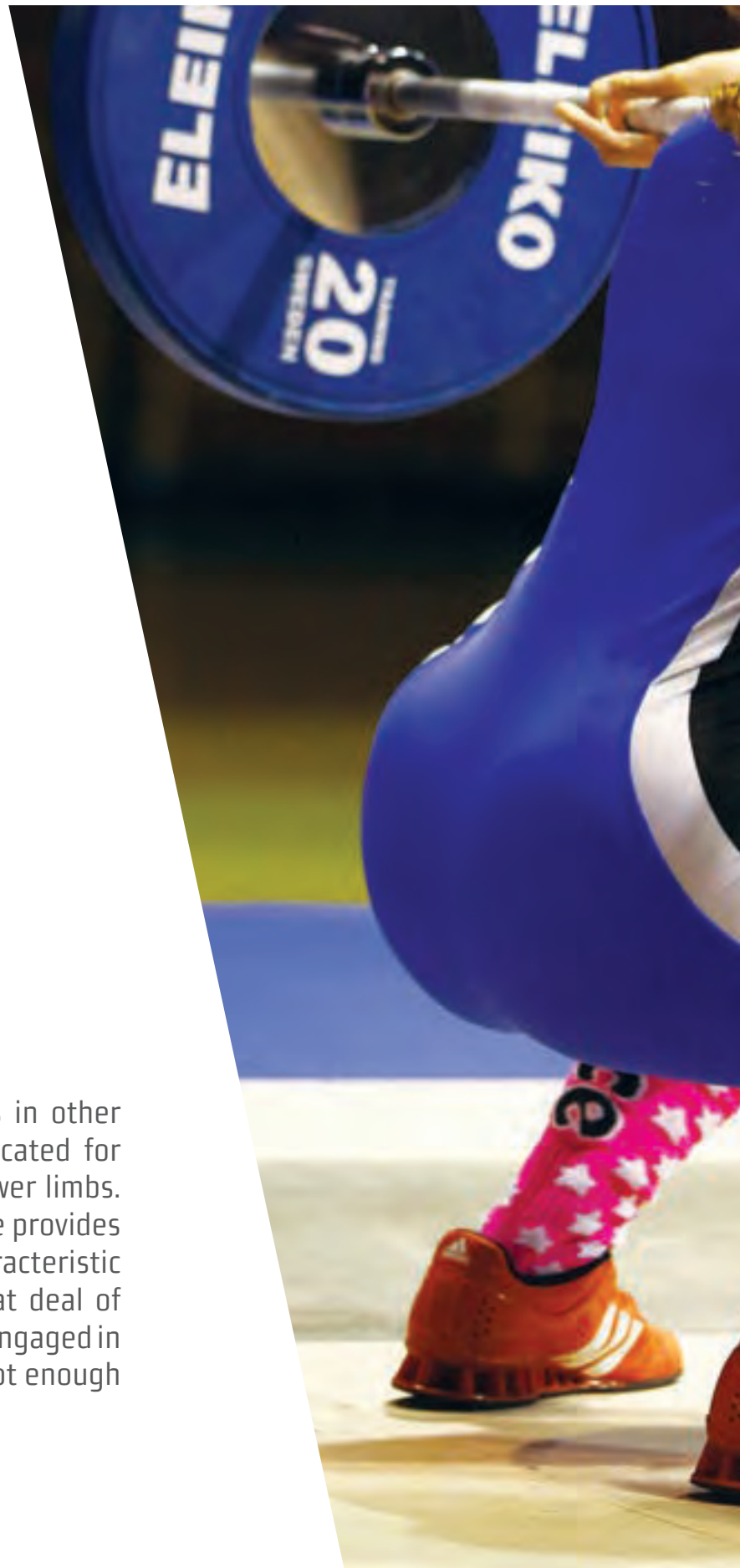




# THE SQUAT: A BIOME- CHANICAL ANALYSIS

The squat in Olympic weightlifting, as in other sports, is an exercise particularly indicated for the development of strength in the lower limbs. A biomechanical analysis of the exercise provides interesting insight into some of its characteristic aspects. In research and study, a great deal of attention has been given to the angles engaged in this exercise and, in my point of view not enough to the neuromuscular work involved.

**BY ANTONIO URSO**





Some research, such as that of Signorile et al., published in "Strength and conditioning Research" (1995), shows how the various muscle groups of the quadriceps would selectively change their activity depending on the intra-rotation and extrarotation of the foot. This was not observed by those who analyzed the squat in a parallel feet position, with internal and external rotation. The study observed the activation of the VM (vastus medialis), VL (vastus lateralis) and RF (rectus femoris) with different electrical responses. More recently, Farahmand (1998) and Boyden (2000), were able to determine the percentage of the quad's contribution to the extension of the leg, thus establishing a percentage of activation of the fibres, during the squat, compared to their maximum capacity of contraction divided as follows: 35% RF (Rectus femoris), 35% VI (vastus intermedius), 40% VL (vastus lateralis), 25% VM (vastus medialis).

### DEPTH OF THE SQUAT AND MUSCLE ACTIVATION

In analyzing the partial, parallel and deep squat, Caterisano et al. in "Strength and Conditioning Research (2002) showed that, there are no significant differences in electrical activity with regard to the vastus medialis, vastus lateralis and biceps femoris, compared with what Farahmand and Boyden had reported. It was observed, on the other hand, that the GM (gluteus maximus) shows greater activity in the deep squat during the concentric phase, compared to the other phases, with the following percentage of activation.

- activation of the GM in Partial Squat 16.9%
- activation of the GM in Parallel Squat 28%
- activation of the GM in Deep Squat 35.4%.

It can be noted how the work of the gluteus increases in direct proportion

to the depth of the squat, therefore, to tone and develop the muscles of the gluteus, it is preferable to increase the ROM (range of motion), as much as possible. These data were also confirmed by Isear in Medicine Science in Sports Exercise (1997), which indicates, however, how the activity of the hamstrings during the squat is limited compared to the work of the quadriceps, while the action of the gluteus (gluteus maximus) is evident during the concentric phase.

### DEPTH OF PERFORMANCE AND MUSCLE ACTIVATION

Preliminary data of work carried out with surface electromyographic instruments have demonstrated that activation tends to increase both in the GM (gluteus maximus) and in the BF (biceps femoris), in proportional to the depth of the performance. For the other thigh muscles, activation did not show significant differences.

### COMPARISON OF MUSCLE ACTIVATION BETWEEN SQUATS AND OTHER EXERCISES FOR THE LOWER LIMBS

In his article in "Strength and conditioning Research" (1994), Signorile showed how all the muscles of the lower limbs are more active in the squat than in the leg extension, when taking into account 10 max reps, and questioning the real need for the use of the leg extension.

- The concentric squat solicits approximately half the activation compared to deadlifts and concentric leg curls.
- As the squat does not appear to be a suitable exercise for training of the hamstrings, they should be trained with specific exercises (many sports do not adopt this philosophy).

In Olympic weightlifting, fortunately the compensation work for the hamstrings is carried out in the dead lift exercises, Snatch and Clean and Jerk, however only in the First Pull.

### SOME MYTHS TO DEBUNK (FROM POLIQUIN)

1. *Squats are bad for your back.* As long as you squat with the proper form, the centre mass of the barbell will not be far away from the centre of gravity of the body, and this is crucial to avoid back injuries.
2. *Smith Machine squats are safer than regular squats.* This is a downright lie. Squats on a Smith Machine cause a high level of tension in the patellar ligament and the anterior cruciate ligament, both of which act as stabilisers for the knees.
3. *Squats are bad for the knees.* False! The squat does not produce damage to the knees. All scientific research has shown that on the contrary, it improves joint stability and reduces the risk of injury. The data collected by the Canadian National Alpine Ski Team suggest that regular squatting reduces not only the amount and intensity of the trauma, but also the time it takes to recuperate from any injuries that do occur.
4. *Squats can damage the heart.* The squat temporarily raises blood pressure, but the heart adapts positively by increasing the capacity of the left ventricle. It is interesting to note that research done on leg press performance on a 45-degree angle shows that this increases the blood pressure three times more than a squat does.

### USEFUL TIPS FOR PERFORMING THE SQUAT

1. Place the barbell on the upper trapezius.



AVERAGE % CONTRIBUTION OF EACH MUSCLE IN THE CONCENTRIC PHASE OF A SQUAT			
MUSCLE	QUARTER SQUAT	PARALLEL SQUAT	DEEP SQUAT
FEMORAL BICEPS	13,37 +- 6.97	15,35 +- 10.12	15.01 +- 7.91
GLUTEUS MAX.	16.92 +- 8.78	28.00 +- 10.29	35,47 +- 1.41
VASTUS MEDIALIS	30.88 +- 16.18	18.85 +- 8.76	20.23 +- 8.10
VASTUS LATERALIS	38.82 +- 17.37	37.79 +- 13.37	29.28 +- 10.72

AVERAGE % CONTRIBUTION OF EACH THIGH MUSCLE IN THE ECCENTRIC PHASE OF A SQUAT			
MUSCLE	QUARTER SQUAT	PARALLEL SQUAT	DEEP SQUAT
FEMORAL BICEPS	13,37 +- 6.97	15,35 +- 10.12	15.01 +- 7.91
GLUTEUS MAX.	16.92 +- 8.78	28.00 +- 10.29	35,47 +- 1.41
VASTUS MEDIALIS	30.88 +- 16.18	18.85 +- 8.76	20.23 +- 8.10
VASTUS LATERALIS	38.82 +- 17.37	37.79 +- 13.37	29.28 +- 10.72



FIGURE NO. 1

MUSCLES IN ACTION DURING THE SQUAT. FROM THE BOOK "NUOVA GUIDA AGLI ESERCIZI DI MUSCOLAZIONE" – CALZETTI & MARIUCCI PERUGIA ITALY BY COURTESY OF FREDERIC DELAVIER

- Stand with feet shoulder width or slightly wider.
- Keep your hands close to your shoulders, with your elbows pointing straight down.
- The lifting belt is optional, but try to train without it.
- Keep your torso as straight as possible while doing the squat, with a slight arch in your lower back.
- Go as low as possible, until the back of your hamstrings is in contact with your calves (almost touching the floor with your gluteus).
- Do not squat in front of a mirror.

### CONCLUSIONS

The squat obviously represents a fundamental exercise in the routine of any sportsperson or athlete who wishes to train the lower limbs. In brief, the electrical activity of the gluteus increases in direct proportion to the depth of the squat. Intra and extra rotation of the leg creates a selective intervention of the quadriceps muscle groups. In the squat, the hamstrings are not activated, and therefore it is advisable

to use a more specific exercise, such as the deadlift or leg curl. It is also worth remembering that the muscles are more active in the squat than in the leg extension, when considering the same 10 max reps. According to Peary Rader, the squat is absolutely and without exception, the greatest single exercise known to man, for conditioning the entire body, improving the health and energy, strengthening the function of the internal organs, giving the most rapid gains in bodyweight, adding to all-round athletic ability. That's quite a large order, but it's true. We have basically **3 factors that contribute to a steady increase of the total performance** in the snatch and the clean & jerk combined. They are as follows:

- An increasingly better technique in the two lifts helps the lifter to better utilize his strength to get higher results in the total for the snatch and the clean & jerk;
- A steady increase of strength without an increase of muscle tissue results in higher performance;
- A steady increase in muscle tissue

results in more strength and a higher performance.

- Our system is based on the 3 principles mentioned above, but it mainly stresses:
  - Building muscle and conditioning;
  - Building strength fast;
  - Choosing the best bodyweight category.



