



## CONSIDERATIONS

### Introduction

**Each minimum movement reflects the history we have in common, evolution**

Let us tell you a story...

It took a long time to make human beings become what they are today starting from the unicellular organism populating our planet millions of years ago.

Each of us contains the traces of this marvellous voyage written in our genetic code: the DNA.

Every thought, every minimum movement of an athlete, of a baby as of anyone of us reflects this incredible common story: evolution.

Most of the time we forget how complex our body is especially when doing exercise, when millions of cells work together allowing us to run, jump or play.

### The fashion factor

**We believe our origins allow us to be different**

Each year a new fashion becomes in a moment the best solution to all problems, aging, obesity, depression, becoming enemy number one and disappearing quickly the following year.

Gyms, sport facilities, wellness centres differentiate themselves only for prices, image and slogans but at the end of the day their vague offerings leave many unsatisfied. We believe our origins allow us to be different. Ours is not a history of sleek gyms and perfect bodies but a more intimate and deeper one.

Our roots are found scattered in the block notes, blackboards and computer files of research laboratories of many countries. Thoughts, formulas, drawings scribbled on pieces of paper stained of coffee because thoughtlessly put on the small table of an airplane seat during a travel from a conference to another.

Our company, the Boscosystem products and methodologies for sports, fitness and health, are born from the passion of a man, Carmelo Bosco, for sports science and from his will to change the status quo creating a new point of view on human performance and training.

### Passion and research

**A great heritage guides us in the creation of our products**

It is this absolute and total passion that has always supported Professor Bosco in his thousand movements, from laboratory to laboratory, from country to country since the time he left his island, Sicily, traveling North to chase the dream of more advanced laboratories where to carry out his research.

Carmelo has always taken everything with him from Sicily: passion, stamina, irony, joy of living and culture. A man dipped in his origins that exploded powerfully through each word and gesture creating in a moment, anywhere, a virtual Sicily, a happy place, intimate but frank and at the same time full of life.

Our opinions, reflected totally in our products and our methodology, are not fashions of the moment but the result of a long journey that has brought us to a holistic vision of performance, well-being and health.

This voyage continues after the premature death of Professor Bosco and takes new shapes through our company, its employees and consultants. Today it is this great heritage that guides us in the creation of our products.

## OUR SCIENCE

### The starting point

#### **Our starting point is to recognise the complexity of the human body**

Today we hear very frequently people speaking about fitness, wellness and sports, but very rarely of the deep complexity that characterises the human body and any use we decide to make of it.

Perhaps because many fear to admit how superficial most approaches are.

Too frequently the impression we get is that one exercise is like the other, that the products are all equal and that the various types of physical training are simply temporary fashions that attract many without being specific for anyone.

Too often fundamental questions like- why that exercise? Why at that speed? Why with that weight?- are avoided leaving the place to illusory images of perfect bodies as much beautiful as difficult to reach.

Our starting point as a company working in the field of fitness, health and performance, is to acknowledge the complexity of the human body, of all, athletes, normal healthy people and patients.

### Evolution

#### **Time spans that seem eternal, are just moments in evolutionary time**

Every human being has approximately 200 different types of cells that join together in millions and form the different tissues and organs. Some tissues specialise in support functions as the bone, cartilage and the connective tissue.

Others develop movement capability as muscles and others become specialised in the elaboration of information and its transmission as the nervous cells.

Human evolution has required a very long time to create what we are today from the early forms of life that populated Earth.

Time spans that seem eternal to us are just moments in evolutionary time.

As an example in the last 50,000 years human beings remained biologically identical. 30,000 years ago mankind populated already great part of the planet and only 10,000 years ago human beings changed from the nomadic life of the hunter to the stable one of the farmer.

### The neurological basis

#### **Speech has deep connection with the neuro-muscular system**

It is the ability to speak, emerged probably in a period between 100,000 and 50,000 years ago, that has marked more than any other event our transformation in modern humans capable to interact among ourselves and with the surrounding reality to the highest degree.

Words have deep connections with human musculature. Many scientists think that the capability of speaking has emerged, at least in part, from the physical movements of primates and the first human beings.

Gestures, expressions, positions, and other fine or rough actions. In a way that is still not clear, linguistic structure can arise from and can even be seen as a special case of motor structure, the structure of action (Studdert-Kennedy, 1983).

Similarly, our inner ability to elaborate the words and the syntax into mental thought can emerge from our capability to handle physical objects. Words that were originally attributes of the objects are more and more managed and joined, like real objects are handled by a child (Wilson, 1998, p. 193). Modern research indicates the existence of a strong neurological basis supporting the connection between physical movement and speech.