**ANTONIO URSO**  
 PRESIDENT OF THE ITALIAN WEIGHT LIFTING FEDERATION AND OF THE EUROPEAN WEIGHTLIFTING FEDERATION.

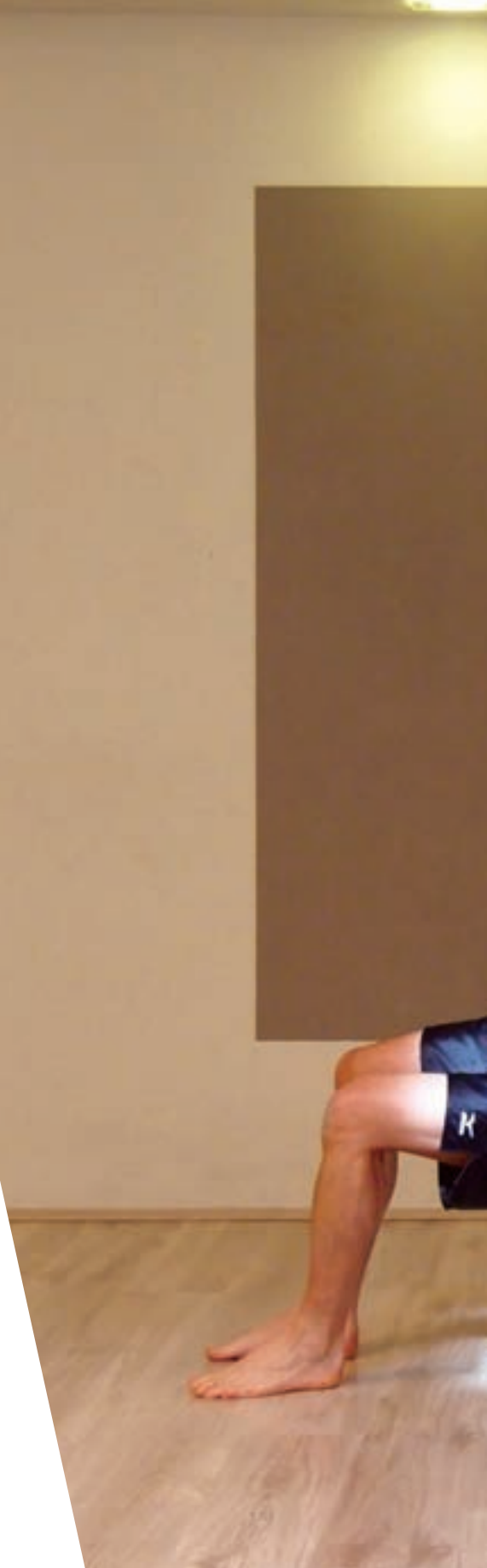
BOARD MEMBER OF THE INTERNATIONAL WEIGHTLIFTING FEDERATION. DR. URSO ALSO HAS A DEGREE IN SPORTS SCIENCE, A MASTER'S DEGREE IN PREVENTIVE AND ADAPTIVE SPORTS SCIENCE; 1ST LEVEL MASTER'S DEGREE IN SPORT REHABILITATION; WEIGHTLIFTING EXPERT. HE HAS COACHED THE NATIONAL MALE AND FEMALE WEIGHTLIFTING TEAMS AND WAS AN ITALIAN WEIGHTLIFTING CHAMPION ON SEVERAL OCCASIONS.

# BEYOND TRAINING

When I was offered the opportunity to think about my first article, never would I have imagined that writing could have taken me so far. The project has been enriched over time, thanks to the trust of the EWF - Scientific Magazine editorial staff. This partly explains the reason behind the many additions and the slow advance, reconnecting the themes of previous articles to the reflection that will follow.

This reconnection sprung from a second reading of Functional Theory. From Functional Theory I tried to extract the insights that have sensitised the training world, directing it - in recent years - towards a different focus. And I tried to broaden the boundaries of Functional Theory. By weakening the contrast and blurring the boundaries, I have focused the attention on a vision of Training geared towards enabling the Body Functions through Forms of Movement.

**BY ALBERTO ANDORLINI**





### ALBERTO ANDORLINI

AFTER EXTENSIVE EXPERIENCE AS A PHYSICAL EDUCATION TEACHER, TODAY HE IS A SPORTS TRAINER AND REHABILITATOR.

HIS ACTIVITY HAS LONG BEEN CONNECTED TO HIS INTEREST IN THE EVOLUTION OF MOVEMENT AND THE DEVELOPMENT OF PERFORMANCE. HE HAS WORKED FOR FIORENTINA F.C., SIENA F.C., AL ARABI SPORTS CLUB, CHELSEA F.C., HE WAS THE PHYSICAL THERAPIST AND SPORTS TRAINER FOR THE ITALIAN WOMEN'S FOOTBALL TEAM. HE IS CURRENTLY THE REHABILITATOR AT PALERMO SPORTS CLUB. HE COLLABORATES WITH THE FLORENCE TRAINING LAB AND LECTURES IN SPORTS SCIENCE AND TECHNIQUES AND PREVENTATIVE AND ADAPTIVE MOTOR SCIENCES AT THE UNIVERSITY OF FLORENCE.



**A methodological assumption.** In the previous articles published in the EWF - Scientific Magazine, the bipolarity of Form-Function was applied to a study that included the Body, Movement, Training, Exercise and Equipment. We designed an ideal Body whose lines and volumes must respect interactive kinetic connections; we spoke of a bio-motor, whose operation is regulated by three differentials and by four-wheel drive; we tried to explain how a chain reaction arises from the ground and develops towards effector organs, passing through the "central" control; we identified 7/8 basic movements and their ontogenetic and phylogenetic genesis; we classified Movement into Transitive and Intransitive; we categorised exercises and equipment into levels based on their training features; we established a terminological taxonomy that passes from Position to Movement, to Action, to Skill; we created a family tree of the Body in Movement, that climbs and grows from

an Elementary Position to generate Extraordinary Skills. At this stage, what points should we revive? What should re-emerge, to revitalise and unite all these aspects? Two points above all: the principle of **de-fragmentation**; and the use of de-fragmentation on the structuring of a **methodological assumption**.

**Defragmentation.** Every day I come across "computer" terms that have the added advantage of accompanying the sound of the word to the vision of an image. This is the case of the term "defrag." I will not dwell on the meaning of the term. Any computer guide can thoroughly explain it. I will transfer the term to the field of Training Methodology. Structuring a method that contains all the possible information and - above all - makes all information accessible and understandable, is a process that computer language defines as "defragmentation."

I am referring merely to the impressions had from my experience. I will

try to reduce everything to minimum terms.

In the "Method" that we use on a daily basis, be it consciously or not, we insert information; this information is none other than our personal files, our beliefs, certainties and doubts, experimental and experiential data, film and photos: basically, all the possible and the impossible input that derives from study, research and practice. Whenever we delete or uninstall something, deeming it useless, harmful or unproductive, a hole is created in the structure of the method, which will be filled by a new principle, a new exercise, a new technique and, perhaps, by a new piece of equipment. So, taking part in a dance lesson, we borrow terms, posture and instructions; swimming in the pool, we will think that a swimming pattern can be diagonal, like walking, but also symmetrical, as rarely occurs when we walk; if we do a judo lesson, we may find that strength more often than not is not produced, it is absorbed; surfing the Internet we might come across photographs of equipment such as those used in Hojo Und, perhaps strange and little known, but so realistically/incredibly functional that they make kettle bells, dumbbells and barbells seem static, rigid and outdated; speaking of yoga, we might realise that some "core centric" postures and certain "stretching positions," are nothing but branches of sana. Everything we learn, everything we feel and experience, becomes part of a "method." This way, we continue to delete some things and install others, and - in doing so - we create an immense structure with



Container	POSITIONS	MOVEMENTS	ACTIONS	TRANSITIONS	CONCATENATIONS	FLOWS
Content	Basic positions	8 Basic Movements	Performing Technical Actions	Studying the stages of a technique	Connected actions	Overall Detail Elementary
<b>DANCE</b>	- 6 basic positions - 5 arm positions	- 3 Planes - 8 Main Directions	BASICS Plié, BattementTendu, BattementJeté, RondDejambe, Fondu, Frappé, RondDejambeEnL'Air, Adagio, GranBattement, Relevé, Retiré, Coupé, Passé, Glissade, PasDeBasque, PirouetteGrandJeté, Sisonne, Entrachatsix, Cabriole	Classes dedicated to (e.g.): - Barre - Floor barre - Centre Exercises	- Promenades - Concatenations - Choreography	OVERALL: - Core - Kinetic Chain - Three dimensionality - Mind-Body Connection
<b>PILATES</b>	-Neutral Spine Position -Supine -Standing -Sitting -Kneeling	- 3 Planes - 8 Main Directions	BASICS: The Hundred, The Roll Up, The Roll Over With Legs Spread, The One Leg Circle, Rolling Back, The One Leg Stratch, The Spine Stretch, Roker With Open Legs, The Cork-screw, The Saw, The Swan-dive; The One Leg Kick, The Double Kick, The Neck Pull, The Scissors, The Bicycle, The Shoulder Bridge, The Spine Twist, The Jack Knife, The Side Kick, The Teaser, The Hip Twist With Stretched Arms, Swimming, The Leg-pull, Front, The Side Kick Keeling, The Side Bend, The Crab, The Rocking, The Control Balance, The Push Up.	Classes dedicated to (e.g.): - Mat Work - Standing Pilates - Circular Pilates - Reformer - Cadillac - Barrel - Step - Chair	- Transition from standing to floor - Standing balances - Flow Pilates - Pilates Fusion	DETAIL: - Contrology
<b>PARKOUR</b>		- 3 Planes - 8 Main Directions	- Landing and rolling- Precision - Vault - Speed Vault - Lazy Vault - King Kong - Monkey Vault - Cat Leap - Tic Tac - Krane - Run Up - Wall Run - Dive Roll - Dash Vault	- Hotsports - Jams - Sessions	- Routes: running, climbing, jumping - Natural Movement - Animal Flow - Primal Flow	DETAIL: - Overcoming obstacles - Natural Movement - Adapting to surroundings
<b>KARATE</b>	- 14 basic positions (dachi)	- 3 Planes - 8 Main Directions	- Moves - Punches - Blocks - Kicks	Practice dedicated to (e.g.): - Bunkai Kata (disassembly)	- Kata - Fighting (Kumite)	DETAIL: - Fighting - Winning without fighting
<b>JUDO</b>	- 2 Positions (dachi) - 2 Holds	- 3 Planes - 8 Main Directions	- Ukemi (falls) - Nage-Waza (projection) - Katame-Waza (control) - Atemi Waza (blow)	Practice dedicated to (e.g.): -Kuzushi (imbalance) - Tsukuri (construction) - Kake (projection)	- Kata (8 recognised forms) - Renraku e Gaeshi (combinations and counter attacks) - Fighting (Randori)	DETAIL: - Initiative (sen) - Contrast to initiative - Initiative after initiative - Better use of energy (seiryuken'yo)
<b>TAIJI CHUAN</b>	- 4 postures (working on stability)	- 3 Planes - 8 Main Directions	- 5 steps - 8 gates - 13 figures	Practice dedicated to (e.g.): - Steps - Moves - Punch/Palm - Arm movements - Leg work	- Forms (pinjin)	DETAIL: - Control/Energy release
<b>SPORTS GAMES</b> (e.g. Football, Volleyball, Basketball)	- High - Medium or Basic - Low	- 3 Planes - 8 Main Directions	Receiving - Controlling - Passing - Shooting Serve - Warm up - Bagher - Smash - Wall Bounce - Pass - Shoot	Training sessions dedicated to (e.g.): - Lift - Pull - Clean - Catch - Push - Sagittal split - Front split	- Match - Game plans (offensive and defensive chains) - movement preparation	ELEMENTARY: Contraction speed continuum
<b>ATHLETICS</b>	- Starting position - Take off	- 3 Planes - 8 Main direction rections	- Running - Jumping - Throwing	Dedicated training sessions	- Start and race - Running and jumping - Translocation and throw	DETAIL: - Speed - Endurance - Strength
<b>ARTISTIC GYMNASTICS</b>	Key posture: I, C+, C-, S vertically I, C+, C-, S horizontally	- 3 Planes - 8 Main Direction rections	- Bridge - Splits - Forward roll - Handstand - Cartwheel - Somersault - Oscillation - Rotation - Vault	Dedicated training sessions	Floor exercises Vault Pommel horse Bar Parallel bars Uneven bars Rings Beam	ELEMENTARY - Starting position - Planned movement (translatory, rotatory, articular) - Final position
<b>ASHTANGA - VINYASA-YOGA</b>	Asana (posture, position, seat)	- 3 Planes - 8 Main Direction	Vinyāsa	Session dedicated to (e.g.): The position of the head, the position of the shoulders, The plough, the fish, bending forwards, the cobra, the locust, the arc. Half spinal twist, the peacock, bending forwards from upright position, the triangle.	Surya Namaskara (Sun salutations)	DETAIL: - Breathing pace - Direction of Energy - Concentration
<b>LIFE</b>	- Lying down - Sitting - Kneeling - Standing	- 3 Planes - 8 Main Direction	- Leaning - Getting up - Lifting objects - Moving oneself - Moving objects	- Lying down - Sitting down - Kneeling - Getting up - Walking - Going up/going down	- Acceleration/deceleration/stopping - Absorbing/producing force - Transmitting force via kinetic rings	DETAIL: - Balance - Orientation - Purpose - Expanding comfort zone

holes, empty spaces and files split into several parts. Multiplying all by hundreds/thousands of times, I get an idea of the state in which “Method” that I continue to use has been reduced. Hence the idea to try to create a framework of principles, objectives, means and content; the very ones that should give life to a method.

**But why should I think about a method?** Because, as I said, after a while, the files that I continue to install tend to get confused, losing the original connotation for which they were chosen and recorded. To find them, to use them after some time has elapsed, will require a lot more effort, forcing me to search for them. It is like reading a book, starting from the first word, then jumping to the tenth, then the hundredth, then returning to the fifth, then the thirtieth and so on; it is true that I can trust in memory, which can draw on all the knowledge that I believe irremovable (gradual, progressive, specificity, individualisation ...); However, it is obvious that by first reading the first word, then the second, then the third and so on, I can increase the efficiency of the actual operative method. Thus arises the need to think of a defragmentation of the elements constituting the method; a defragmentation which does not oblige me to follow an immutable routine, but rather, indicates a rational path. We shall try to restore a registration criterion, reset in order of contiguity and reuse information, limiting ourselves to just one part of a training session, the one that makes Movement the cor-

nerstone of the process. The first information is given by a table. To make things simple, we will call it Table O. Table O is the kind of “summary table”, which should normally be at the end of an article. That is not to say that it may also be inserted in the middle of the speech. Never, however, at the beginning, and never without an adequate and appropriate legend. Placing it alongside the introduction is like promising that that is where we are going to end up: in the quicksand of old news.

### Preamble <sup>1</sup>

**Let’s pick up where we left off.** In previous articles we outlined the profile of a training session based on a broad vision. Let’s say that in order to photograph the state of that small portion of the world which we call training, we used a wide angle and not a microscope. The resulting photo would be a subjective image; taken from a particular perspective angle, it contains details of little importance for some or of great significance for others; it can pinpoint an infinitesimal fragment of reality or can embrace almost all possibilities. Naturally, it is a question of point of view.

**Now.** Tying the principles and untangling the concepts; this is the objective of the lines that follow. I will try to do it NOT as an author, but as a reader, because I know that those who are tuned into the S&C channel are not “casual” academics, “passing” researchers or “accidental tourists”. They are careful “listeners”, meticulous performers,

true fans of Body and Movement, Exercises and Equipment, Training and Relations.

I will try to do it because the words contained in the preceding articles, in their overall imperfection, however, represent the expression of an unfinished thought. A thought that goes “beyond training”. A thought made up of many tiny points, each arranged on a line, as thin and endless, as it is undefined and inaccurate.

Joining the dots, connecting them, aligning them, can lead not to a surprising discovery, but rather to an unexpected re-discovery; not a futile invention, but an unexpected destination: *training according to a new awareness*.

No poster, no statement, no position. Far from it. For me it is actually a modest “adverb”. A “MAYBE,” shall we say. An invitation, if it were, to think and to reflect before doing, to know before buying. A chance to explain first to myself and then to the readers, the lines of thought that guided the writing of the previous pages, and that will guide their subsequent re-elaboration.

In the pages that follow, I will often use the first person plural. Not an inappropriate and presumptuous “WE”, but rather an “inclusive” plural which arises from the hope of an exchange at a distance; a plural that approaches, engages and unites us.

**Mea culpa.** Let’s re-read the previous articles and review the criti-

<sup>1</sup> Noun. A preliminary or preparatory statement; an introduction. Late Middle English: from Old French *preambule*, from medieval Latin *praeambulum*, from late Latin *praeambulus* ‘going before’. <http://www.oxforddictionaries.com/definition/english/preamble>





cal elements. The structurally and conceptually “weak” elements which cannot hold, because they are unusual, or perhaps, more simply, because they are not adapted to the expectations or suited to the demands. For people who have already read the articles, it will be a useful, though perhaps boring revision [although a revision is always open to a new interpretation, a vision with new eyes!]; for those reading it for the first time, it is a pre-view, albeit obligatory.

We are referring to thirteen points - the number that came to mind - that DO NOT work in favour of what has been expressed in previous articles and of what will be pointed out in subsequent work.

Thirteen points which, rather than facilitating understanding, may end up complicating the meaning and making reading more complex. Let's take a look at the thirteen points against:

1. The articles are NOT aimed at coaches, trainers or instructors. The articles are aimed at Explorers of Movement, to Tightrope Walkers of Thought. Doubtful explorers and uncertain tightrope walkers, questioning which way to go.
2. The articles, unfortunately, DO NOT talk about numbers. Sets and repetitions, kilograms and seconds are significantly more stable references than the image of a body that wants to get up from the ground to oppose gravity.
3. The articles are the result of a slow process, matured and developed over the years in a process of conceptual “layering”. What might appear “adventurous” and “challenging” at the dawn of the new millennium, just 15 years later, seems almost impalpable and inconclusive because it has already been sufficiently studied, understood and accepted.
4. The articles do not make up a treaty, an essay, a compendium or manual. The articles are an extract, a notebook, a kind of minimum and essential memory ... or a pantry. That's it, they reflect the chaotic and “itinerant” character of a pantry.
5. The notes would like to help you read every single movement, letter by letter, word by word; avoiding divisions between techniques and disciplines, between methods and systems. They would like to teach how to describe all possible movements, guiding and mastering the intrinsic potentiality. They would like to incite a “science-based” creativity, which would be the matrix of new motor contaminations.
6. The road to integrating, as opposed to disintegrating the motor approach, understanding rather than demanding, broadening rather than breaking up, lies in the acquisition of a common language that makes the coordinates “space” and “mechanical” the best means of establishing a logical sequence; the “stylistic” key to composing a sentence, a theme, a story, a novel or a poem; the master key with which

to open all kinds of activities (from the dangerous tides of fitness, to the inaccessible walls of rehabilitation, and the endless plains of sport); the decoder with which to receive and translate all those signs which too often go unnoticed, that come from the field and from the gym, the stadiums, the arenas, but also from the street, schools, public gardens, squares and theatres.

7. The language we use is often a language of analogies and metaphors; alas, a non-scientific language. Popular at times; "enigmatic" in certain passages. Most certainly an unconventional language, because there is nothing conventional and absolutely sure about the proposal itself. A language that would like to invite you to reread what has been read, in an attempt not to understand more, but rather to enhance ... doubt.
8. It is pointless to seek a conventional index that guides the reader from the dark depths of the basic concepts, to the clear light of the exercise. The idea that supports the exposure, albeit written, is that of a freely "articulated" reflection, or, better still, of a "helical" reflection. Not a closed circle, but a "spring" that expands, stretching, expanding themes and amplifying issues. The two extremes of the helix never touch; they approach and move away, depending on whether we want to compress the sense of the discussion, or expand the meaning.
9. Reflection sometimes forces concepts into diagrams and tables. Well, diagrams and tables are nothing more than simple snapshots. Here is my advice: once the idea has been approached, it would be better to forget the picture and proceed on your own tracks of thought.
10. The articles do not provide answers. They do, however, allude to answers. They can be stimulating and attractive; or boring and unacceptable; but they do not want to give answers; They do not want to be indisputable, much less unassailable. And they especially do not want to teach. They do not push to work in one single manner, but they invite us to think in a unique and personal way.
11. The articles do not reveal novelties; they recover elementary, methodological "memories" and build an alternative hypothesis around them, which is more or less shared, more or less acceptable, more or less comprehensible (in the absence of a floor on which to lay down with readers down and try to feel and do).
12. The articles should be read separately. Or not be read at all. Each article is a multi-thematic intervention. And every action open to further reflection. We need space to stretch concepts and space to digest. They are not so difficult so as to discourage reading, nor so easy to invite a quick glance. They are incomplete and complex. I must admit: very incomplete and - perhaps - unnecessarily complex.
13. The Final point. The articles should be read in small doses. And possibly associated with other texts. Less "creative" texts; more concrete texts. Texts that quench the thirst for



everlasting, unalterable certainty.

**13 to 1.** Having said that, let's get to the positive aspects. I tried to count them, to enumerate them, but I stopped at ... number one. One single point for which all this writing was worth; and for which - I hope - it will be worth reading.

The articles fall within the scope of abstraction, hypothesis, "*theoretical speculation*" [from the Greek word *theoresis*, der. of *theoréō* meaning to "see, investigate"]; and there they can stop. They can lie down on a page, it is true, but they can also "crawl" on a tatami.

Nothing prevents this. They can remain dead letters or climb on a perch; fill a page, or flip over a bar. They may cross the line between theory and practice, and stimulate action; and, in doing so, push each to its **own** interpretation and to its **own, very personal** realisation.

**Rewind.** I will try to go over what I have written, and explain what awaits us. The articles, reflections and assumptions included, introduce, or recall, terms and concepts related to an unconventional vision of training.

At the end of each article, certain submerged concepts are clarified. These are steps forward, or backward, depending on the perspective to which we are accustomed.

The "steps", the conclusions, are "the summing up", the synthesis of a theoretical approach, which guides not to compartmentalisation, but to the versatility of the body in motion; not to segmentation, but to the continuity of training and operation; not to immobility, but to

the transformation of equipment and instruments.

**A house of pages.** Each article is a chapter in its own. It deals with a theme, and opens other pathways. Establishing a relationships of conceptual continuity between the various chapters is a kind of jigsaw puzzle. A house of cards, or pages. Each page relies on the other. Securing the castle of pages, with the imaginary ties; building a network of "guidelines" that encourage and attract to itself and among itself, thoughts and actions; this is the aim of the words that follow.

Let's take the castle apart, page by page. The article "Functional Training and Movement Training" (published in EWF - Scientific Magazine, Number 2 - Aug./Dec. 2015) was designed as an incubator for conceptualised assumptions or... hypothetical concepts. We talked about a two thousand five hundred year-old history; two thousand five hundred years during which mankind fluctuated between the preparation of a real movement and a realistically finalised one (daily movement), the search for a movement that is a gestural expression of emotional tension (artistic movement) and the completion of a movement expressed as an agonistic moment (sports movement). Our talk has led us to classify Exercises (5 levels) and Exercise Machines (3 levels).

**Why Exercise and why Exercise Machines?**

Because Exercise and Exercise Machine represent, to date, the ingredients of greatest use in the training process; the elements

on which there is greatest media attention but which, on the other hand, have not required adequate study. Substantially with Exercise and Machines, we try out new ways of taking a step forward; without realising that, more often than not, they are the same exercises (which we believe innovative) and the same machines (presented as revolutionary) that force us to take a side step or even a step back.

In the paragraph, "Form and Function of the body and movement" (within the same article), we focused on two terms, Form and Function; terms closer to the world of Design, than to the Science of Training. We followed up on a free interpretation of the axiom "Form follows Function", applying it to the existing bilateral relationship between Body and Movement. The terminological disquisition, such as we defined the treatment of the subject, gave us a glimpse of the possibility to enable the Function of the Body System by means of various Forms of Movement, and, through the actual Functions of Movement, to induce changes in the Forms of the Body.

**Why Form and why Function?**

Because - in my opinion - only by recognising Forms and Functions of the Body and Movement, can you identify the distinctive matrix of our journey, to diversify the proposal, to organise a consecutive and consequential progression. In other words, I choose to: 1) to train the form of the body through the form of movements; 2) the function of the body through the function of movement; 3) the form of the body through the function of movement;



and, 4) the function of the body through the form of movement. Obviously, the proposal is limited by what is meant by the Form and Function of the Body and Form and Function of Movement.