## The system of locomotion

### **Physical movement is at the basis of complex capabilities development**

Recently, NASA scientists have noticed that astronauts exposed for extended periods to absence of gravity might suffer from dyslexia probably due to a degeneration of the cerebellum caused by the alteration of the motor activity in space (Meikle, 2001).

Therefore physical movement appears to be fundamental even for the development of a complex ability such as speech. But in spite of the uniqueness of the human race, our DNA is for 99% identical to the one of chimpanzees.

Man biologically designed to move, hunt, run and fight has been able to evolve transforming reality to such an extent that he could eliminate the problems he was programmed to overcome.

Therefore hunting, fasting and hard physical work have disappeared from the life of most of us in developed countries leaving largely unused our biological system.

Especially the musculo-skeletal system that constitutes the largest part of our body mass because so essential in the biological program initially foreseen for the human race.

## Muscles and metabolism

### **In nature details make the difference**

Therefore tissues like the muscle, relegated by modern life to a marginal role, are in reality biologically essential. At the basis of every movement, muscles are a very ancient tissue that still uses metabolic pathways, like anaerobic glycolysis, developed when the atmosphere on Earth was lacking oxygen.

Muscles also are extraordinarily versatile, easily capable of increasing up to 50 times their metabolic rate in response to work loads. However, as for all biological systems, the consequence of disuse is degradation and pathology.

Details make the difference in nature. If the 99% of our DNA is identical to the one of chimpanzees we must then realize that apparently enormous inter-individual differences are genetically microscopic. For this we think there is nothing worse than being rough and vague when dealing with the human body.



## THE RESEARCH OF CARMELO BOSCO

### Our culture

#### Sports science is the true science of health

Our knowledge of the human body and of its mechanisms originates from **203 scientific publications of professor Carmelo Bosco** many of which top international scientific journals, and from quotations in some of the most important exercise physiology books such as the classic **Astrand-Rodahl Textbook of Work Physiology**.

Our culture, our values are not driven simply by a company mission' or `vision' but rather they emerge as natural consequences of our origins, of countless conferences, hours and hours of debates, discussions until late evening with many, many scientists from all over the world. Therefore for us research and development are not simply elements of a calculated business strategy. They are a choice of life and a reason of being.

Our philosophy is transformed in the Boscosystem method that guides the creation of our products. The research of Carmelo Bosco covers a wide area of exercise and performance physiology reaching the area of health and prevention. His work unfolds around a central interest for the neuro-muscular system, the interaction between the nervous system and the muscle at the basis of any human movement.

### Our heritage

#### Bosco has always been an outsider, constantly aiming at breaking false myths

From this central interest in the years Bosco extended his field of research: from muscular mechanics to energetic metabolism; from neuromuscular activity to hormonal responses to physical exercise; from biomechanics of movement to methodology of training; from the studies on fatigue to the discovery of vibrations as a training method and as a prevention tool of important diseases such as osteoporosis.

Professor Bosco formed himself in the great physiology school of Northern Europe, Finland in particular, inspired by fathers of physiology and modern Biology like Bernard, Darwin and Selye. But Bosco has always been an outsider, a misfit constantly aiming at breaking myths and changing the status quo. Never satisfied with the level of knowledge, always convinced that there was something more to understand, some unexplored area to discover, never he accepted to sit on his laurels.

For this reason perhaps his many movements, the countless engagements with professional teams and more recently his great interest in using physiology of sports to create the future science of health. After his premature death, together with his body of knowledge, this is the challenge that he left in heritage to us.

### The right answers

Carmelo Bosco to the students of Sport Science [University of Tor Vergata - Rome - March 2002]

*"You must know that medicine, medical science is born from the study of pathology and not of the healthy human being. Health has been defined by medicine simply through the removal of disease. But we know the healthy body, we study how to improve its performance, we know what it takes, not simply to remove disease, but to preserve an equilibrium of well-being, well therefore we have a great responsibility to adapt these acquaintances and to not only to make them available to athletes but to all. And we know that its not enough to simply say go jogging, lift some weights, do this exercise. Clear and serious answers are needed. Perche` to that speed? Why ` 10 times and not twenty? Perche` for a therapy we look for a doctor and for exercise prescription we trust anyone? Improvised gurus, businessmen masked like experts. It is the body of the people at stake, without mentioning the psico-physical well-being. Here's why only a minority of people perform regular exercise. Only through serious answer people can be convinced. And this is exactly why I believe the science of the sport can have a great role. We are those who have the knowledge to give the right answers not the ones that make sports their profession but above all to all that want to use exercise to be well. In an ageing world these competences can become fundamental in order to assure well-being, independence and quality of the life to millions of people."*

1975 - 1988            a

### Research on muscular mechanics: pre-stretching

Carmelo Bosco mostly worked in Finland as a researcher in the laboratory of Sports Biology at the **University of Jyväskylä** and as the Director of the **Laboratory of Biomechanics and Physiology of Sports in Kuortane**, in those years the main centre for the physical preparation of most of the Finnish elite athletes.