The hypothesis put forward in the article envisages that: 1) the Form of the Body is that of a biotensile structure; 2) the Function of the Body is social life; 3) there are 8 basic Forms of Movement; and 4) the Functions of Movement are balance, relationship, purpose and expansion. The paragraph which opens the article "Beyond training" (EWF - Scientific magazine, issue 3, Gen./Apr. 2016) is a strenuous exercise in mental gymnastics, I am well aware of that. It addresses many topics, perhaps too many: from the Body, to Movement, to the Body in Movement. It talks of shadow play; or of the concept of dice in training; motor pictograms and ideograms; of performances "opposite and contrary" to conventional ones; of "ordinary and extraordinary" movements and of "human and superhuman" performances; of transitive and intransitive movement; of Habilitating (as the synthesis of *pro*, *pre*, and *re*-habilitation); of four motor stages that support a process that goes from dysfunctionality to functionality; and of three instrumental levels that make the Body an instrument and its relationship with the external world (surfaces and objects), the inevitable "obstacles" or the essential "aids" for the exercises to actually make the Movement.

**Why** should you read (or I write) this article? I have no answers, just

a reflection to share. Training is like a Rubik's Cube: a three-dimensional puzzle made up of 27 moveable coloured tiles. The purpose of the game, we know, is to turn and twist the sides of the cube so that each of the faces has only one colour. There are endless possible combinations (well, 43 252 003 274 489 856 000 to be exact), of which only one is the correct one; all to arrive at a single solution. Now, imagine that it is the body, and not the cube, that must be disassembled and reassembled; and imagine that, among the many combinations, we can find a second way, a plausible alternative that can still lead us to the solution; and that, when you get to the solution, the colours of the cube are not the ones we started with, not the usual primary colours, but shades different from the initial ones. The reason - *what I asked myself at the beginning of the paragraph* - lies precisely in the search for an alternative route, a different landscape, a forgotten nuance. And the solution, in my opinion, lies in a different way of presenting and interpreting; a mental exercise that encourages everyone to find that new "nuance".

The main theme is represented by an idea: making the body system "able" can establish a language that is common to all areas that use the movement. The body in movement covers a space by the partial displacement of each of its parts. The set of "partial" movements produces *regular* or *irregular areas* that intersect, and integrate with each other, they cover the entire plane and solid geometry of the Euclidean universe. The same areas, by moving along the axis of time,

create four-dimensional motor representations, which are common to all actions, whether they are regular and daily, or extraordinary and exceptional. Every movement, as constrained and limited by the mechanical possibilities of the body itself, is an elementary form, added to much larger and comprehensive entities when adaptability to social relationships (relational performance) prevails; or, vice versa, in increasingly restricted and specific sets when the exaltation of a single motor aspect is dominant (athletic performance). The neutral silhouette of any movement is an ideogram when it expresses an idea (I squat to ...); it becomes a pictogram when it expresses a meaning (I squat because in doing so I improve my performance; I limit the damage that such activities make when performed incorrectly; I relearn how to bend my legs to get close to the ground). That same neutral silhouette is the result of a phylogenetic evolution and is enclosed in an ontogenetic code. The progress that we have improperly defined as ontogenetic can represent the direction to be taken to Enable the Functions of the Body through the harmony of composite Forms of Movement Forms (i.e. dys-functional, non-functional, pre-functional and functional exercises) and "Instrumental" forms (i.e. Gravity, Surfaces, Objects). The paragraph "The ABC of Movement" (ibid.) begins to pull away from the field of the purest theoretical disquisition to establish slightly more solid operational bases. There are three subjects on which to establish a methodological consequential logic: Position, Move-

ment and Action. A single target to aim at: Skill. In all this, there is time and the opportunity to speak, in purely metaphorical manner, of a Tree that Moves, a Pyramid and a Staircase with a Thousand Steps.

**Why** establish a taxonomy of Movement? Because we are talking about training movement. Because by training movement, we can move training. And ultimately, because we can propose Positions without thinking that they are non-functional antechamber of pre-Functional Movements; that Movements are the precursors of functional Actions; and that the Actions, linked by relations of contiguity, continuity, cohesion and coherence, can generate Transitions, Concatenations and Flows (the subject of future articles). The concluding paragraph **“Concluding and summing up. Or retracing**

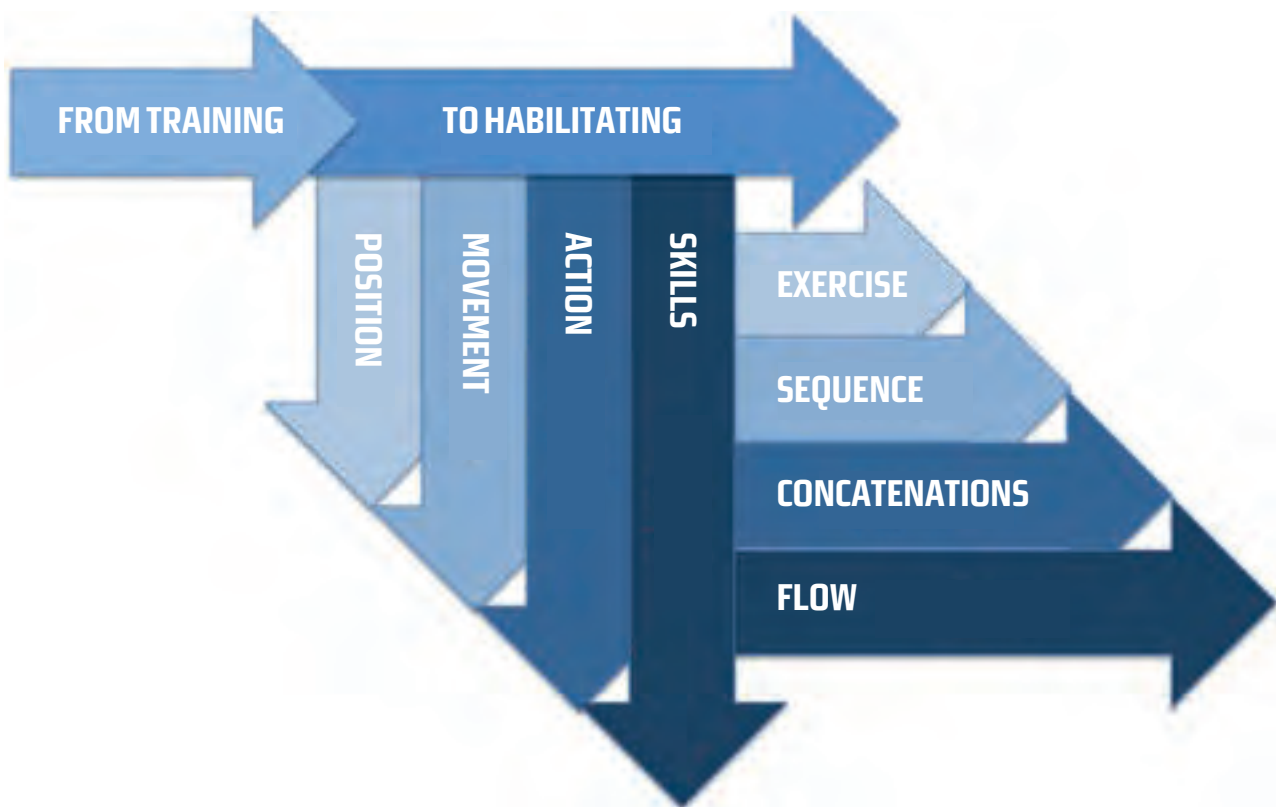
**our steps”** (ibid.), the last article before this, should have established an end, drawn a conclusion, a final report. At least in regard to all this wandering between concepts, images and ideas. Nothing of the kind. It starts from where we started. From that “Always” which is the title of the first paragraph of the first article...

And from that paragraph, it begins to search, and to delve deeper. And what does it find: a Dodecahedron and three executive possibilities in the relationship between individual movements, in other words: performing identical, complementary or independent movements.

**At this stage**, what points should we revive? What should re-emerge, to revitalise and unite all these aspects? Very few points. But, alas, very substantial.

**In brief.** On reflection of the meaning of a “differently careful” training session I will try to:

1. propose a Grammar of Movement, not simpler or clearer than the existing terminology, but no doubt closer to the requests and proposals for training aimed at improving relations;
1. highlight the spatial coordinates of the body that “wants to move”, with the goal of establishing a succession that is qualitative progression, not quantitative digression;
1. establish a methodological continuity between the three new terms, **Transition, Concatenation and Flow (diagram1)**; reduce the distance between field, activity and discipline in an effort to move training towards an integrated and integral dimension.



# “GRIT YOUR **TEETH!**”

DENTAL OCCLUSION  
AND **MUSCLE PERFORMANCE**

BY  
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## 1. Introduction

It is by now common for many athletes of various sports to use occlusal intraoral devices, such as mouth guards or bite planes, to improve athletic performance.

Studies in recent years have shown the close connection between the craniomandibular muscles and its skeletal segments (stomatognathic apparatus) with the rest of the musculoskeletal system of the whole body; then again, it is quite obvious that the organs and apparatus of our entire organism are all interconnected, however, their “harmonious” functioning is the result of perfect synergetic balance.

It has been proven once again, albeit with varied theories of application, how in some individuals, malocclusions can create an altered postural balance, a variation in the intensity of strength and consequently a decrease in muscular performance.



Posture, balance, strength and muscular performance are the fundamental pillars of athletic performance in individuals with optimal cardiovascular, respiratory, neurological and general internal systems.

Research and experimentation were carried out in order to understand and objectively evaluate how rebalancing of the occlusion actually affects muscle strength and performance.

A significant evaluative contribution has been provided by the use of a wireless EMG (electromyography), that objectively relays functional information on the neuromuscular alterations induced by occlusal contact, and more precisely, the influence of the occlusal function through validated indices. This non-invasive test, which consists of applying 6 wireless probes (9 grams in weight, 3 on the right side and 3 on the left) with adhesive



patches to the motor points of the masseter, temporal and sterno-cleidomastoid muscles.

Another fundamental feature of this system is the standardisation of the electromyographic signal and therefore, the accuracy and (even more importantly), the repeatability of the values obtained from the test.

Yet another feature is the high speed execution - from 5 to 15 seconds, based on the movement to be analysed. The athlete has full freedom of movement thanks to the wireless technology.

The study was inspired by an actual clinical fact that involved an Italian Olympic athlete, who after adopting the use of a mouth guard, immediately lost 20% of her muscle strength.



Having verified, studied and finally solved the problem of our Olympic athlete, prompted us as a STUDY GROUP of SAN GIORGIO DENTAL CLINICS in Rome, along with the President of the Italian Weightlifting Federation, Dr. Antonio Urso,

to extend our study to the Italian Weightlifting National Team, in the hope of making a concrete contribution to regular athletic training, by optimising physical harmony and rebalancing malocclusions.

## 2. Clinical protocol and methods

The study was conducted on a group of 21 athletes, 10 female and 11 male aged between 16 and 23 years of age, all practising the sport at a competitive level.

The protocol included:

- Collection of medical history
- Physical examination with particular attention to malocclusions
- Orthopantomax-ray
- TMJ open and closed mouth x-rays
- Powder moulds
- Detection of centric with face bow
- ANALYSIS OF DENTAL CONTACT with superficial EMG (electromyography) at rest and under strain.







The protocol specifically included:

### PHYSICAL EXAMINATION

- Exam in upright position to highlight postural or facial asymmetries;
- The athlete is then seated comfortably and an initial examination of the teeth is carried out to detect any malocclusions, with lateral deviations in maximum incusation;
- On palpation of both sides, any signs of pain were detected on the emergency points of cranial nerves and chewing muscles;
- Auscultation of joint sounds;
- Analysis of occlusal reports in maximum intercuspation to show overjet, overbite, the type of occlusion according to Angle's classification;
- Examination of both lateral and protrusive occlusal contacts;
- Digital orthopantomogram of dental arches and of TMJ with mouth open and closed.

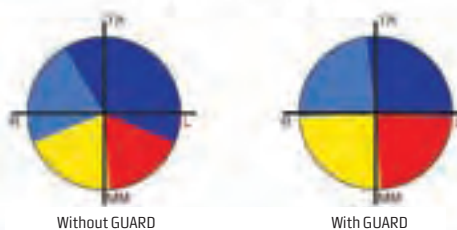
In the cases where alterations of the occlusion were present, a gnathological approach to correcting the occlusion was taken, with or

### Test at rest without and with GUARD



Graphic representation of values in Table 1

Table 1	Without GUARD	With GUARD	Normal values
POC TAN	73,07	90,62	83,12%±100
POC MM%	87,09	85,56	83,12%±100
POC BCM%	85,4	89,22	83,12%±100
POC medio %	80,09	88,09	83,12%±100
ASIM	-17,66	-1,57	-10,00%±10
TORS	77,61	90,9	80,00%±100
TORQUE	22	6,48	-10,00%±10
BAR	49,94	68,13	80,00%±100
ATTIV	-50,06	-31,87	-10,00%±10

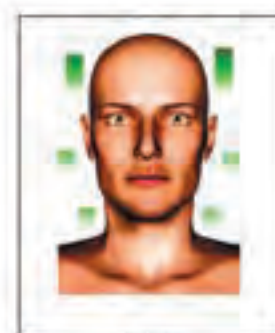


Pie Chart of values in Table 2

Table 2	Without GUARD	With GUARD	Normal values
TAN right	84,37	130,77	~83%
TAN left	144,98	218,94	~83%
MM% right	41,48	114,3	~83%
MM% left	34,85	98,93	~83%
SCM% right	105,44	89,84	~83%
SCM% left	134,23	102,3	~83%
IMP (%*sec)	65	142	85,00%±15

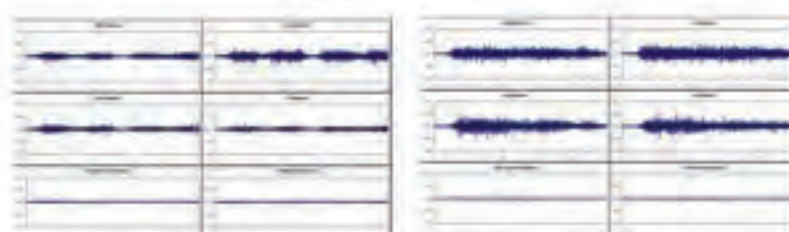


Without GUARD



With GUARD

Graphic representation of values in Table 2



Without GUARD

With GUARD

Electromyographic trace

**Stress test at rest with and without GUARD**



Without GUARD With GUARD

Graphic representation of values in Table 1

Table 1	Without GUARD	With GUARD	Normal values
POC TAN	82.8	83.89	-53.07% to 100
POC MM%	61.28	88.99	-83.07% to 100
POC medio %	72.04	85.99	-83.07% to 100
ASIM	-9.08	-9.48	-10.07% to 10
TORS	82.14	91.17	-90.07% to 100
TORQUE	-0.23	4.54	-10.07% to 10
BAR	80.68	89.49	-90.07% to 100
ATTIV	2.69	2.98	-10.07% to 10



Without GUARD With GUARD

Pie Chart of values in Table 2

Table 2	Without GUARD	With GUARD	Normal values
TAN% right	38.08	249.98	-83%
TAN% left	45.68	337.1	-83%
MM% right	40.19	297.95	-83%
MM% left	48.19	325.34	-83%
IMP (%/sec)	42	297	85.07% to 115

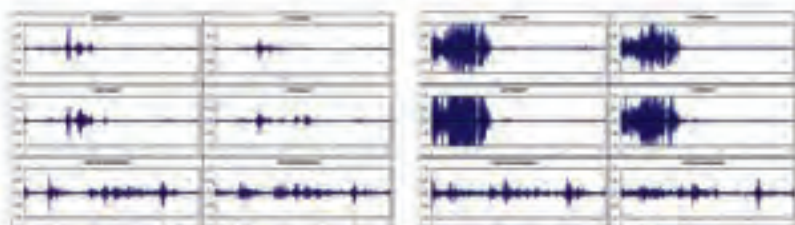


Without GUARD



With GUARD

Graphic representation of values in Table 2



Without GUARD

With GUARD

Electromyographic trace

without the mouth guard, with superficial EMG at rest and under strain after the correction. A clinical examination and x-rays revealed that 55% of those tested had occlusal problems that required gnathological correction.

Selective grinding was sufficient for 2 individuals;

The application of mouth guard was necessary for 7 individuals;

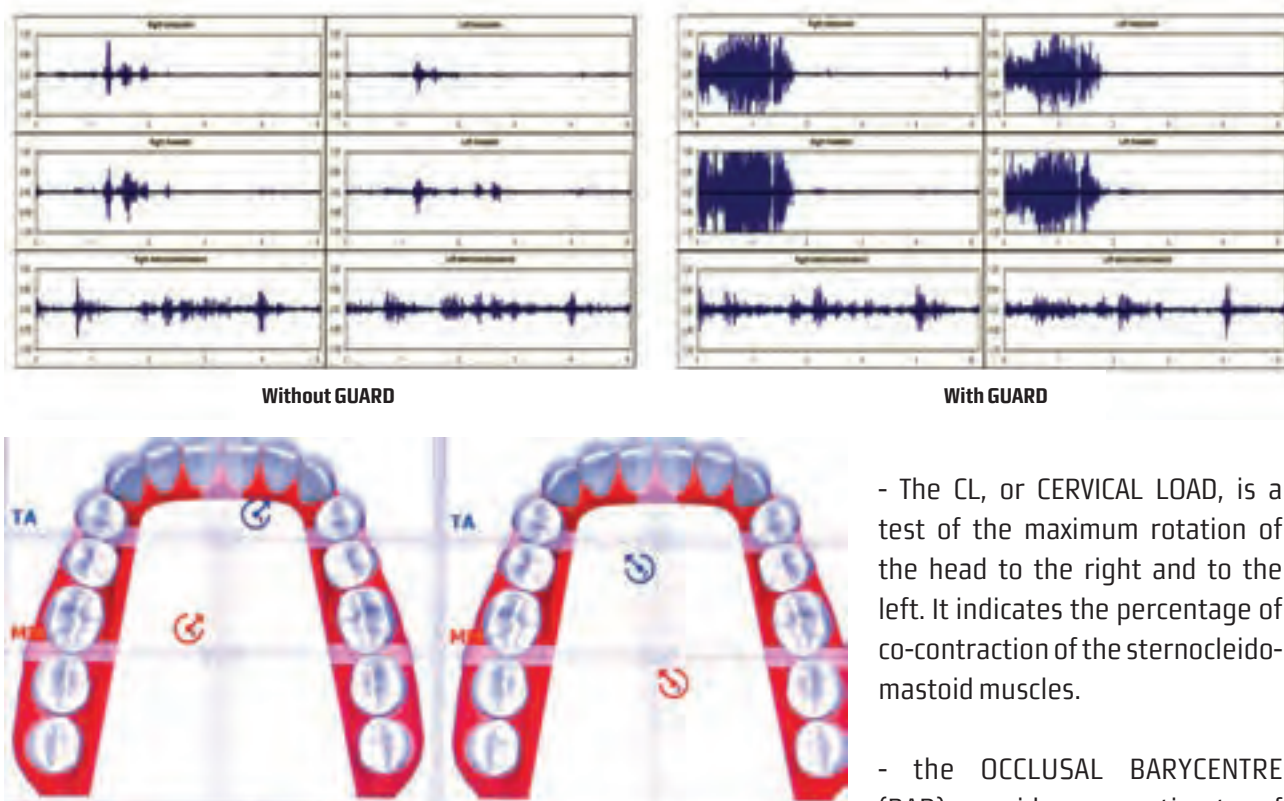
In one case, orthodontic and prosthetic rehabilitation was required, which called for an excessive period of time and was unsuitable for the study at hand. It was referred to another form of research.

The superficial EMG test was divided into 4 distinct PRE and POST sections, each of which included 2 tests - the first AT REST and the second UNDER STRAIN.

The correction tests were carried out one hour after inserting the mouth guards or after selective grinding. Each test produced 5 results:







### 1st SECTION PRE 1

EMG AT REST

### 2nd SECTION POST 1

EMG UNDER STRAIN

### 3rd SECTION PRE 2

EMG AT REST WITH CORRECTION

### 4th SECTION POST 2

EMG UNDER STRAIN WITH CORRECTION

In 4 cases we chose to repeat additional sections after one month, then subsequently after two months and three months, in order to confirm the results of the muscle adaptation and training with the mouth guard.

The superficial EMG test provides a set of parameters.

A rapid 5-second teeth clenching test detects the activity of the masseter and anterior temporalis muscles, both left and right. The result provides us with 3 values:

- the POC, in other words, the in-

dex of the symmetric distribution of the muscle activity determined by the occlusion (left and right temporalis and masseter muscles and the sternocleidomastoid). It indicates if the two homologous muscles of each pair contract in perfect symmetry due to a correct dental occlusion. The estimated POC is almost 100%; whereas, if a dominant muscle is coupled with a weak muscle, the value may be substantially lower than 100%. When the POC exceeds 83%, this indicates good muscular symmetry. The POC is represented both as a percentage and graphically.

- The CL, or CERVICAL LOAD, is a test of the maximum rotation of the head to the right and to the left. It indicates the percentage of co-contraction of the sternocleidomastoid muscles.

- the OCCLUSAL BARYCENTRE (BAR) provides an estimate of the occlusal centre of gravity. When the points of contact tend to concentrate on the molars, the masseter muscles register greater contraction than the corresponding temporalis muscles. When the points of contact are more to the front, on the first and second premolars, the tem-



NAME OF ATHLETE			MAXIMAL	110 KG	
DATE	WORK 85% DOUBLE	1ST SECTION POST 1	4TH SECTION POST 2	5TH SECTION POST 2	INCREASE %
FEBRUARY-13	95 KG.	95 KG.	95 KG.		0%
MARCH-13			97 KG.		5%
APRIL-13			100 KG.		7%
MAY-13			102 KG.		9%

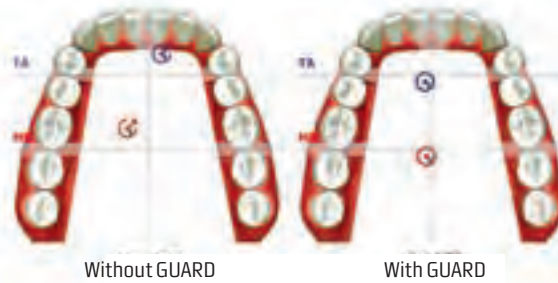


poralis muscles express greater contraction. The representation is expressed both as a percentage with normal values above 90% and on a graph (where the dark grey horizontal lines represent 100% values, whereas the grey lines represent 90% values. The ideal BAR point is the intersection of the three lines.

- the TORS indicates mandibular rotation. This assesses the possible presence of a torque (rotation or, improperly, a lateral slide) It provides an estimate of the rotational "behaviour" of the mandible on the horizontal plane, when it is in occlusion with the maxilla. The TORS index compares the twisting moment of the right temporalis muscle with the twisting moment of the left temporalis muscle with the right masseter muscle. Values of 100% indicate no mandibular rotation. Values of 90% or less indicate that the muscle predominance tends to rotate the mandible to the right or the left, because of occlusal fulcrums (mandibular lateral deviations). The directionality of the lateral deviation is represented on the graph by arrows in the blue or red circle. This leads us to believe that, with the exception of special cases, no actual mandibular rotations take place because the neck muscles compensate this muscle predominance, however, at the same time the muscle-tone balance is altered negatively.

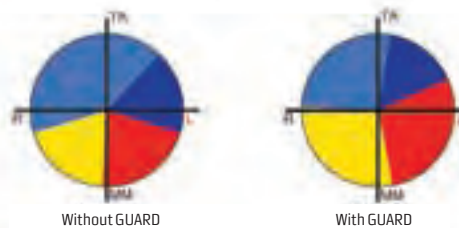
- IMPACT evaluates muscle work, providing indications on the vertical dimension of the occlusion. Normal values are 100% + o - 15%.