In this phase the scientific activity focuses on muscular mechanics and the effects of **pre-stretching**.

A fundamental discovery in 1982 is that pre-stretching allows the accumulation of elastic energy in the muscle improving the performance in the positive phase of muscular work (Bosco et al., *Int J Med Sport*, 3, 1982). (Bosco et al., *Acta Physiol Scand*, 128, 1986).

This was demonstrated for fast fibres as well as for slow ones depending on the speed and amplitude of the movement. (Bosco et al., *Acta Physiol Scand*, 116, 1982).

This research, together with the studies carried out in Russia in the sixties, allowed the development of plyometric training, widely used today in the world of sports.

1975 - 1988            b

### Beginning of the eighties: Ergo-Jump, Ergo-Power and Muscle-LAB patents

Basically pre-stretching determines a greater activation of the central nervous system allowing to optimise the training methodology (Bosco and Viitasalo, *Electromyogr. Clin Neurophysiol* 22, 1982; Forest, in: *Biomechanics XB*, 1987).

From an application point of view from these studies originates the battery of tests known as **Bosco Tests** used today all over the world. At the beginning of the eighties Bosco invents and patents two innovative systems for physical evaluation known as **Ergo Jump™** and **Ergo Power™** that in a simple and not invasive manner allow the measurement of power output and muscular work during physical exercises of different nature.

In the following years these two products have been integrated in a new version known as **Muscle LAB™** that includes synchronised electromyography making possible the study of the electric answer of working muscles. In the years these products became precious instruments for many physiologists, coaches and athletes optimising physical testing, the planning of training and the prevention of injuries.

1988 - 2002            c

### Creation of individualised training methodology

In this phase the research of Bosco extends to muscular efficiency, energetic metabolism, hormonal response to exercise and the effects of gravitational force on the human body (Bosco, *Acta Physiol Scand* 124, 1985).

Systemic and holistic aspects of the response to physical exercise start being the main scientific interest of professor Bosco. The axis of research is moved towards the creation of new personalised methodologies of training and progressively on how these methodologies can be used not only to improve performance but also health of us all. While continuing to teach in Finland, Bosco becomes full professor at the **Semmelweis University in Budapest**, one of the most prestigious and old Central European Universities, dedicated to Ignaz Semmelweis, that in 1847 identified the causes of puerperal fever in women and was disregarded by the medical community for his revolutionary ideas.

In this phase the relationships with many of the collaborators of today are established. These people continue to enrich the level of knowledge of our company.

1988 - 2002 d

### Different hormonal responses due to change in speed of movement

A profitable cooperation starts with the Professor **Atko Viru**, one of the worlds top experts of the relationship between hormones and exercise. This opens the door to the understanding of the long term adaptation to exercise mediated by hormones, an essential aspect in order to develop new and more effective training methodologies and equipment. It is during this phase that two fundamental aspects of the hormonal response to exercise are brought to light.

Thanks to the development and the validation of a new dynamometer named **Muscle LAB™** (*Bosco et al., Eur J Appl Occup Physiol 70, 1995*) it has been possible to measure muscular work during exercise and to observe the different hormonal answers caused by various speeds of execution. Movements with elevated power output, executed at high speed, stimulate testosterone, while strength movements with high loads and low speed induce the production of growth hormone.

Moreover it became evident that testosterone, always considered a hormone regulating protein synthesis, is in reality related to speed of movement and to muscular contraction through an action on the calcium pump. (*Bosco and Viru Biology of Sport, 5, 1998; Bosco et al., Med Sci Sport Exerc, 32, 2000*).

1988 - 2002 e

### Vibration gains the centre of the attention

These researches gradually supplied an amount of knowledge allowing the development of new and complex physical training methods.

The interest that Bosco had since 1992 (Belli and Bosco, *Acta Physiol Scand* 144, 1992) for the muscular response to mechanical stimulation, coupled with the more recent studies on hormones, paved the way to his last research topic: vibration, a force which we are unconsciously constantly exposed to.

*"Running, hunting, fighting, playing the drums and dancing, navigating the oceans, cutting trees and giving life to the first villages or travelling in a high speed train, men since always have been exposed to thousand types of vibration".*

We are in Budapest at the Semmelweis University, one of the most prestigious and old Central European Universities. Carmelo Bosco is professor of exercise physiology and, during an important conference, is introducing his new line of research. *"Vibrations"* Carmelo continues *"as the force of gravity are part of our natural environment, they accompany every movement that we make and shape the reactions of our body. It is a force mostly imperceptible that nevertheless unfolds around our entire existence guiding our evolution in the course of the years. Being able to use this natural force, to manipulate it, to dose it and kindly to expose the body to its power is the key to rethink how we exercise"*.