**Stress test at rest with and without GUARD**



Graphic representation of values in Table 1

Table 1	Without GUARD	With GUARD	Normal values
POC TAN%	80.92	83.72	>83.7%
POC MM%	74.02	84.32	>83.7%
POC medio %	77.47	84.02	>83.7%
ASIM	1.8	-12.08	<10.1%
TORS	79.86	90.9	>90.9%
TORQUE	-19.38	-0.89	<-10.1%
BAR	88.08	85.13	>90.4%
ATTIV	-31.15	9.57	<-10.1%

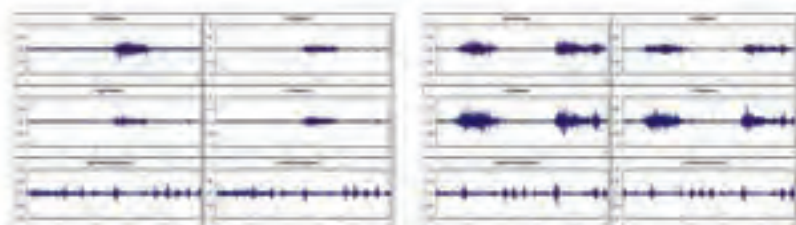


Pie Chart of values in Table 2

Table 2	Without GUARD	With GUARD	Normal values
TAN right	115.45	99.08	<90%
TAN left	83.35	127.06	<90%
MM right	38.85	120.79	<90%
MM left	65.51	153.22	<90%
IMP (%/sec)	72	128	>83.7%

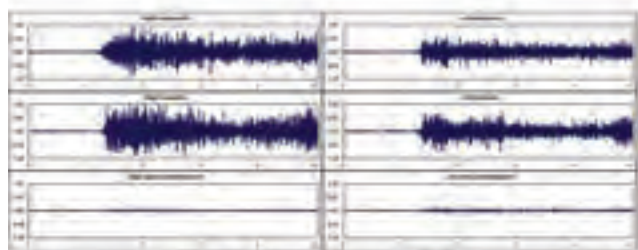


Graphic representation of values in Table 2

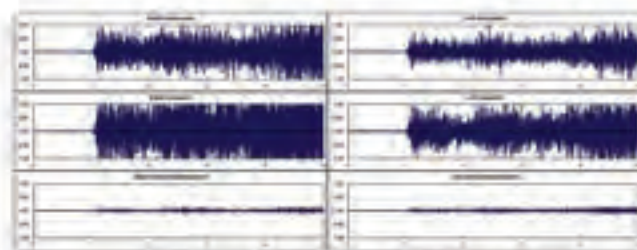


Electromyographic trace

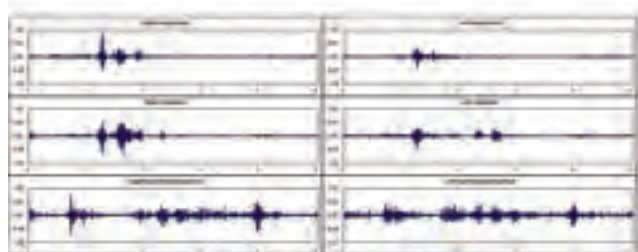
## Electromyographic trace - muscle strength expressed over time



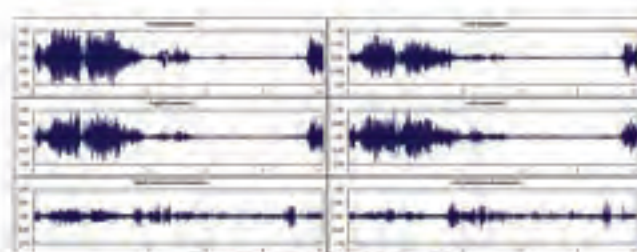
At rest without GUARD



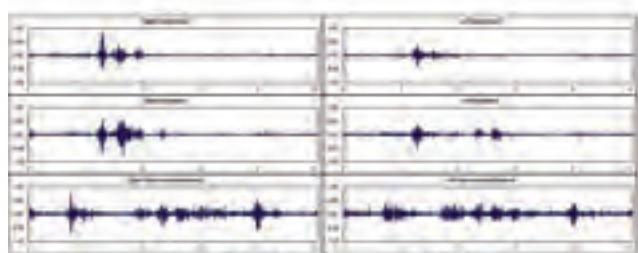
At rest with GUARD



Stress test without GUARD



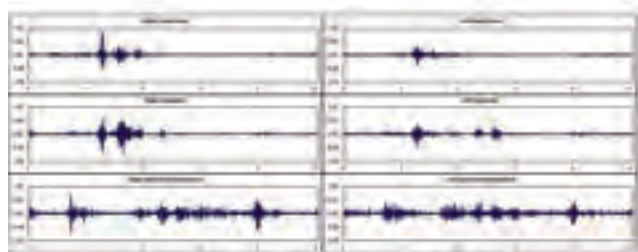
Stress test with GUARD



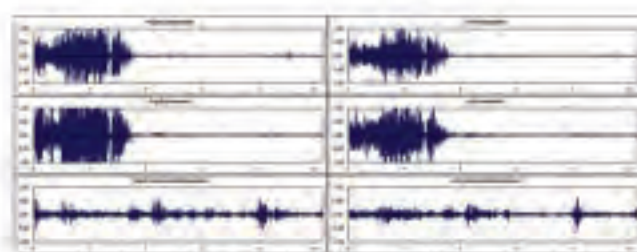
At rest without GUARD



At rest with GUARD



Stress test without GUARD



Stress test with GUARD

The software processes all these data, also providing us with a whole set of parameters that, without going too much into detail, provides indices of the level of electric intensity measured in the muscle that express the potential electric percentage of the single muscle and in relation to the muscles being examined and their homologous counter laterals.

**OCCLUSAL BALANCE**

In 2 of the cases examined, in order to achieve good correction, a relatively low amount of selective grinding was necessary along with the re-doing of 2 badly performed fillings.

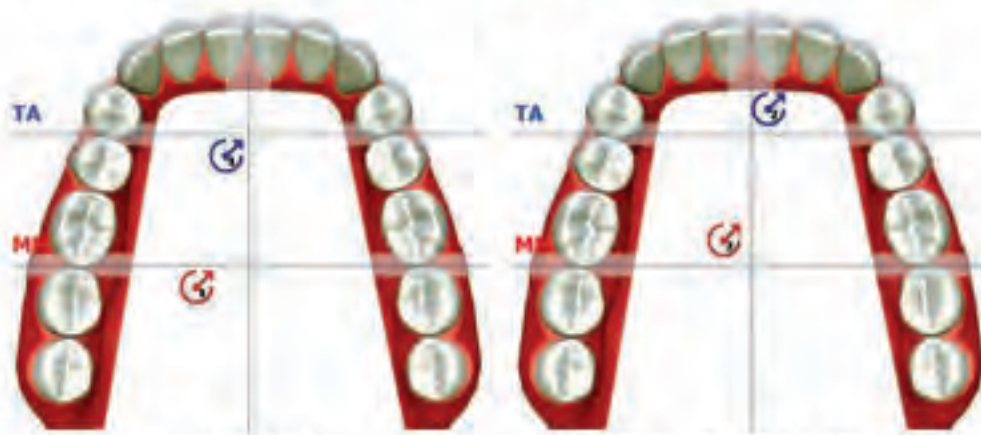
Personal mouth guards were made for 7 athletes.

There are 3 types of mouth guards:

- Soft
- Semi-rigid
- Hard

We opted for semi-rigid mouth guards as they can keep the mandible in a pre-fixed position, they take up minimum space and are not uncomfortable; the drawback is that they rapidly lose stability, especially

**Stress test (100kg load) without and with GUARD  
Contextual control after 1 month and after 3 months**



**Without GUARD**

**Immediate control  
with GUARD (HYPERCORRECTION)**



**Without GUARD**

**Control after one month with GUARD**



**Without GUARD**

**Control after 3 months with GUARD**



if subjected to considerable occlusal stress, as occurs in weightlifting, therefore they must be replaced every few months. We believe that, as in all anaerobic sports, where maximum performance intensity is expressed in rapid time, a hard mouth guard is the most appropriate choice.

The soft mouth guard is unsuitable for sports where the maximum athletic expression occurs rapidly, however we believe it could be suitable and provide a protective function in sports with longer timeframes.

All the athletes that carried out a correction of their occlusal balance registered an 8-10% improvement in their electromyographic values, with the highest value being 18%.

In the same period, the trainers recorded the results of the snatch and clean&jerk during training sessions. Training preparation requires individuals to give 80% of their potential. In comparing the results obtained with the mouth guards and the

pre-mouth guard period, in the four months that followed the use of the device, there was a 15% increase in weight lifted, with a peak of 18% in training work (double at 80% of maximal).

However, the trainers also refer another value that was intentionally excluded from this study - stability and consequently posture.

There was a clear improvement in stability and in the balance of the athlete during the exercise, some in the snatch, some in the clean & jerk.

All the studies conducted on the analysis of the relationships between the stomatognathic apparatus and the musculoskeletal system, demonstrate the strong connections between a correct occlusion and an improvement in posture, balance, stability and consequent overall muscular efficiency. Our study examined the recovery of muscular efficiency of the stomatognathic apparatus in order to **quantitatively demonstrate** - and



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not by mere deduction - that recreating muscular balance of the stomatognathic apparatus improves muscle performance of the entire musculoskeletal system.



**ANTONIO URSO**

PRESIDENT OF THE ITALIAN WEIGHT LIFTING FEDERATION AND OF THE EUROPEAN WEIGHTLIFTING FEDERATION.

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IN THE YEARS 1984-1988, HE ATTENDED AND ACTIVELY COLLABORATED ON STUDIES AT THE SCOLIOSIS UNIT OF THE ORTHOPAEDIC CLINIC AT THE UNIVERSITY OF ROME, DIRECTED BY PROF. GIORGIO MONTICELLI AND THE DON GNOCCHI FOUNDATION. SINCE 1991, HE HAS ATTENDED SEVERAL COURSES ON ODONTOSTOMATOLOGY, PERIODONTOLOGY AND GNATHOLOGY AT THE STOMATOLOGICAL INSTITUTE OF MILAN, AT THE NEW YORK UNIVERSITY COLLEGE OF DENTISTRY AND AT NORTHWESTERN UNIVERSITY DENTAL SCHOOL IN CHICAGO, ILLINOIS. FROM 2000 TO 2009, DR. DEL VECCHIO DIRECTED META MEDICA, A SPECIALISED OUTPATIENT CLINIC IN ROME. HE CURRENTLY SHARES HIS PROFESSIONAL EXPERTISE AT THE SAN GIORGIO DENTAL CLINICS IN ROME, WHERE HE HOLDS THE ROLE OF CHIEF MEDICAL OFFICER AND SCIENTIFIC DIRECTOR.

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FROM UNIVERSITY OF ROME TOR VERGATA ON 21 NOVEMBER 2005; HE IS CURRENTLY OF PROSTHODONTICS AND GNATHOLOGY AT THE SAN GIORGIO DENTAL CLINICS IN ROME.



# EDITORIAL GUIDELINES

## EDITORIAL GUIDELINES FOR AUTHORS OF ORIGINAL RESEARCH WORK TO BE PUBLISHED IN STRENGTH & CONDITIONING. THE SCIENCE OF HUMAN MOVEMENT (S&C).

*EWF Scientific Magazine* (hereafter *SM*) is a scientific journal published by the European Weightlifting Federation (EWF). *SM* publishes surveys and research reports, systematic reviews, reviews, collections of studies, research notes and technical and methodological reports - both original and those drawn from the most Authorized international scientific literature available (with particular but not exclusive reference to the three magazines of the Strength and Conditioning Association of the United States of America: *the Journal of Strength and Conditioning Research*, *Strength and Conditioning Journal* and *NSCA's performance training journal*), which contribute to promoting knowledge on physical training as a whole and on strength training in sport and physical activity in particular. All original typescripts, accepted for publication, must present either concrete and practical applications for the professional who works in the strength training sector, or provide the basis for further applied research in the specific field. The original typescripts are subjected to "double blind" *peer-reviews* by at least two reviewers who are experts in that particular field. Editorial decisions are taken based on the quality of the work presented, the clarity, the style and the importance of the presentation regarding the aims and objectives of *SM*. Suggestions for the drafting of a paper to be published on *SM* can be found at <http://www.nasca-li-ft.org/publications/JSCRtips.shtml>. Authors are invited to carefully read this interesting document, which is very useful for the preparation of any manuscript to be published.

### EDITORIAL MISSION STATEMENT

The editorial mission of *EWF Scientific Magazine* (*SM*) is to work to advance knowledge of the movement and training of mankind, on the assumption that the first is always, and in any case, the expression of muscle strength and that the second constitutes a lifestyle and ethics entrusted to skilfully and thoroughly trained professionals with vast knowledge of the facts, as well as specific competence. Since its first appearance, *SM* has had the ambitious goal of bridging the gaps and misunderstandings between the scientific laboratory and those working in the field, enhancing both the practical experience of the coaches and the results of research, especially applied research. For this reason, it makes - as an editorial rule - constant reference to the practice and the inclusion of recommendations for the implementation of research results in the practice of movement and sport.

The process of improving the overall psychophysical condition through the implementation of appropriate exercise programmes covers a wide range of people: from children to senior citizens, through all ages, from novices to professional athletes, at all possible levels. For the professional it is important to have an in-depth knowledge of the process of training and to realise how it can be supported by other

practices and other areas of knowledge, such as nutrition, rehabilitation and re-education, psychology, technology, special exercise techniques and biomechanics.

### Original research

*SM* publishes studies and research covering both the effects of exercise programmes on performance and on the human body as well as the underlying biological basis. It includes research stemming from the many disciplines whose aim is to increase knowledge about movement in general and sport in particular, their demands, their profiles, workout and exercise, such as biomechanics, exercise physiology, motor learning, nutrition, psychology, rehabilitation and re-education.

One of the primary goals of *SM* is to provide a scientific basis for qualified and updated programmes of physical training and sports training.

### Type of articles and their total length

Due to space limitations, *SM* normally publishes articles no longer than ± pages, including bibliography, figures and images (approximately 4 pages of text with line spacing 1 is equivalent to 14,000 characters, including spaces, + 1 page of bibliography + one page of images and figures and graphs). Works of greater length can naturally be accepted for publication, but may be divided into parts or, with particular reference to the bibliography may be suitably posted on the website [www.calzetti-mariucci.it](http://www.calzetti-mariucci.it).

*SM* publishes studies and collections of studies and research, systematic reviews, reviews, methodological reports, technical reports and research notes that are associated with and related to the mission of the magazine. A collection of studies is a group of articles by different Authors that address an issue from various perspectives. The reviews should provide a brief critical review of the literature and integrate the results of previous research to inform the reader about the basic aspects and applications of the subject. As noted above, *SM* is mainly concerned with the practical aspects of the literature reviewed and published.

Furthermore, the Author or Authors of the texts submitted for publication must have experience and knowledge in the given area enabling them to declare themselves experts in the field and to ensure credibility to their findings and their recommendations. *SM* strongly recommends the presentation of material that illustrate methodologies to advance the studies on muscle strength and overall training of the same.

### GUIDELINES FOR THE PRESENTATION OF ORIGINAL RESEARCH WORK TO BE PUBLISHED

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7. All texts should be double-spaced, and an extra space between paragraphs. The paper must include margins of at least 2.5 cm and include the page numbers in the upper right corner beside the current title. Authors should use terminology that is based on the International System of Units (SI).

8. The Authors of the texts are invited to use non-sexist language and to show that they are sensitive to the appropriate semantic description of people with chronic illness and disability (as pointed out - for example - in an editorial of *Medicine & Science in Sports & Exercise*, 23 (11), 1991). As a general rule, only abbreviations and codified symbols should be used. If unusual abbreviations are used, they must be explained from their first appearance in the text. The names of trademarks must be written with a capital letter and their spelling is to be carefully checked. The names of chemical compounds and generic names must precede the trade name or abbreviation of a drug the first time that it is used in the text.



## PREPARATION OF MANUSCRIPTS

### 1. Title page

The title page should include the title of the paper, the current title in short, the laboratory or laboratories where the research was conducted, the full name of the Author or Authors, the department, the institution, full postal address of the corresponding Author, phone number, fax number and email address; furthermore, a declaration of any funding received for the work carried out must be included.

### Title page without the name of the Authors

A second page should be enclosed containing only the title of the paper. This page will be used to send the paper to the Reviewers for the double-blind review process.

### 3. Summary and Keywords

A separate sheet must contain a summary of the paper in not more than 250 words, followed by a minimum of 3 to a maximum of  $\pm$  keywords, not used in the title. The summary must be structured in sentences (not titles) related to the purpose of the study, methods, results, conclusions and practical applications arising from the work presented.

### 4. Text

The text must be composed, as a rule, of the following sections with titles in uppercase and in the following order:

A. Introduction. This section is a careful development of the hypotheses of the study that led to the implementation of the survey. It is advisable not to use subtitles in this section and try to limit it to 4-6 paragraphs, written in a concise manner.

B. Methods. The following subtitles are required in the Methods sections in the following order: "Experimental approach to the problem," where the Author or Authors of the study show that the approach can prove the hypotheses developed in the introduction, and can offer some basic principles for the choices made regarding the independent and dependent variables used in the study; "Subjects", where the Authors insert the approval of their project by the control bodies, if any, and the appropriate informed consent obtained. All the characteristics of the subjects that are not dependent variables of the study are to be included in this section and not in the "Results"; "Procedures" includes the methods used, bearing in mind the concept of the possibility of a "replication of the study"; "Statistical Analysis", is the section that clearly states the statistical approach to the analysis of the series or of the data series. It is important to include the  $\alpha$  level of significance (e.g.,  $P \leq 0.05$ ). Authors are requested to include in the paper the statistical power for the size and reliability of the measures used with intra-class correlation coefficient (ICC). Additional subtitles may be used, but their number must be as limited as possible.

C. Results. The results of the study are presented in this section. The most important findings must be presented in the form of tables and figures and the less important should be included in the text itself. Do not insert data that are not part of the experimental project or have been already published.

D. Discussion. In this section, the results of the study are elaborated. They must be related to the literature that currently exists; all hypotheses therefore must be covered.

It is recommended that statements such as "further research will be necessary, etc. etc..." be avoided.

Practical applications. In this section, it is essential to indicate to the coach or the sports professional how to apply and use the data contained in the article. It is a distinctive feature of SM, also in compliance with the editorial mission (see above), to try to bridge the gaps between the professional laboratory and the professional field.

### 5. Bibliography

All references must be listed in alphabetical order by last name of the first Author and numbered. References in the text must be made with numbers [e.g. (4, 9)]. All bibliographic entries listed should be cited in the paper and indicated by numbers. Please carefully check the accuracy of the bibliography, mainly to avoid - during the preparation of proofs - changes in bibliographic entries, especially regarding the numerical order in which the citations appear.

### 6. Acknowledgements

In this section, information may be included regarding identification of funding sources, updated contact information of the Author and acknowledgements to others involved in the execution of the experiment, if it was an experiment. In this part of the document, information must be included relating to conflicts of interest. In particular, the Authors should: 1) declare the professional relationship with other companies or producers who benefit from the findings of the study and 2) cite the specific grant funding in support of the study. Failure to disclose such information could result in the rejection of the article submitted for publication.

### 7. Figures

The legends of the figures should be submitted on separate pages, and each figure should appear on a separate page. Each work should be accompanied by a set of figures. Electronic photographs copied and pasted in Word and PowerPoint will not be accepted. The images must be scanned at a minimum of 300 pixels per inch (ppi). The Line art should be scanned at 1200 ppi. Please specify the file format of the graphs. TIFF or EPS formats will be accepted for both Macintosh and PC platforms. We also accept image files in the following native application file formats:

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*Layout.* Ensure that all figures and tables have been mentioned in the text. Indications must be given as to their position between paragraphs, for example: Figure 1 is to be inserted at this point, or the Table 1 in the latter; etc.

### 8. Tables

Tables should be typed double-spaced on separate pages and include a short title. Ensure that there is adequate space within the tables and use the least possible number of layout rules of the rows. When tables are necessary, the information must not be a duplicate of data already in the text. All figures and tables must include standard deviations or standard errors.

### Costs for Authors

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### Terminology and measurement units

Under the terms of the Scientific Committee of SM and in order to promote uniformity and clarity in all scientific journals, the Authors are invited to use the standard generally accepted terms in the field of sports sciences and sports. The Scientific Committee of SM accepts the use of the following terms and units. The units used will be those of the International System of Units (SI). Exceptions allowed: heart rate: beats per minute; blood pressure: mm Hg; gas pressure: mm Hg. The Authors may refer to the British Medical Journal (1: 1334-1336, 1978) and the Annals of Internal Medicine (106: 114-129, 1987) to properly express other units or abbreviations. When using units of measurement, please place the multiplication symbol in the middle of the line to avoid confusion with a full stop; e.g.  $\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$ .

Among the simple units and those derived most commonly used in research reports of this magazine are:

Mass: gram (g) or kilograms (kg); force: Newton (N); distance: metres (m), kilometre (km); temperature: degree Celsius ( $^{\circ}\text{C}$ ); energy, heat, work: joule (J) or kilojoules (kJ); power: watt (W); time: Newton per meter ( $\text{N} \cdot \text{m}$ ); Frequency: hertz (Hz); pressure: Pascal (Pa); time: second (s), minutes (min), hours (h); volume: litre (l), millilitre (ml); and the quantity of a particular substance: moles (mol), millimoles (mmol).

Conversion factors selected:

- $1 \text{ N} = 0.102 \text{ kg (force)}$ ;
- $1 \text{ J} = 1 \text{ N} \cdot \text{m} = 0.000239 \text{ kcal} = 0.102 \text{ kg} \cdot \text{m}$ ;
- $1 \text{ kJ} = 1000 \text{ N} \cdot \text{m} = 0.239 \text{ kcal} = 102 \text{ kg} \cdot \text{m}$ ;
- $1 \text{ W} = 1 \text{ J} \cdot \text{s}^{-1} = 6.118 \text{ kg} \cdot \text{m} \cdot \text{min}$ .

When using the nomenclature for the types of muscle fibres, please use the following terms. The types of muscle fibres can be identified using the methods of histochemical classification or by gel electrophoresis. The histochemical staining of the ATPase is used to separate the fibres in the forms of type I (slow-twitch), type IIa (fast-twitch) and type IIb (fast-twitch). The work of Smerdu et al. (AJP 267: C1723, 1994) indicates that the fibres contain the type IIb myosin heavy chain type IIx (typing fibres by gel electrophoresis). To meet the need for continuity and to reduce confusion on this point, it is recommended that the Authors use IIx to indicate what were called IIb fibres (Smerdu V, Karsch-Mizrachi I, Champion M, Leinwand L, and S. Schiaffino, Type IIx myosin heavy chain transcripts are expressed in type IIb fibers of human skeletal muscle. Am J Physiol 267 (6 Pt 1): C1723-1728, 1994).



# Spanish resumenes

## EL LADO B DEL CEREBRO

Menotti Calvani

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 6-15

En el siglo XVIII, con la invención del microscopio, el hombre ve por primera vez los animalcula, los microbios que había utilizado desde la prehistoria para producir alimentos. En el siglo XIX se demuestra que las bacterias son causantes de enfermedades en el hombre. En los últimos decenios, se demuestra que las bacterias ejercen funciones indispensables para la salud de las personas y en los últimos años se hace patente que intervienen en el funcionamiento del cerebro.

## LAS COMPETENCIAS DEL ENTRENADOR

Alberto Cei

SM (ing), n.º 4, año II, mayo-agosto de 2016, págs. 16-23

Si bien es cierto que son los deportistas quienes compiten y ganan o pierden, es innegable que la calidad de su ejecución se forja en el entrenamiento, que representa una situación centrada en la interacción entre el técnico y el deportista y de la que ambos son conscientes. ¿Cuáles son las competencias que ha de poseer el entrenador? Una reseña sobre el tema.

## ¿PUEDE EXISTIR "ALGO COMO" EL TIRÓN ASIÁTICO?

Andrew Charniga, Jr.

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 24-33

Si bien la técnica de levantamientos realizados en el período anterior a 1989 parecería lógica, los levantamientos de la época en que se realizaban pruebas sin previo aviso y fuera de competición deben clasificarse simplemente como lo que son: pesos que los levantadores de peso masculinos siguen sin poder levantar en la actualidad (Charniga, 2012). En consecuencia, ¿podemos considerar que el tirón ruso es la técnica biomecánica óptima o solamente una técnica biomecánica que solo puede realizarse debidamente con potenciadores del rendimiento? La carga en la espalda mientras la barra pasa el nivel de la rodilla con el tirón ruso, en el que los hombros se sitúan por delante de la línea vertical de la barra, es radicalmente diferente a la del tirón asiático, en el que los hombros quedan por detrás y el tronco se sitúa en posición casi vertical. No obstante, dicho esto, es muy probable que el error más importante del protocolo ruso sea la función secundaria que se atribuye al sistema de palanca formado por el pie y el tobillo y, especialmente, a la función limitada que se asigna a los músculos de la pantorrilla, que se reserva para levantar los talones en el último momento del tirón.