It's a hot summer day, and the public, mostly exercise physiologists from all over the world, starts asking what professor Bosco wants to reach with this new theory. The first tie knots are undone in order to let more air pass. Someone stands up and opens the window. The buzz of the audience can be heard in the hall, the sum of the hundred whispers of interrogation. Carmelo continues raising the tone of his voice: *"Adding to the normal forms of exercise, all based on gravitational force, a new and fundamental stimulus like vibrations we can amplify the level of stimulation of the biological system reducing the time necessary in order to have results and acting in a better way on complex systems like the bone preventing pathologies such as osteoporosis"*.

1988 - 2002 f

### The NEMES patent is born: Neuro-Muscular Mechanical Stimulation

The concept of Neuro-Muscular Mechanical Stimulation (NEMES) is based on this brilliant intuition on how to use existing natural forces to improve our condition. Today this is the name of one of our innovative product lines based on the use of mechanical vibrations.

Quickly a number of researches demonstrated the extraordinary effectiveness of this method bringing though also to light the importance of dosing the stimulation and the protocols on the base of highly individually characterized responses (*Bosco et al., Biology of Sport, 15, 1998*) (*Bosco et al., Eur J Appl Physiol 79, 1999*) (*Bosco et al., Clinical Physiol, 19, 1999*) (*Bosco et al., Eur J Appl Physiol, 81, 2000*)

And it is through these last researches that the patent that differentiates the NEMES™ products originates. The NEMES™ products are the only machines in the world equipped with an advanced system able to detect the muscular response to vibration through electromyography (EMG) and to identify the optimal vibration frequency for each subject. From the studies on vibration emerges also the great stimulation that this method induces on bone tissue making it an optimal candidate for the prevention and cure of pathologies like osteoporosis.

1988 - 2002 g

### **Products shaped for your personal needs**

These studies open the road to a definition of new methodologies of training based on deep physiological knowledge.

The research at Boscosystem s.r.l. starts from this basis today in order to develop a completely new methodology that puts at the centre the human being and his needs and starts from this to build the equipment and methods.

It is not simply a change from mass to individualized fitness but more from a fitness organized around the products and the gyms to one created around the people.

It is the final users, you, guiding us in the creation of our products and methodologies.

With Boscosystem it will not be you having to adapt to our products but us adapting our products to your needs.



## WHAT IS HEALTH?

### A new concept

#### Health is not merely the absence of disease and infirmity

The debate on the relationship between health and disease since ever has fascinated researchers and philosophers as Georges Canguilhem and has permeated modern thought in particular with Michel Foucault and his work on madness. For the majority of us health is simply the absence of disease. According though to the World Health Organization, health is instead a complete state of physical, mental and social well-being and not merely the absence of disease and infirmity.

*Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.*

### Prevention

#### Prevention instead of a battle against disease

When discussing about health and disease we are forced to consider them as opposite phenomena, separated and distinguished. But in reality this distinction is a consequence of a historical process and not of a biological phenomenon.

The separation between health and disease transforms natural truth into something socially simpler, more acceptable and adapted to the requirements of complex social organisations. In reality what exists is life in different shapes and death, the same for all.

This division between health and disease enforced by medical science reflects the shift of interest from the entirety *individual-society-environment* to the singularity *body-disease* reflecting the renunciation to protect life in favour of the battle against disease.

### Scientific solidity

#### Prevention can only be safe if based on a solid and scientific structure

No surprise that it is difficult to associate the definition of health of the WHO to the grey world of hospitals. In reality for all of us the image of a hospital reminds only of disease and suffering underlining in a sharp manner how little health has to do with medicine.

Prevention is a term of which medical science has taken control simply to notice that its true realisation means the cancellation of the existence of the medicine as a class and social structure.

The truth is that true prevention can only exist outside medicine, but at the same time it can only be credible and safe if based on a solid and scientific structure.

### Sports science

#### Sports science... an opportunity for health

This is why we believe that sports science is the true science of prevention.

Life unfolds in an unstable equilibrium between health and disease with moments in which a force prevails on the other. This equilibrium is indeed influenced by the choices of life we make and by the means we apply in order to make health prevail. We consider sports science an opportunity for health.

Studying and improving mankind in his condition of health, sports science is not taking care of therapy, but of the ways to make the health prevail on disease and of how to enhance it optimising performance.