## ANALICEMOS EL LEVANTAMIENTO DE PESAS JUVENIL

Anna Swisher

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 34-39

La autora examina una serie de problemas relacionados con la práctica del levantamiento de pesas en edad joven: sus beneficios reales, la edad adecuada para iniciarse en esta práctica y el motivo por el que es necesario aprender los gestos del levantamiento en edad precoz, la importancia de la formación de técnicos especializados en la edad joven y las formas de avanzar en la preparación y en la propuesta de cargas a lo largo del tiempo.

## TENDENCIAS MOSTRADAS POR LOS RESULTADOS, RELATIVAS A HOMBRES Y MUJERES, EN EL CAMPEONATO DEL MUNDO Y EN LOS JUEGOS OLÍMPICOS ENTRE LOS AÑOS 2000 Y 2014

Thomas Norlander

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 40-45

El autor analiza los resultados obtenidos por los deportistas de ambos sexos en las competiciones mundiales más importantes de levantamiento de pesas y observa un marcado progreso de las ejecuciones de los deportistas asiáticos de ambos sexos. Asimismo, trata de responder a diversas preguntas que surgen del análisis de los resultados y aborda también la cuestión de los controles antidopaje en Asia y en Europa.

## ENTRENAMIENTO DE FUERZA EN LA EDAD EVOLUTIVA: ¿ADAPTACIONES MORFOLÓGICAS Y NEURONALES?

Antonio Paoli, Tatiana Moro

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 46-51

Los autores analizan la función y la difusión del denominado entrenamiento contra resistencias a lo largo de la edad evolutiva. Entre otras cuestiones, ponen de relieve los factores vinculados a la mejora de la fuerza en la edad evolutiva, como la contracción conjunta de los músculos agonistas y antagonistas, la distribución desigual del tipo de fibras musculares y el proceso de activación muscular. Según los autores, la mejora de la fuerza con el entrenamiento contra resistencias en edad evolutiva pasa por una correcta estimulación nerviosa, con sobrecargas adecuadas a un máximo reclutamiento, evitando las prácticas que favorezcan la hipertrofia y el aumento de masa muscular.

## LA SENTADILLA: UN ANÁLISIS BIOMECÁNICO

Antonio Urso

SM (ing), n.º 4, año II, mayo-agosto de 2016, págs. 52-55

La sentadilla es un ejercicio aparentemente simple y fácil de realizar, pero en realidad,

para ejecutarlo correctamente y aplicarlo debidamente es necesario tener conocimientos específicos no solo de biomecánica, sino también de la secuencia de intervenciones musculares, que a menudo se pasa por alto en el estudio de la aplicación de este ejercicio. Asimismo, la sentadilla es un ejercicio determinante en el aumento de la fuerza de las extremidades inferiores tanto en la halterofilia como en otras disciplinas. Este ejercicio, que en la actualidad se utiliza en prácticamente todos los deportes, se aborda en el presente artículo para ofrecer una visión más amplia de los elementos que lo componen, no solo de tipo biomecánico, sino también neurofuncional.

## HACIA UNA CONSCIENCIA INCIERTA

Alberto Andorlini

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 56-65

El autor prosigue con su original razonamiento sobre una visión poco convencional del entrenamiento, así como del movimiento. Presenta su programa de intervenciones en la revista, encaminado a: proponer una gramática del movimiento que responda mejor a las necesidades y a las propuestas de un entrenamiento dirigido a mejorar la vida de relación; poner de relieve las coordinadas espaciales del cuerpo que desea moverse con una progresión cualitativa; establecer una continuidad metodológica entre los términos "transición", "vínculo" y "flujo"; y reducir la distancia entre ámbitos, actividades y disciplinas, con el objetivo de llevar el entrenamiento hacia una dimensión integrada e integral.

## A REGAÑADIENTES. LA OCLUSIÓN DENTAL Y EL RENDIMIENTO MUSCULAR

Antonio Del Vecchio, Antonio Urso, Eugenio Cilento, Raffaello Del Vecchio, Angelo Marinoni, Domenico Marzullo

SM (ing), n.º 4, año II, mayo-agosto 2016, págs. 66-77

Los autores presentan un estudio sobre los dispositivos oclusales intraorales, como las férulas de descarga, que en la actualidad se utilizan de forma habitual para mejorar la ejecución deportiva, sobre la base del supuesto que la postura, el equilibrio, la fuerza y el rendimiento muscular representan los pilares fundamentales de la misma ejecución. Asimismo, han tratado de determinar objetivamente la medida en que el reequilibrio de la oclusión afecta a la fuerza y el rendimiento muscular. En este ámbito, la utilización de un EMG (electromiografía) de superficie inalámbrico ha permitido recabar valiosa información sobre las alteraciones neuromusculares causadas por el contacto oclusal y, más concretamente, la influencia de la función oclusal mediante índices validados.



# Russian

## СТОРОНА «Б» МОЗГА

[Menotti Calvani](#)

В восемнадцатом веке, с изобретением микроскопа, люди получили возможность увидеть в первый раз микробы (так называемые animalicula), которые с доисторических времён использовались для производства продуктов питания. В 1800 было установлено, что бактерии являются причиной заболеваний человека. В последние десятилетия, было показано, что бактерии имеют функции необходимые для здоровья человека, а в последние годы было открыто что они участвуют в функционировании мозга.

## ОМПЕТЕНЦИИ ТРЕНЕРА

[Alberto Cei](#)

Хотя и правда то что тот кто тренируется, соревнуется, выигрывает или проигрывает это спортсмен, нельзя отрицать что качество работы спортсмена закладывается в процессе тренировки. И этот процесс основан на взаимодействии тренера и спортсмена. Участники этого процесса прекрасно это понимают. Каками же навыками должен обладать тренер? Обзор проблемы.

## СУЩЕСТВУЕТ ЛИ ТАК НАЗЫВАЕМЫЙ АЗИАТСКИЙ ТИП ТЯГИ ШТАНГИ?

[Andrew Charniga, Jr.](#)

Существование техники рекордных подъёмов штанги в период до 1989 казалось бы достаточно логичным. В эпоху предшествующую появлению новостей с соревнований подобные подъёмы штанги должны были классифицироваться следующим образом: подъёмы которые тяжёлоатлеты мужчины не в состоянии осуществлять до настоящего дня (Charniga, 2012). Следовательно мы знаем что русская тяга характеризуется либо оптимальной биомеханикой либо может быть эффективно реализована только с помощью стимуляторов производительности? Нагрузка отягощения на спину в Русском подъёме происходит когда штанга проходит через уровень колен когда плечи находятся впереди и радикально отличается от Азиатского подъёма где плечи находятся позади по отношению к линии штанги и туловища почти что вертикальной. Тем не менее, этот факт по всей вероятности представляющий собой наиболее существенный недостаток Русского протокола, играет незначительную роль по отношению к рычагу системы стопы ноги и лодыжки и в частности по отношению лимитированной роли отведённой мышцам голени как резерва для подъёма пяток в последний момент тяги.

## НАША ТОЧКА ЗРЕНИЯ О ТЯЖЁЛОЙ АТЛЕТИКЕ В ЮНОШЕСКОМ ВОЗРАСТЕ

[Anna Swisher](#)

Автор рассматривает целый ряд проблем, связанных с практикой тяжёлой атлетики в юношеском возрасте: реальные преимущества тяжёлой атлетики, когда надо начинать

практику этого спорта и почему надо учить жесты тяжёлой атлетики в раннем возрасте. Автор так же анализирует важность подготовки тренеров юных спортсменов, пути прогресса в подготовке и в использования нагрузок в течении долгого времени.

## ТЕНДЕНЦИИ ОПРЕДЕЛЁННЫЕ НА БАЗЕ РЕЗУЛЬТАТОВ ТЯЖЁЛОАТЛЕТОВ (МУЖЧИН И ЖЕНЩИН) ПОКАЗАННЫХ НА ЧЕМПИОНАТАХ МИРА И НА ОЛИМПИЙСКИХ ИГРАХ В ПЕРИОД С 2000 ДО 2014

[Thomas Norlander](#)

Автор анализирует результаты показанные тяжёлоатлетами (мужчинами и женщинами) на самых важных мировых соревнованиях по тяжёлой атлетике, отмечая заметный прогресс выступлений азиатских спортсменов (мужчин и женщин). Автор пытается дать ответы на ряд вопросов связанных с анализом результатов и говорит так же о допинговом контроле в Азии и в Европе.

## ТРЕНИРОВКА СИЛЫ В ДЕТСКОМ И ПОДРОСКОВОМ ВОЗРАСТЕ: МОРФОЛОГИЧЕСКАЯ И НЕЙРОННАЯ АДАПТАЦИЯ?

[Antonio Paoli, Tatiana Moro](#)

Авторы концентрируют своё внимание на роли и на распространении так называемой тренировки с отягощениями (resistance training) в детском и подростковом возрасте. В частности с особым вниманием анализируют факторы способствующие развитию силы в эволюционном возрасте, среди которых отмечают совместное сокращение мышц агонистов и антагонистов, различное распределение типов мышечных волокон и различные тенденции активизации мышц. По мнению Авторов, развитие силы с помощью тренировки с отягощениями (resistance training) в детском и подростковом возрасте зависит от правильной нервной стимуляции, используя нагрузки адекватные для достижения максимальной мобилизации, избегая любую практику направленную преимущественно на развитие гипертрофии и на увеличение мышечной массы.

## ПРИСЕДАНИЯ СО ШТАНГОЙ НА ПЛЕЧАХ (SQUAT): БИОМЕХАНИЧЕСКИЙ АНАЛИЗ

[Antonio Urso](#)

На первый взгляд, приседания со штангой на плечах (squat) кажется простым упражнением которое легко выполнять. В реальности, правильное и надлежащее выполнение этого упражнения требует специальных знаний не только биомеханики, но и правильной последовательности работы различных мышц, что часто упускается из вида в прикладном изучении этого упражнения. Кроме того, приседания со штангой на плечах представляет собой упражнение которое играет фундаменталь-

ную роль для развития силы нижних конечностей и не только в тяжёлой атлетике. В данной статье это упражнение, используемое в настоящее время почти во всех видах спорта, анализируется таким образом, чтобы иметь более широкое представление всех составляющих его элементов: как биомеханических так и нейрофункциональных.

## НА ПУТИ К НЕОПРЕДЕЛЁННОМУ (ПО)ЗНАНИЮ

[Alberto Andorlini](#)

Автор продолжает своё оригинальное рассуждение о нетрадиционном понимании процесса тренировки и движения. Определяет программу публикации статей в нашем журнале с целью предложить так называемую «Грамматику движения» которая максимально соответствует требованиям тренировки направленной на улучшение жизни в обществе; определить пространственные координаты тела которое хочет двигаться прогрессируя с качественной точки зрения; установить методологическую преемственность между понятиями Переход, Связь, Поток; и наконец ограничить расстояние между различными областями, видами деятельности и дисциплинами, с целью развития процесса тренировки в направлении интеграции и интегрирования.

## ЗУБЫ СТИСНУТЫ. СТОМАТОЛОГИЧЕСКАЯ ОККЛЮЗИЯ И МЫШЕЧНАЯ ПРИЗВОДИТЕЛЬНОСТЬ

[Antonio Del Vecchio, Antonio Urso, Eugenio Cilento, Raffaello Del Vecchio, Angelo Marinoni, Domenico Marzullo](#)

Авторы представляют исследование о внутриротовых окклюзионных устройствах таких как bite и зубная пластинка, которые в настоящее время широко используются для улучшения спортивных результатов. Это использование базируется на предположении что положение тела, равновесие, сила и эффективность мышц являются фундаментальной основой (пилястром) спортивного результата. Авторы пытаются объективно оценить как переконструирование связанное с окклюзией влияет на развитие силы и производительности мышц. И этом смысле использование аппарата для ЭМГ (электромиографа) с беспроводной поверхностью позволило собрать ценную информацию о нервно-мышечных изменениях вызванных окклюзионным контактом или же более точно воздействием окклюзионной функции, используя проверенные индексы.





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